

**“Settlements in Tarai Region : Their Socio-Economic
And Demographic Characteristics And Correlates
— A Case Study of Najibabad Tahsil
In District Bijnor, U.P.”**

*A dissertation submitted in partial fulfilment
for the award of the
Degree of Master of Population Studies (M.P.S.)*

By
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**Centre For The Study of Regional Development
School Of Social Sciences,
Jawaharlal Nehru University,
New Delhi-110067.**

1981

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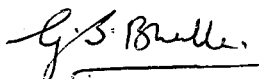
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the University, is, to the best of our knowledge,
a bonafide work and may be placed before the EXAMINERS
for Evaluation.


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CHAPTER I

1.1 Introduction

The term 'settlement' is the characteristic grouping of population into occupancy units having the facilities in the form of houses and streets which serve the inhabitants. It reflects the facilities developed in the process of human occupancy of the land and their grouping¹. Therefore, settlements are defined as cluster of houses including open lands around or interspersed among them, usually grouped at a convenient site and with or without any formal plan. It is a concrete expression of human occupation of the earth's surface representing an organized colony of human beings. It consists of buildings in which people live or work or store or use them otherwise and incorporates tracts and streets over which their movements take place. The rural settlement is primarily influenced by the environmental factors based on ecological relationship between a number of human beings grouped in households and natural resources they make use of. These settlements are later affected by the degree and complexity of its socioeconomic development and its expanding relationship with other settlements and human society².

-
1. Kohn, C.F.: Settlement Geography, Edited in American Geography : Inventory and Prospect by P.E. James and C.F. Jones, Syracuse, 1954, p. 125.
 2. Singh Ram Bali: "Rural Settlements, Types and Their Distribution: Examples from Varanasi District" in R.L. Singh, K.N. Singh and Rana, P.B. Singh (eds.) Readings in Rural Settlements of Geography, National Geographical Society of India, Varanasi, 1975, p. 224.

All the movements or activities of man for socio-economic development have the effect of "introducing a cultural element" in the natural environment of a settlement in the space.³ These cultural elements and the settlements of an area are interrelated" with the factors of geography, e.g. relief, climate, geology and socio-economic conditions". The functional activities refer to the social and economic activities such as, health, education, agriculture, industries etc. In other words settlements reflect the relative locational arrangements in a given space. They are closely inter-related with the areal dimension and to a certain extent with areal physio-socio-economic attributes.⁴ This implies that the pattern of distribution and types (size, growth, functional classification etc.) of rural settlements is governed by the balance of attractive and restrictive forces which perform different types of functional activities in the space.

All kinds of functional activities provide infrastructure and social facilities to the settlements fulfilling the various human needs, as biological, cultural and economic. Settlements have to have infrastructures and social facilities which are the capital source continuously sustaining and supporting the

-
3. Hudson, F.S.: Geography of Settlements (Macdonald and Evans, Great Britain, 1976), pp. 2-3.
4. Singh, R.L. : "Spatial Characteristics of Rural Settlements and their Types in a Part of Middle Ganga Valley" in K.L. Singh (ed.) Geographic Dimensions of Rural Settlements, Op.Cit., p.140.
Singh, K.N. :
Rana, P.B.S.
Dinesh, K.S.

needs⁵. The social facilities are vital part of the rural standard of living and must, therefore, be an integral and basic element of planning for village economy⁶. This gives the suggestive clue that rural infrastructure and social facilities can play a developmental role of prime importance rather than meet only welfare needs⁷.

In order that an economic plan 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. Whatever social facilities have been provided to the rural settlements for the development of rural areas are not enough to serve all the villages. In contrast, there is concentration of social facilities and improved amenities in the cities which has led to growing social disparities between rural and urban areas⁸.

-
5. Ghosh Bijit : "Some Thoughts on Rural Urban Planning" in Lalit K. Sen, Dealings on Micro Level Planning and Rural Growth Centres (NICD, Hyderabad, 1972), p. 263.
6. Kulp, Earl, M.: Rural Development Planning, 1970, p.88.
7. Rao, V.M. : Population Planning and Area Development Information Data XI-Villages in Tumkur, 1978, pp.3-4, United Nations Asian and Pacific Development Institute in Collaboration with the Institute for Social and Economic Change Workshop.
8. Prakash Shri : Regional Inequalities and Economic Development with Special Reference to Infrastructural Facilities in India, Indian Journal of Regional Sciences, Vol. IX, No.2, 1977, pp. 172-173.

This gives an impression that a balanced development of social facilities in the country may reduce the population pressure in the cities and improve the standard of living of the people in the rural areas also.

In order to remove glaring rural urban disparities and for accelerating the socio-economic welfare of the people in rural areas, it is important to consider rural space as a multi-functional system with varying dimensions of development processes and structure⁹. The organisation of a multifunctional system will vary according to levels of development phenomenon within a given area.

In the above context it is necessary to analyse the existing spatial multifunctional system of settlements landscape with special reference to the pattern of distribution of social facilities in a group of human settlements. Hence, the spatial distribution is the aggregate pattern of use of space by a society which determines the optimum structure of movements of man and material in intra and inter-regional dimensions¹⁰. This optimum structure is the result of interaction between man and material with a further determination of socio-economic characteristics.

9. Haggett, P. : Determination of Population Thresholds
Gunawardena, K.A. : for settlements Function by the Reed-
Munch Method (1938) in P. Haggett *et al.*
Locational Model, Locational Analysis in
Human Geography (Arnold Heinmann, London,
1977), p. 141.

10. Chand Ramesh : Spatial Organisation of Social Facilities-
A case Study of Bulandshahr, U.P., 1979, p.2.

1.2 Selection of the Study Area:

In India, with the great diversity in the resources base, climate and social set up, socio economic and demographic characteristics of the country and differ significantly from one region to other. The technology induced and the facilities given to the inhabitants brings intra and inter regional disparities as well. Therefore, for the future planning, the different areas and their characteristics should be diagnosed at micro level and treated in order to check to population growth as well as to reduce disparities among the settlements (rural versus, urban, large sized versus small sized). To achieve such goals, the studies should be performed in different natural regions of the country. Here the present study, therefore is an attempt to analyse the socio economic and demographic characteristics of the Terai belt in the Indo-Genetic macro region of India. The study area 'Najibabad Tahsil' is situated in the Terai belt of Indo-Genetic plain.

1.3 The Problem under Study :

The present study deals with an investigation of an area - Najibabad Tahsil (Bijnor) with an emphasis on the socio-economic and demographic characteristics of the settlements and their distribution pattern with special reference to social facilities on the basis of physical facts. The analysis of socio-economic and demographic characteristics shall be done with the varying size of settlements to see whether size of

settlement has got any impact on its socio-economic and demographic characteristics. The spread of innovation is also a very strong phenomenon which brings rapid changes in the cultural structure of the settlement. Therefore, the analysis of these characteristics is to be made with reference to the point of origin of innovations i.e. central place or urban centre. So the distance from urban centre becomes one of the strong explanatory variable for the social, economic and demographic characteristics of the settlement.

1.4 Objectives of the Study :

The objectives of the present study are as follows :-

1. To describe the physical, social, economic and demographic characteristics of the study area - Najibabad Tehsil on the basis of the characteristics of each individual settlement.
2. To assess the spatial distribution pattern of settlements with their socio-economic and demographic characteristics.
3. Generally it is observed that most of the social facilities are located in large sized villages and also the localization of these facilities is influenced by some political factors. Therefore, it becomes important to examine the spatial distribution of social facilities in different size of village.
4. To build up the hierarchy of the settlements on the basis of composite score of social facilities available to the settlements.

5. To examine the level of dependency of the socio-economic and demographic characteristics among the different size of settlements.
6. To examine the impact of social facilities on the socio-economic and demographic characteristics of the settlements.
7. To examine the impact of location of settlements on their socio-economic and demographic characteristics with reference to distance from roads.
8. To examine impact of location of settlements in relation to central place (i.e. urban places; the points of origin of innovations) upon the socio-economic and demographic characteristics of the settlements.

1.5 Scope of the Study :

The present study is a diagnostic analysis of the social amenities available in the settlements of the study area and of the manner in which they change their socio-economic and demographic characteristics. This study at the grass root level is expected to make some contribution towards decision making for allocation of social facilities in the area in an optimum manner, in order to reduce the disparities among the settlements.

1.6 Hypotheses to be Tested:

The following hypotheses are to be tested in relation to present study -

- a. The level of functions determine the size of settlement.
- b. Since innovations generally take place first in urban areas they travel from them in all directions from the centre to

peripheral areas. The intensity of innovations will be inversely proportionate to the distance between the settlement exposed to it and the origin of innovation (urban centre). So this distance can be taken as the determining factor to explain the variation in socio-economic and demographic characteristics of the settlements. So the hypothesis have that the spread of innovation affects the socio-economic and demographic structure of the village.

- c. Accessibility determine the socio-economic and demographic characteristics of the settlements.
- d. The degree of the relationship among the socio-economic and demographic characteristics change in different size groups of villages.
- e. Different socio-economic and demographic characteristics are interrelated.
- f. Settlements have their functions based on the population size.
- g. Literacy rate influences the localisation of social amenities.
- h. Accessibility (measured in terms of distance of villages from nearest Pucca road) influences the localisation of social amenities.
- j. Higher the workers engaged in tertiary sector higher would be the concentration of social amenities in the villages.
- k. Distance from nearest town also affects the localisation of the social amenities.

1.7 Data Base :

- a. For each village of Najibabad Tahsil, the data has been taken from the "Primary Census Abstract" and "Village Directory" of district Bijnor for the 1961 and 1971 censuses.
- b. The data relating to distance of the village from the road is taken from the topographic sheets published by Survey of India, 1970. No. $53 \frac{K}{1}$, $53 \frac{K}{3}$, $53 \frac{K}{2}$, $53 \frac{K}{4}$, $53 \frac{K}{6}$ & $53 \frac{K}{7}$.
- c. Information regarding, relief, climate, soil, drainage, geology, water resources etc. have been taken from district Gazetteer of Bijnor.
- d. Data on agro-economic services and other facilities have been collected from Tahsil headquarter Najibabad and district headquarter Bijnor.

1.8 Methodology :

The concern of present study is mainly to discuss the characteristics of rural settlements and to explain variation in the characteristics. Here the urban centres of the Tahsil are taken as the explanatory space locations in order to analyse the behaviour of socio-economic and demographic characteristics of the rural settlements distributed around these nodal centres. Therefore, the characteristics of urban centres should not be operated mixed with rural characteristics. Hence, the characteristics of urban centres are treated separately.

The present study has been done on the village level on the basis of area investigation, historical and physical facts. The following statistical and cartographic techniques have been used in this study :-

- a. Spatial distribution of the settlements has been examined with the help of Near Neighbour Analysis¹¹.
- b. The average spacing among the settlements have been identified by applying Mather's Model of average spacing¹².
- c. To determine the hierarchy of the settlements and level of development, composite scores are calculated for each village by aggregation the assigned weightages to each facilities¹³.

$$W_i = \frac{N}{F_i} \quad \& \quad C_j = \sum_{i=1}^K W_i X_{ij}$$

F_i = Number of settlements having the facility.

N = Total number of settlements of the area.

W_i = Weightage to the i th function.

K = Total number of sub-function for J th settlement.

C_j = Composite score for that function for j th settlement.

X_{ij} = Value of the i th sub function in j th settlements.

11. Clark, J.P. "Distance to Nearest Neighbour As a Measure of Evens, F.C. : Spatial Relationship' in Population Ecology (1954), Vol. 35, pp. 445-53, Aslam Mahmood, Statistical Methods in Geographical Studies (Rajesh Publications, New Delhi, 1977, pp. 72-75.
12. Mather, E.C. : A Linear Distance Map of Farm Population in the Annals of Association of American Geographers, Vol. 34, 1964, pp. 173-180.
13. Bhat, L.S. : Micro Level Planning - A case study of Karnal Area Haryana, K.B. Publications, New Delhi, 1976, p. 60.

- d. The interrelationship between the socio-economic and demographic characteristics has been calculated by correlation coefficient :-

$$r = \frac{\sum XY - (\sum X) \times (\sum Y) / n}{\sqrt{\frac{\sum X^2}{n} - \left(\frac{\sum X}{n}\right)^2} \sqrt{\frac{\sum Y^2}{n} - \left(\frac{\sum Y}{n}\right)^2}}$$

- e. Choropleth technique of cartography has been used to show the distribution pattern of the different characteristics of the settlements.
- f. Graphical methods are also used to depict the concentration and dispersion of the characteristics among the different size of settlements like Lorenz Curve and Gini Coefficient¹⁴.

1.9 Organisation of the Study:

Present study has been constituted with eight chapters:-

Chapter I deals with the importance of the present study its objective, scope, methodology and building of Hypotheses.

Chapter II shows the general characteristics of the Tahsil Najibabad. General characteristics include, Geographical location, physical setting resource base (soil, forest & minerals), Transport, Net-work, industries etc. The cultural aspects of the Tahsil are also discussed briefly.

14. David M. Smith: Pattern in Human Geography, Penguin Publications, 1977, pp. 200-204.

In Chapter III, the pattern of distribution of settlements within the Tahsil boundary have been discussed. Analysis of the settlement patterns is done on the basis of 'Near Neighbour Distance' Analysis. The distribution of settlements in relation to transport network and urban centres has also been discussed here.

Chapter IV deals with the distribution of different social amenities in the Tahsil. Here an attempt is made to see the association between size of the settlements and localisation of social amenities. The concentration of social facilities are analysed with respect to different population sized groups of settlements.

Chapter V, explores the levels of development of the settlements reflected by their hierarchy among the settlements. The composite score of social amenities has been used to show the hierarchy among the settlements of the Tahsil. Here an attempt is also made to show the association between social amenity score and size of settlements.

Chapter VI, deals with the distribution of different socio-economic and demographic characteristics of the settlements in the Tahsil. It is a well known fact that different socio-economic and demographic characteristics are related. therefore, the degree and direction of relationship among these characteristics has been discussed. Different factors like accessibility, distance from Urban centres and availability

of social amenities have direct effect upon socio-economic and demographic structures of settlements, therefore, for an attempt has been made to relate these factors with socio-economic and demographic structure of the settlements.

The social amenities always play an important role in order to change the socio-economic and demographic structures of rural settlements, but there are certain factors which influence the localisation of these social amenities. This is two way process. Therefore, Chapter VII deals for the search of factors responsible for the localisation of social amenities.

Chapter VIII concludes the whole study, presenting the facts and findings related to socio-economic and demographic characteristics of the settlements for future planning in Najibabad Tahsil.

CHAPTER II

General Characteristics of the Region2.1 Location :

The area under study - Najibabad Tahsil - constitutes the northern part of Bijnor district in Rohilkhand division of Upper Ganga Plain of U.P. Najibabad Tahsil extends from $29^{\circ} 25'$ north to $29^{\circ} 58'$ north latitude and from $78^{\circ} 7'$ east to $78^{\circ} 31'$ east longitudes covering an area of 1234.7^1 square kms. The Ganges on north and west, Siwalik hills on north and north east, tahsil Bijnor and Nagina on south west and south east respectively, make the boundary of Najibabad Tahsil.

2.2 General Features of the Tahsil:

The land surface in Najibabad is broken by several rivers of considerable size and their tributaries, flowing from east to south west direction. This alteration of local country and reversion depressions extends northwards to abroad belt of forest, which forms a fringe along the north eastern border. The taluk narrows towards its northern angle. There is a small range of low hills in the northwest constituting the great Himalayan chain outwork. In the north eastern part there is a well marked gradual slope of Bhabhar, a waterless tract formed of boulders carried by rivers from the hills, underneath the water sinks to a great depth. The slope is more gentle here. The another tract along the Bhabhar called

1. District Hand Book, Bijnor, 1971.

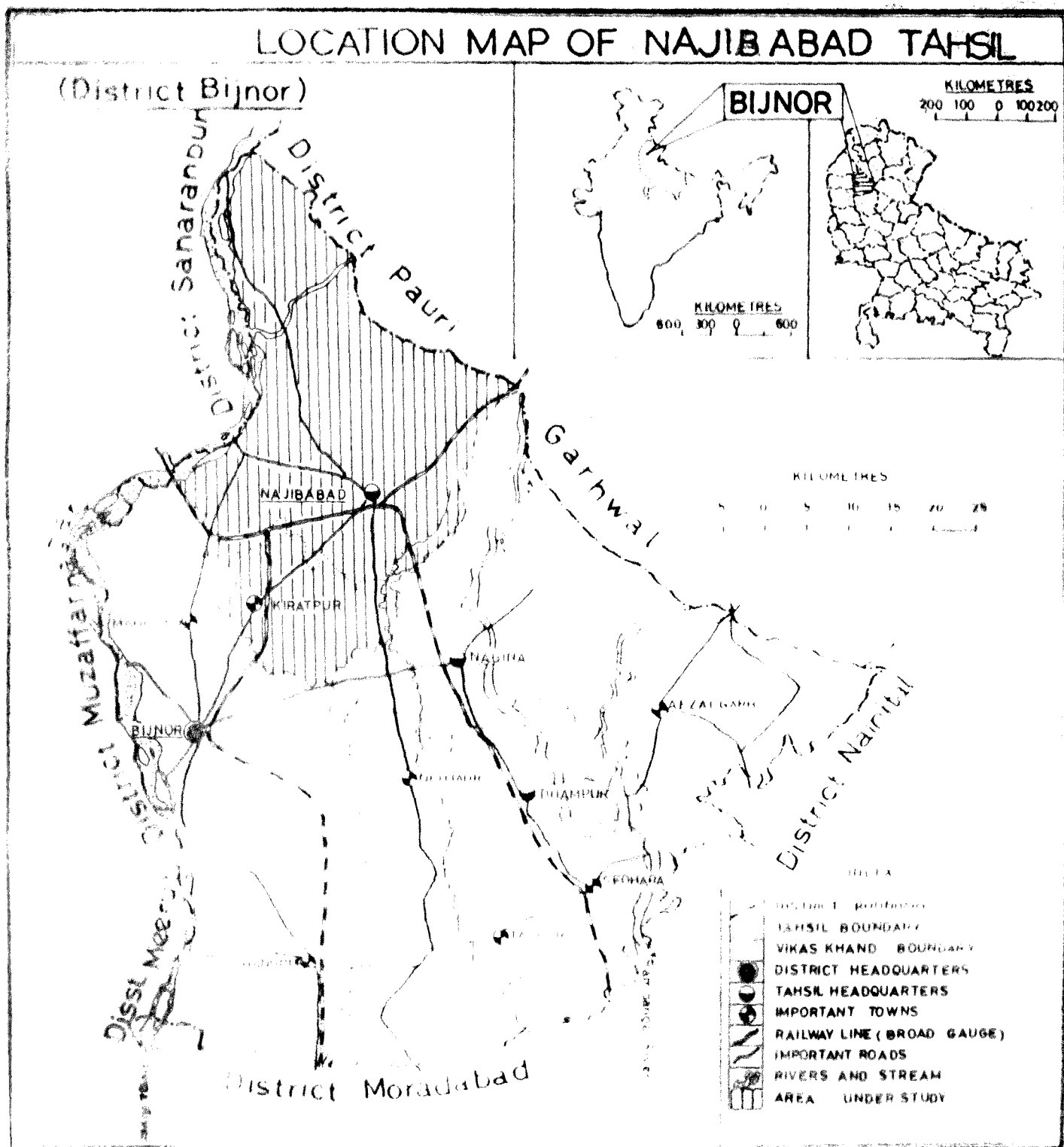


Fig:1

Tarai is also present here but with not such intensity as in Nainital district plains. The area under study more or less resembles to the characteristics of Bhabhar and tarai belt of Indo-Gangetic plain.

2.2.1 The Chandi Hills:

Of the various natural divisions of the tahsil the hill tract in the extreme north is by a the smallest. It occupies an area of 25 square miles and whole of this is included in government reserved forests. The main peak of this hilly region is Chandi, 1928, feet above sea level. The hills are little more than rugged and barren rocks uncultivated and uninhabited. On the slopes there is a luxuriant growth of bamboos. This hill region has a very poor dry and shallow soil. At the foot of the hills, both of the south and north west, the soil is good alluvial deposit over deep bed of boulders.

2.2.2 The Forest Belt :

This belt of forest tract extends from the level portion of Chandi in the north to Rehar in the east. Northern Chandi hills, its highest is about 950 feet, drops regularly in the east upto 890 feet. The surface of the ground, however, is very uneven through the tract. The level is broken by innumerable streams and water courses which carry out the drainage from the neighbouring hills of Garhwal, the channels of the larger rivers having wide valleys on either side while the banks of the smaller tributaries are scored in every direction by ravines.

Otherwise the forest area is a fertile stretch covered with the forest and grass jungle and is being used as the pasture land for the people living in the plain area near to these jungles. In the valley the soil is rich and moist while on the higher levels, it is lighter in texture capable of bearing excellent crops in all but driest season. A considerable area of the forest has been converted from the old trees into the Eucalypts, sal and sesam plantation and is being used for the cultivation of gram and wheat on the lease basis which has provided employment to a number of people. Forest covers 30.69% area of Tahsil.

2.2.3 The Open Country :

The south of this forest belt lies an open expanse of country, which continues to the southern part of the taluk. The surface is genetyly undulating and rises from the low valleys of the rivers to the sandy ridges which mark the water parting. The general slope of the region is from north to south.

2.3 Soils:

South of the Siwalik hills, the Bhabhar tract and whole of the taluk consists of recent alluvium. On the higher ground the soil is light and sandy open pure sand; on the level stretches it is a mixture of sandy and clay in varying proportion, classified generally as loam and in the low areas and the depressions on the uplands the sand disappears, leaving nothing but a stiff of agriculturios clay. The more recent deposits are left behind by the rivers during the flood season giving rise to a very fertile soil in the valleys.

2.4 Drainage:

The distribution of the various soils is very much connected with the drainage system of the taluk, for the rivines have a marked influence upon the land on their banks. These rivers which are exceedingly numerous, belong to several, systems or rather several sub-divisions of the same system, as all the surface utimately finds its way through the river channels unto the Ganges. Map (Fig. No. 2) shows the drainage system. The following main rivers are passing through this Tahsil:-

1. The Ganges - forming the western boundary of taluk has given rise to a khada flood plain of sandy soil.
2. Malin river which is connected to the birth place of king Bharat (after whom the name of our country was founded) flows from north east to south west, through the main part of the tahsil, giving a very fertile land to the tahsil. Its tributories are Ratnal, Lukarhan.

The other rivers are, Chhoysa, Ban Nadi, Pilli Nadi, Rawason and Kotawali.

2.5 Minerals:

The mineral products of the tahsil Najibabad are extremely meagre. The soft sand store found in the low hills of the north is of no use for building purposes, nor are there traces of any quarries works. The saline efflorescences known

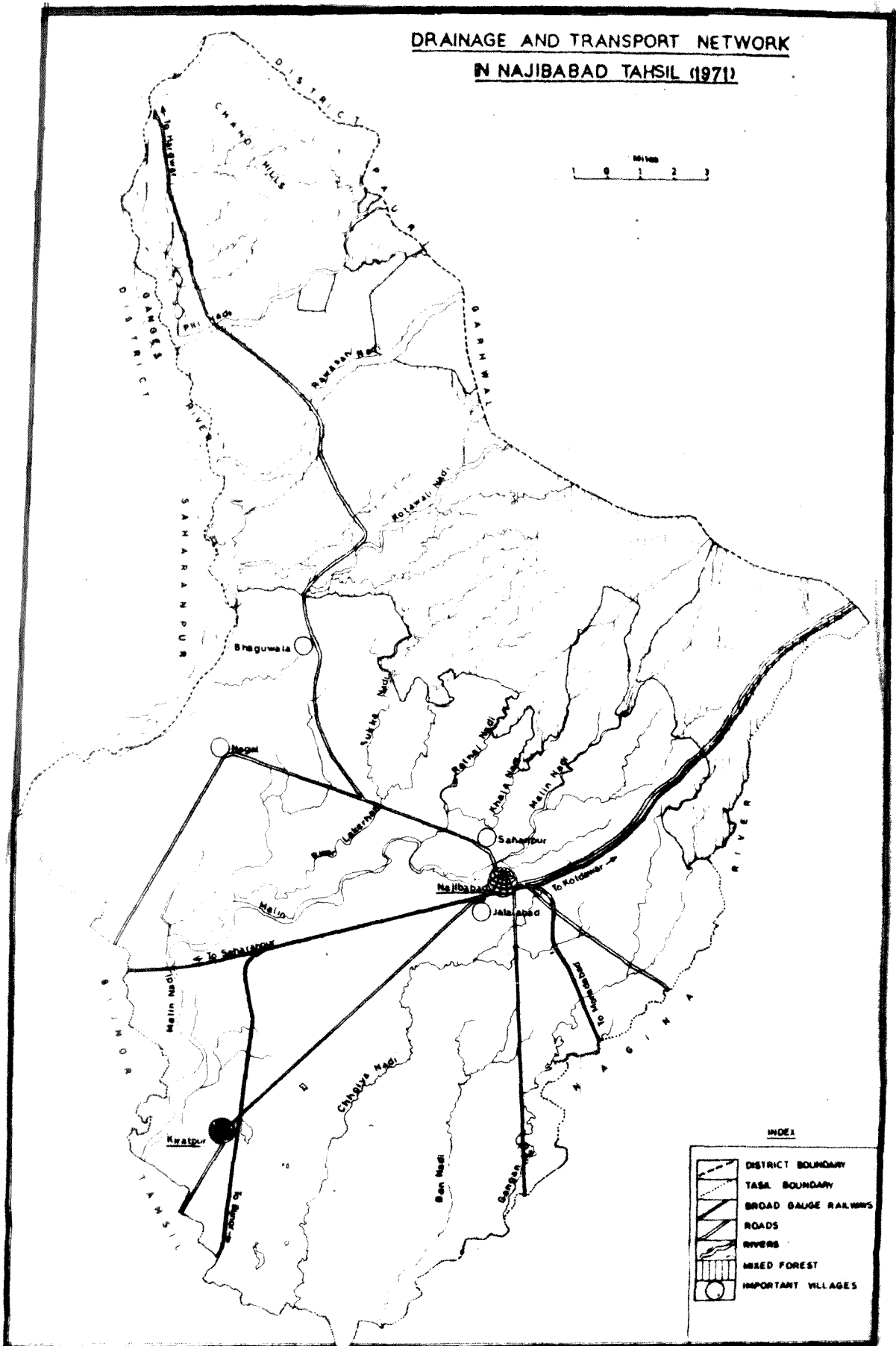


Fig. 2

as Reh, which make their appearance on the saturated tracts of the Khadar. The clay is also found in the tahsil giving a base for earthen pottery.

2.6 Climate :

Owing to its geographical position Najibabad enjoys a climate which is superior to that of any district of the plain. The comparatively high latitude, combined with the proximity of Himalayas and the presence of many hill streams serve the district. As a rule the tahsil is beyond the influence of east winds and in hot weather the west wind seldom blow with violence. The period of hot summer starts from middle of April. The temperature increases in May and June. The cold weather begins in October and lasts for six months reaching climax in January. The winter rains take the form of hail storms and sometimes accompanied by hail. Most of the rainfall come during the rainy season starting from late June to September. Najibabad records an average of 46.78 inches of rainfall.

Under Ground Water Resources² :

The water Table in the Bhabhar tract is very low. There are no wells in the Bhabhar and therefore actual depth is not known. A tubewell exists in Tolipara Fara whose depth is 26 meters. In the Tarai region, water table is fairly high

2. Working Plan for Bijner Plantation Division, Siwalik Circle Uttar Pradesh 1970-71, pp. 50-51.

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ranging from 1.5 metres to 12 to 10 metres in Sahampur north of Najibabad Town. But along the Ganges spur the water table is again very low and it is about 25 metre near Nangal. In Kiratpur block the table is about 7 to 8 metres. The water equifer under the aluvial bed is about 300 feet in Najibabad Tahsil but in Kiratpur Tahshil water equifer is about 100 to 200 feet blow the surface. This marked difference in water equifer has been responsible for the development of wells for irrigation and ultimately for the economic development of the two blocks of the tahsil.

2.7 Transport

Najibabad tahsil has very good transport network. There is one state road and other district roads radiating from Najibabad state road connects Haridwar & Moradabad, via Najibabad. There are also some district roads which connects the large villages and the towns of the Tahsil. The double broad gauge railway line passes through the tahsil. Najibabad and Muzenpur Narayan are the two railway junctions.

2.8 Agriculture

Because of the non-availability of water in Najibabad block intensive agriculture is not possible but where there are irrigation facilities there intensive agriculture is being carried out. Sugarcane, wheat and rice are the most leading crops which are grown there.

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2.9 Industry :

Being a sugarcane producing area, the main industry of the tahsil is sugarcane crushing. Kiratpur is an important Khandsari producing centre. Other industries like Saw mills which utilise the forest produce are located at Najibabad. The tahsil also has an oil mill and a few flour mills. One rice mill is also situated near Najibabad Town.

2.10 Socio-economic and Demographic Characteristics of the Tahsil

Najibabad tahsil have in all 403 villages inhabited and two urban towns named Najibabad (Tahsil & Block head-quarter, population 42586) and Kiratpur (Block headquarter population 25147) in 1971. Tahsil experiences 22.90 percent of urban population of which 62.87 and 32.13 percent constituted by Najibabad and Kiratpur respectively.

Urban towns show 22.18 percent growth of population during the 1961-71 decade while rural population experienced a population growth of 37.5 percent. Najibabad town experienced rather fast growth of population 24.12% while Kiratpur showed only 19.03% of population growth.

The rural population has 854 females to 1000 males but in towns show a sex ratio 887 females per 1000 males, an increase of 33 females per 1000 males.

In urban areas the literacy rates are 27.59% (Najibabad has 24.73 and Kiratpur has 14.25% literates). Rural population have an 16.29% literacy rate. As far as the female literacy is concerned, it is 20.78% in urban population and 6.44% in rural population. Najibabad town has 24.73 percent of female literacy but Kiratpur town has 14.25 percent of female literacy.

As for as the schedule caste population is concerned. It constitutes 22.17%. Urban areas have only 8.06 percent of scheduled caste population. Rural population has 26.37 per cent scheduled caste and 0.84 percent scheduled tribe population.

In towns 26.49 percent population is engaged in various economic activities of which 51.4 percent, 31.75 percent and 16.85 percent workers are engaged in tertiary, secondary and primary activities respectively. In rural sector 29.36% of population is termed as workers of which 82.78, 8.23 and 8.99 percent workers are engaged in primary, secondary and tertiary activities. Female participation is very low in both the rural and urban areas. For urban areas female participation is 1.57 percent while rural population shows only 1.13 per cent female participation according to 1971 census.

CHAPTER III

3.1 Spatial Distribution of Settlements :

The settlement pattern of any region is determined by the balance of the attraction and restrictive forces and, therefore, different regions reflect varying spatial distribution patterns of settlements.¹

The spatial framework comprising the settlements and population provides a basis for regularity in the organisation of some settlements as central places.² Physical barriers, however, becomes restrictive factors and availability of resources become attractive factors. Since the northern strip of forest covers almost one fourth of the area of the tahsil it has become a restrictive feature for people to settle down there. The undulating surface furrowed by seasonal rivers and nonavailability of water due to deep water equifer (see map no. 2) have become restrictive forces for the evolution of settlements in the forest belt of the tahsil.

The spatial distribution patterns of the settlements are statistically measured by the Near Neighbour distance analysis where $R = \frac{\bar{D}_o}{\bar{D}_r}$ ³, R is the NND index \bar{D}_o is observed mean distance between settlements and \bar{D}_r is expected mean distance. Obviously,

1. Ibid.

2. Clarkh, P.J.; "Distance to Nearest Neighbour as a measure of spatial relationship in population, Ecology", Volume 35, 1954, pp. 445-453.
Evans, F.C.

3. See Appendix I.

it is expected that this value would vary in magnitude from one area to another since variations in the surface of alluvial land (physiography), the economic base, and land occupancy are likely to influence the spacing of rural settlements of any area⁴.

In a homogeneous area, it is expected that settlements would show an even distribution pattern. The centrality among the settlements and facilities provided to them led to differentials in growth and hence some of the settlements grow faster resulting in variation in size of settlements among themselves. Large-sized villages show concentration and higher function level as well and provide facilities to small-sized villages. If these large-sized villages tend to agglomerate at one place, then, the small-sized villages shall be ill fed. Therefore, one should see the distribution pattern of villages in each category of villages according to population size like-(below 200, 200-499, 500-999, 1000-1999 and 2000+). If ratio of R values for villages of two consecutive population size group is around one then it can be concluded that the settlements of these two groups are arranged in central place system.

Map (Fig. 3) shows the distribution of settlements according to Near Neighbour Distance Analysis. Most of

4. Berry, B.J.L.: Spatial Analysis. A Reader in Statistical Geography (1968), p. 161.

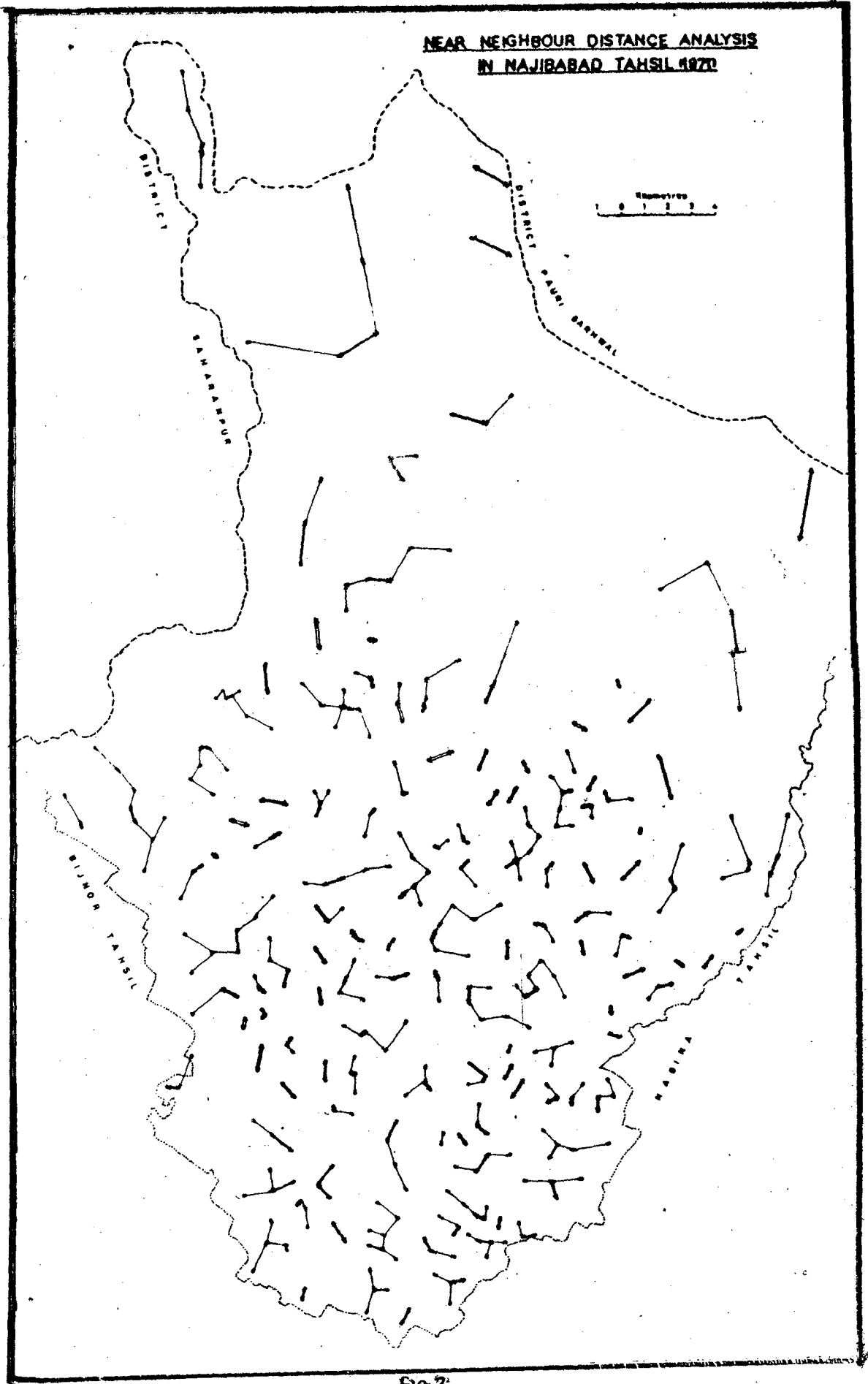


Fig 3

settlements are located in the central and southern part of the tahsil, since forests in the northern part of the tahsil have restricted the evolution of settlements. If forest area is included in the calculation of Near Neighbour index, the value of R (0.821) would be naturally reduced which will imply concentration of settlements. In Tahsil, most of the villages are located in the southern part, which is an economically active area, therefore, one should see the distribution of settlements within directly economic active area. Hence, only the economic active area is taken into account while calculating the R values.

TABLE 3.1
DISTRIBUTION OF R(NND INDEX) BY DIFFERENT
SIZE GROUPS OF VILLAGES IN NAJIBABAD TAHASIL (1971)

Size of villages	No. of villages	Do	R	Ratio
Below 200	94	1.41	0.935	
200-499	142	1.31	1.067	1.146
500-999	122	1.26	0.951	0.891
1000-1999	34	2.16	0.861	0.905
Above 2000	11	3.90	0.884	1.026
Total	403	.719	0.987	

Note: R values are calculated excluding forest area of the tahsil.

R value of 0.987 for the tahsil indicates that the settlements are randomly distributed in the tahsil Najibabad.

R values for different size groups of settlements - below 200, 200-499, 500-9999, 1000-1999 and above 2000 are 0.35, 1.067, 0.951, 0.861 and 0.894 respectively (Table 3.1). Higher values of R for small-sized villages and low for large-sized villages indicates that large-sized villages tend to cluster in comparison to small-sized villages.

The calculation of ratios of two consecutive R values starting from large-sized villages to small-sized villages shows that the village of -above 2000 population and 1000-2000 population are in a central place system. The next ratio (distorted downward) indicates the distribution of villages of 500-999 population, is more clustered than the distribution of villages in size class just higher than this. Again this ratio is reduced downward indicating the same phenomenon. The ratio of R between the two lowest categories of villages of 1.146 suggests that the villages with population -below 200 are more evenly distributed than the villages falling in size category 200-499.

Values of \bar{D}_0 show that average distances between the two neighbour settlements is higher in large sized villages. According to Mather's Model⁵, the average spacing between the two neighbour villages in Najibabad Block is 1.73 kms. In Kiratpur Block this figure is 1.23 kms. It suggests that villages of Najibabad Block are located little apart from each other in comparison to the villages of Kiratpur Block. For

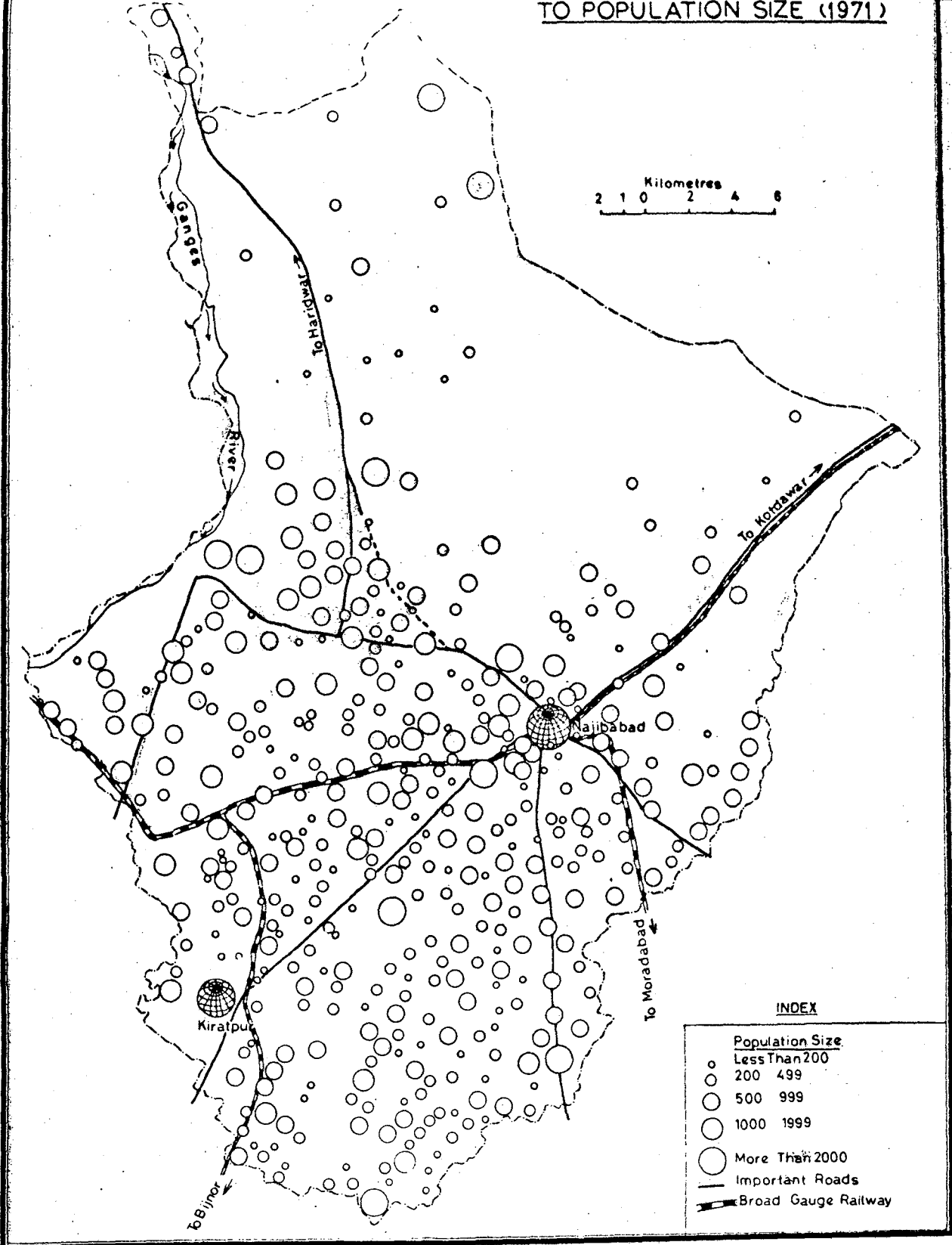
5. See Appendix II.

Tahsil average spacing for settlements is only 1.69 kms.

The map (Fig. 3) also shows the possible linkages by connecting the nearest neighbour of each settlement. This map shows the presence of a number of patterns thus obtained. The villages forming a group can be considered as one because due to the nearness the interactions among such villages shall be very high. And if some facility is provided in one of these villages (forming a group), it can be optimally utilized by its and the constituent villages of such groups.

Map (Fig. 4) shows the distribution of villages according to their population size class in the tahsil. It reveals that most of the villages are located between the two towns Kiratpur and Najibabad. The comparison of Map. 4 and Map 2 shows that most of the villages are located in the old alluvium, on both the banks of Malin Nadi which provides a fertile land to Tahsil. Most of the small sized villages of the category - less than 200 are located away from the urban centres. Most of the large-sized and medium sized villages are located on Pucca road or nearer to railway lines. The large-sized villages are located mostly away from the urban centres it is because of the fact that the people in remote areas tend to live forming a village large village due to security. Secondly, facilities like small shops etc are also located in large villages, therefore, people will like to live in such villages which perform some functions. Therefore, in the remote areas of the tahsil the size of settlement is larger. The small size villages too are located in forest belt but these villages are recently inhabited.

DISTRIBUTION OF RURAL SETTLEMENTS IN NAJIBABAD TAHSIL ACCORDING TO POPULATION SIZE (1971)



INDEX

Population Size	
○	Less Than 200
○	200 499
○	500 999
○	1000 1999
○	More Than 2000
—	Important Roads
—	Broad Gauge Railway

Fig. 4

3.2 Distribution of Villages in Relation to Pucca Roads:

As the transport network in a region helps in smooth flow of man and material, it also influences the settlement pattern, for example, 32.3 percent villages in the tahsil were located within one kilometre from Pucca and 73.0 percent villages were located within three kilometres from Pucca road (Table 3.2). Only 16.5 percent villages had low accessibility and were located at a distance of more than three kms from pucca road. Most of the large-sized villages and very small sized villages were located near pucca road. It is because of the fact that large-sized villages are the service centres or central places which had to be connected by best communication system. A considerable proportion of the villages of 200-499 and 500-999 population size were located in the interior not served by pucca roads. This variation of accessibility can be seen reflected in the socio-economic and demographic characteristics of the settlements.

TABLE 3.2

DISTRIBUTION OF VILLAGES ACCORDING TO DISTANCE FROM PUCCA ROAD IN NAJIBABAD TAHSIL (1971)

Size of villages	Distance in Kms			Total
	1	1-3	More than 3	
Below 200	38(40.42)	35(37.23)	21(22.34)	94(100.00)
200-499	35(23.24)	63(44.37)	46(32.39)	142(100.00)
500-999	38(31.15)	50(40.98)	34(27.87)	122(100.00)
1000-1999	13(18.24)	15(44.12)	6(17.65)	34(100.00)
Above 2000	8(72.73)	1(9.09)	2(18.18)	11(100.00)
Total	130(32.26)	164(40.69)	109(27.05)	403(100.00)

Note: Values in brackets are the percentages.

3.3 Distribution of Villages According to Distance from Nearest Town :

The other important aspect related to the distribution of settlements is connected with spread of innovations. It was indicated in Chapter I, that it is generally the urban centres that are exposed first to innovations and become aware about various types of developmental activities. These innovations and developmental activities travel in all directions around the urban centres with the intensity inversely proportional to the distance of other settlements. Therefore, villages nearer to urban are expected to have different socio-economic and demographic characteristics than the villages which are far away from these centres.

Table 3.3 gives the distribution of villages in different groups according to the distance from urban centres. The distance from urban centres is grouped into four classes, -less than 3 kms, 4 to 7 kms, 8 to 15 kms and more than 16 kms. This classification has a meaning that the distance of three kms can be frequently measured on foot therefore the villages located within a radius of three kms from urban centres will have strong interactions. The distance of 4 to 7 km can be measured by bicycle frequently. The distance 8-15 kms can be related to occasional visit to urban centres and the distance of more than 15kms will reduced the interactions with urban centres. The villagers located away from urban centres can not be served effectively by the urban centres. Therefore, in such

situations some of larger villages shall emerge as second or third order service centres to serve the villages located around them and there would be strong interdependency among such remote villages.

Table 3.3 shows that only 14.64 percent villages are located within a radius of three km from urban centres. 26.55% villages are located 4 to 7 kms away from urban centres. 45.66 percent villages are located 8 to 15 kms away from urban centres. 13.15% of villages are located in remote areas of the tahsil. The village of Tahsil are served by five urban centres namely; Najibabad, Kirtipur, Haridwar, Bijnor and Kotdwar. 45.45 percent of large-sized villages are located in remote areas. Out of total 11 large-sized villages two are located nearer to Najibabad town serving as satellite semi-urban settlements. Most of the villages in the tahsil are located 8 to 15 kms away from urban centres.

TABLE 3.3

**DISTRIBUTION OF VILLAGES IN THE VICINITY OF
NEAREST TOWN IN NAJIBABAD TAHSIL (1971)**

Size of villages	Distance in Kms				Total villages
	Upto 3	4-7	8-15	Above 16	
Below 200	21(22.34)	27(28.72)	34(36.17)	12(12.66)	94(100.00)
200-499	13(9.15)	45(31.69)	70(49.96)	14(9.86)	142(100.00)
500-999	17(13.93)	26(21.31)	62(50.82)	17(13.93)	122(100.00)
1000-1999	6(17.65)	7(20.59)	16(47.06)	5(14.71)	34(100.00)
Above 2000	2(18.18)	2(18.18)	2(18.18)	5(45.45)	11(100.00)
Total	59(14.64)	107(26.55)	184(45.66)	53(13.15)	403(100.00)

Note: Values in brackets show percentages.

The settlements in the tahsil are randomly located having an average spacing (Mathers Model) of 1.69 km and average mean distance 0.72 km. The middle-sized village have minimum average mean distance of 1.26 km. The average mean distance is high for larged sized villages. 27 percent villages have low accessibility 41 percent village have moderate assensibility and 32 percent villages have high ecessibility. About 46 percent villages are locsted 8 to 15 kms away from urban centres which 13 percent villages are located in remote areas.

CHAPTER IV

Distribution of Social Amenities

From the very beginning of human civilization, man has tended to concentrated settlements in the most favourable climated regions and to obtain maximum facilities for his use which enable him to have a happier life. This tendency has determined his life stype in terms of social interaction and organisation through ages. On the one hand, the socio-economic and demographic characteristics specify the patter of infrastructural facilities and other amenities, on the other hand, the available social facilities and amenities not only measure the standard and status of a region but also meet mits welfare needs and play an important role in the process of integrated development.¹

In India, in contrast to rural settlements, most of the urban centres enjoy almost all the social amenities. This results in greater rural to urban migration. Since there is threshold level in terms of a minimum population for each specific social amenity, each and every amenity can not be provided in every rural settlement. But this argument deprives small settlements of even the minimum social amenities. In view of this in this chapter the pattern of distribution of certain social amenties in the villages of Najibabad tahsil has been discussed.

1. Op. Cit.

There are nine main facilities which are further classified as below into their sub-categories :-

Social Facilities main categories	Social Facilities sub-categories
I. Educational	a. Primary School b. Middle School c. High School d. College
II Medical	a. Dispensary b. Hospital c. Other facilities
III Communication	a. Post Office b. Post and telegraph c. Telephone
IV. Electricity	a. Electricity
V. Transport	a. Kucha road b. Pucca road c. Railways
VI. Drinking Water	a. Well b. Tubewell c. River d. Hand pump
VII. Market	a. Weekly market b. Bi-weekly market c. Regular Market
VIII Public Administration Service	a. Sub-division office b. Police station c. Development Block
IX. Banking service	a. Cooperative Bank b. Other banks.

4.1 Educational Facilities:

Education is one of the key factor of the development in any society. The culture, standard of living, occupational

structure and mode of production etc of any region, are greatly affected by the level and standard of education received by the population living in it through the educational amenities distributed in that region. It is an accepted fact that the level of education represents the economic status of the population in any region. Therefore, the need of education cannot be ignored as far as planning on macro meso or micro level is concerned.

Tahsil Najibabad is one of the less developed tahsil as far as district Bijnor is concerned. The educational facilities in the tahsil include primary school, middle school, higher secondary school and intermediate college etc.

4.1.1 Primary School:

The distribution of settlements having primary school, (Table 4.1) shows that out of 403 villages in tahsil 101 villages had primary schools. Only 25.12% of village in tahsil has this facility which seems to be very low figure. If we see the distribution of primary schools in different villages category between the two blocks, we find (i) that 45.5% of primary schools are located in the middle sized villages and only 38.2% villages of this category have primary school. In Najibabad block out of 78 villages only 28(35.90%) villages of 500-999 size category receive primary schools (whereas Kiratpur Block shows considerably high percentage 41.86 for this.

TABLE 4.1

DISTRIBUTION OF PRIMARY SCHOOLS IN DIFFERENT
POPULATION SIZE VILLAGES IN BOTH BLOCKS AS WELL
AS IN TAHSIL

Category & Size of villages	NAJIBABAD BLOCK			KIRATAEUR BLOCK			TAHSIL				
	No. of vill- ages	No. of vill- ages having primary schools	% of Vill- ages hav- ing pri- mary schools	No. of vill- ages	No. of vill- ages hav- ing pri- mary schools	% of vill- ages hav- ing pri- mary schools	No. of vill- ages	No. of vill- ages hav- ing pri- mary school	% of vill- age hav- ing pri- mary schools	Popula- tion served	% of primar school
I. Less than 200	51	2	3.92	43	4	9.3	94	6	6.38	1587	5.94
II. 200-499	83	17	20.48	60	5	10.00	143	23	16.20	1961	22.77
III. 500-999	78	28	35.90	43	18	41.46	121	46	38.02	1852	45.54
IV. 1000-1999	28	13	48.00	6	4	66.67	34	17	50.00	2500	16.83
V. 2000 +	7	7	100.00	4	2	50.00	11	9	81.81	3226	8.92
Total	247	64	26.31	156	34	21.29	203	101	25/12	2128	100.00

(ii) The second category of villages (200-499) stands second in the tahsil, having 22.77% of total primary schools located only in 16.20% villages of this category. Najibabad block shows high percentage (20.48) of villages having primary schools in this category in comparison to Kiratpur block in which only 10.17% of villages have this facility.

(iii) The third rank goes to the fourth category of villages (1000-1999) having 16.83% of primary schools located in 50% villages. In this category Kiratpur block shows 66.67% of the villages having primary schools whereas in Najibabad block this figure is only 50.0%. According to the population threshold all of the villages should get this facility in this category because these villages have a optimum population size to feed the primary school.

(iv) The fourth rank for the distribution of primary school goes to the fifth category of villages (2000+) only 8.91% of total schools are located in these villages. In the Najibabad block all the villages of this category have primary schools, but in Kiratpur block. Only 50% of villages have this facility.

(v) The small size villages having population of less than 200 population have only 5.94% of primary schools, located in only 6.38% villages Najibabad block has only 3.92% of villages of this category having primary schools but Kiratpur block has 6.38% of villages of this category having primary schools.

As far as service capacity per school is concerned, it is found that in the tahsil, one primary school serves 2128 population which is a very large number to be served properly for the primary education. The village having less than 200 population seems to be better served by this figure, here, one school serves 1587 people. But only a few villages of this category have primary schools therefore the above logic fails. In both the blocks of the tahsil no one category of village has one primary school per 1000 population. If the demand of the people for primary education is to be met then, Government should provide at least one school per 1000 of population in the rural areas of the tahsil.

4.1.2 Middle Schools:

Like primary schools, middle schools are also important to promote the education of any region. The Table 4.2 shows the distribution of middle schools in different categories of villages. There are only 16 middle schools in the tahsil out of which large size villages of population size 2000+ and 1000-1999 have 6 and 5 middle schools respectively. The category second and third have 2 and 3 middle schools respectively. No village of population size less than 200 has middle schools. Kiratpur block has 9 middle schools whereas Najibabad block has got only 7 middle school. The Table 4.2 reveals that one middle school serves 1429 population. The distribution

TABLE 4.2

**DISTRIBUTION OF MIDDLE SCHOOLS IN NAJIBABAD TAHSIL IN
DIFFERENT SIZE OF VILLAGES(1971)**

Category and size of villages	Najibabad block			Biratnour block			Tahsil			Population served by per middle school
	No. of vill-ages	No. of vill-ages having middle schools	% of villages having middle schools	No. of vill-ages	No. of vill-ages having middle schools	% of villages having middle schools	No. of vill-ages	No. of vill-ages having middle schools	% of villages having middle schools	
I. below 200	51	x	0.0	43	x	0.00	94	x	x	x
II. 200-499	83	x	0.0	60	2	3.39	143	2	1.41	20000
III. 500-999	78	2	2.56	43	1	2.32	121	3	2.48	25000
IV. 1000-1999	28	1	3.57	6	4	66.67	34	5	14.75	9091
V. Above 2000	7	4	57.14	4	2	50.00	11	6	54.55	6667
Total	247	7	2.83	156	9	5.80	403	16	3.98	14.29

TABLE 4.3

DISTRIBUTION OF HIGH SCHOOLS IN NAJIBABAD TAHSIL IN DIFFERENT SIZE OF VILLAGE (1971)

Categories & size of villages	Najibabad Block		Kiratpur Block		Tahsil	
	No. of villages	No. of villages having High Schools	No. of villages	No. of villages having high Schools	No. of villages	No. of villages having High Schools
I. below 200	51	1	43	0x	94	1
II. 200-499	83	x	60	x	143	x
III. 500-999	78	1	43	2	121	3
IV. 100-1999	28	x	6	x	34	x
V. Above 2000	7	1	4	x	11	1
Total	247	3	156	2	403	5

of middle school is very much associated with the size of village. By analysing distribution of primary school and middle school it can be concluded that the facility of higher level tends to be located in large villages.

4.1.3 Higher Secondary Schools and Colleges:

The Table 4.3 given below shows that there are only 5 higher secondary schools located in villages in the tahsil feeding to rural population. Three higher secondary schools are located in Najibabad Tahsil one each in the category of villages, less than 200, 500-999 and 2000+. Kiratpur block has only two higher secondary schools all over located in middle size villages.

Najibabad has got only one intermediate college in the rural areas and that is located at Mangal a semi urban village in Najibabad Tahsil.

Najibabad town has one Post-graduate college and three intermediate colleges. This town serves most of the population of the tahsil for higher education. Kiratpur town has only two Intermediate Colleges. Naturally the function of higher order shall be located in bigger settlements due to its higher hirarchy rank.

4.1.4 χ^2 Test:

H. Type of educational facilities and size of settlements are not associated.

TABLE 4.4

**DISTRIBUTION OF EDUCATIONAL FACILITIES IN NAJIBABAD
TAHSIL ACCORDING TO SIZE OF VILLAGES**

Category & size of Villages	Primary school	Middle school	High school	Intermediate college	Total
I. Less than 200	6	x	1	x	7
II. 200-499	23	2	x	x	25
III. 500-999	46	3	3	x	52
IV. 1000-1999	17	5	x	x	22
V. 2000+	9	6	1	1	17
Total	101	16	5	1	123

χ^2 calculated = $\frac{O_1^2}{E_1} - N = 19.82$ and

χ^2 tabulated at 12 D.F. & 5% of limit of confidence is 5.226.

Since χ^2 tabulated is less than χ^2 calculated therefore we reject the hypothesis and can conclude type of educational facilities are associated with the size of settlement, i.e., the higher order functions tend to concentrate in larger villages.

4.2 Medical Facilities :

"No society can legitimately call itself civilized if a sick persons is denied medical aid because of lack of means. Society becomes more wholesome, mores serene, sipiritually healthier, if it known that its citizens have at the back of their conciousness, the knowledge that not only themselves, but all their fellow have a access when ill to the best that medical skill can provide².

2. Directorate of Pilot Research Project in Growth Centres Planning Department, Government of Pondichery, Integrated Area Development Plan of Pondichary Health, 1974, pp. 272.

This is what Aneurin Bevan said, No doubt that health care is one of the aspect of integrated economic development and planning. Medical facilities not only provide health care but also contribute substantially in raising the productivity - both in quantity and quality, of the working force in any region.

With the above context, the medical facilities available in the Najibabad tahsil have been examined in this chapter. The medical facilities have been classified in two groups (a) Hospital and Dispensary and (b) other Medical facilities.

4.2.1. Hospital and Dispensaries :

The Table 3.5 gives the distribution of medical facilities at block level as well as classified by size of settlement in 1971.

The above Table reveals that the rural settlements in Najibabad tahsil have meagre medical facilities. There are only 13 medical facilities out of which 9 are hospital or dispensary and 4 are family planning centres in the tahsil. Najibabad block have 6 hospitals or dispensaries out of which 5 are located in large sized villages and one in medium sized village out of total 247 villages. Kiratpur block has got only 3 hospitals or dispensaries all located in small sized villages and one maternity and child welfare centre that too located in small sized village. In the tahsil one medical facility serves 16667 population. Most of the medical facilities of intense care are located in tahsil Headquarter Najibabad.

TABLE 4.5

DISTRIBUTION OF MEDICAL FACILITIES IN NAJIBABAD TAHSIL IN DIFFERENT SIZE OF VILLAGES (1971)

Category & size of villages	Najibabad Block			Kirsatour Block			Tahsil		
	No. of villages	No. of hospital or dispensary	No. of other medical facilities	No. of villages	No. of Hospital or Dispensary	No. of other medical facilities	No. of villages	No. of Hospital or Dispensary	No. of other medical facilities
I. below 200	51	x	x	43	3	1	94	3	1
II. 200-499	83	x	x	60	x	x	143	x	x
III. 500-999	78	1	3	43	x	x	121	1	3
IV. 1000-1999	28	x	x	6	x	x	34	x	x
V. Above 2000	7	5	x	4	x	x	11	5	x
Total	247	6	3	156	3	1	403	9	4

Other than Government hospital and family planning centres there are a large number of private doctors also who serve the population of the tahsil. The same urban settlement also have a handsome number of private doctors to serve rural population.

4.3 Communication Facilities :

One of the basic needs of development in any region is communication. In other words the essence of existence for population is communication of ideas, views, easy and quick movement of people and goods.

The present study deals with the availability of communication facilities in Najibabad tahsil. The communication facilities includes post office, post and telegraph office and telephone.

4.3.1 Post Offices:

Table 4.6 shows the distribution of post offices in Najibabad tahsil. According to 1971 Census there are 26 post offices located in villages in the tahsil Najibabad, out of these, three post offices are situated in small size villages, seven in middle size villages and fifteen post offices in large size village, Najibabad and Kiratpur block share 16 and 10 post offices respectively in the Tahsil. In the category 2000 or more, 63.64% of villages receive post office in the Tahsil. In small size villages only 1.05% and

TABLE 4.6

DISTRIBUTION OF POST OFFICE IN NAJIBABAD TAHSIL AT BLOCK LEVEL AS WELL AS ACCORDING TO SIZE OF VILLAGES (1971)

Category & size of villages	Najibabad Block			Kiratpur Block			Tahsil		
	No. of villages	No. of villages having post office	% of villages having post office	No. of villages	No. of villages having post office	% of villages having post office	No. of villages	No. of villages having post office	% of villages having post office
I. Below 200	51	x	0.00	43	1	2.32	94	1	1.06
II. 200-499	83	2	2.41	60	1	1.67	143	3	2.10
III. 500-999	78	4	5.13	43	3	6.98	121	7	5.79
IV. 1000-1999	28	5	17.86	6	3	50.00	34	8	23.53
V. Above 2000	7	5	71.43	4	3	50.00	11	7	63.22
TOTAL	247	16	6.48	156	10	6.41	403	26	6.45

2.10% of villages have post office. The category 500-999 have 5.79% villages having post offices while 1000-1999 village category has 23.53% of its villages, having post office. If we examine the distribution of post offices in the tahsil at block level we find that there are only 6.43% of villages in Najibabad block which have post office while in Kiratpur block this percentage reduces upto 5.81%.

From the Table 4.6, it can be concluded that most of the large sized villages have communication facility through there is a scarcity of post offices. In the tahsil, one post office serves 8621 population.

4.3.2 Post and Telegraph :

There is only one post and telegraph office in the tahsil.

4.3.3 Telephone :

This is the media of communication only used by the upper class of societies or administrative offices. The distribution of phone in tahsil shows that the villages having phones are concentrated around Najibabad town.

4.4 Electricity :

Electricity is one of the cheap source of energy consumed in the villages. Most of the villages having electricity use it for irrigation purposes and is also

TABLE 4.7

**DISTRIBUTION OF ELECTRIFIED VILLAGES IN NAJIBABAD TAHSIL
BY DIFFERENT SIZE OF VILLAGES (1971)**

Category & size of villages	Najibabad Block			Kiratpur Block			Tahsil		
	No. of vill- ages	No. of electri- fied vill- ages	% of electri- fied villages	No. of vill- ages	No. of electri- fied vill- ages	% of electri- fied vill- ages	No. of vill- ages	No. of electri- fied vill- ages	% of electri- fied villages
I. Below 200	51	14	23.52	43	17	39.53	94	29	30.85
II. 200-499	83	33	39.76	60	39	66.10	143	72	50.70
III. 500-999	78	29	37.18	43	25	58.14	121	54	44.63
IV. 1000-1999	28	17	60.71	6	6	100.00	34	23	67.65
V. Above 2000	7	5	71.43	4	4	100.00	11	9	81.82
Total	247	96	38.87	156	91	58.71	403	187	46.52

used to run small scale industries like flour mill and sugar factories etc. The Table 4.7 gives the distribution of electrified villages in Najibabad tahsil according to 1971 Census in different size of villages.

The above table reveals that 46.52% of villages are electrified in Najibabad tahsil. If we see the distribution of electrified villages according to size of settlements one finds that most of the large sized villages are electrified. 30.85% of villages in 1st category of small sized villages are electrified. The percentage of electrified villages increases towards the large sized villages. Block-wise distribution of electrified villages shows that Kiratpur block lead in electrification having 58.71% of its village electrified in which large size villages are completely electrified. In Najibabad block only 38.87% of villages are electrified, there also large size villages show high percentage of electrified villages. The electrification is also a function of the size of village. In the large sized villages there is higher demand for electrification and also awareness of this facility. Therefore, the villages of large sized show high electrification.

4.5 Transportation :

Transport is the true index of development. The developed means of transportation and communication show the prosperity of any region. In fact, transportation is a necessary ingredient of nearly every aspect of economic

and social development. It plays a key role in getting land into production, in marketing primary and secondary commodities and also in making natural resources accessible.³ According to Pandit Nehru the first Prime Minister of India, "Transport and communication have become the pulse of world and an essential part of the human life and human progress and approaches all the time, measure and universality".⁴

Transportation has an important impact on industrial development land utilization, providing educational and medical facilities etc.

In this study the transportation facilities are discussed in three categories: (i) Pucca roads; (ii) Kucha roads and (iii) Railways.

4.5.1 Pucca Roads :

Table 4.8 reveals that the fact that 30.48% of villages in Najibabad Tehsil are connected by Pucca road. 63.64% of large sized villages are connected by Pucca road but the small size villages are still having low connectivity with Pucca roads. Kirtpur Block has only 10.32% of villages connected by Pucca roads. Here only 50% of large sized villages are connected with road otherwise all small or medium sized villages have poor connection with Pucca roads.

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3. Wilfred Owen : Strategy for Mobility; Washington, D.C.
 4. Inagural speech by Pandit Nehru at Second Plenary session of International Telegraph and Telephone Consultative Committee, held in New Delhi, Dec. 1960, Source: Economics of Tele-communication in India, by R.S. Shrivastava, 1968.

TABLE 4.8

**DISTRIBUTION OF VILLAGES CONNECTED BY PUGCA ROADS
ACCORDING TO SIZE GROUPS AT BLOCK LEVEL (1971)**

Category & size of villages	Najibabad block			Kiratpur Block			Tahsil		
	No. of Vill- ages	No. of vill- ages connec- ted with pucca road	% of village connect- ed with pucca road	No. of vill- ages	No. of villages connected with pucca road	% of villages connect- ed with pucca road	No. of vill- ages	No. of vill- ages connec- ted with pucca road	% of villages connected with pucca road
I. Below 200	51	22	43.14	43	2	4.65	94	24	25.53
II. 200-499	83	34	40.96	60	6	10.17	143	30	21.13
III. 500-999	78	33	42.31	43	1	11.62	121	38	31.41
IV. 1000-1999	28	14	50.00	6	5	16.67	34	15	44/12
V. Above 2000	7	5	71.43	4	2	50.00	11	7	63.64
Total	247	108	43.72	156	16	10.32	403	124	30.84

This transportation network is good in Najibabad tahsil where at least 40% of villages of all population category are connected by Pucca roads. There is no significant difference between small and medium size of rural settlements as far as the Pucca and road connectivity of villages is concerned. 71.43% of large sizes villages are connected by Pucca roads in Najibabad Block.

4.5.2 Kutchha Roads :

Likewise Pucca roads, the Kutchha roads are also not less important of their contribution for development of any region. Government cannot provide connection by Pucca road to all villages of any category it is the question of time.

Table 5.9 reveals that 42.04% of villages in tahsil Najibabad are connected by Kucha roads. Here only 30.85% of small size are villages connected by Kucha roads. Combination of Table No. 4.8 and 4.9 shows that still about 50% small sized villages are not connected by any Pucca or Kutchha road in the Tahsil. About half of large sized villages are connected with Kutchha road. As far as the connection of villages by Kutchha road is concerned Najibabad block shows higher percentage of villages connected by Kutchha roads in comparison to Kiratpur block. The combination of Table 4.8 and 4.9 also reveals that except large sized villages, villages of small size have a considerable number yet to be connected by Pucca or Kutchha road.

TABLE 4.9

**DISTRIBUTION OF VILLAGES CONNECTED BY KUCHA ROADS IN
NAJIBABAD TENSIL (1971)**

Category & size of villages	Najibabad Block			Kiratnur Block			Tahsil		
	No. of vill- ages	No. of villages connec- ted by kucha road	% of villages connect- ed by Kucha Road	No. of villages	No. of vill- ages connec- ted by Kucha Road	% of villages connected by Kucha road	No. of vill- ages	No. of vill- ages connec- ted by Kucha Road	% of villages connected by Kucha road
I. Below 200	51	19	37.25	43	10	23.26	94	29	30.85
II. 200-499	83	48	57.83	60	13	22.03	142	61	42.96
III. 500-999	78	46	58.97	43	10	23.26	121	56	46.28
IV. 1000-1999	28	13	46.43	6	4	66.67	34	17	50.00
V. Above 2000	7	4	71.43	4	2	50.00	11	6	54.55
Total	247	130	52.63	156	39	25.16	403	169	42.04

4.5.3 Railways :

The other important means of transportation is railways. According to 1971 census there are only 22 villages which were experiencing this facility in the Tahsil, out of which 17 villages are located in Najibabad block and 5 in Kiratpur block and most of them belonged to 500-999 category followed by villages of 200-499 population, only 5.4% of villages in tahsil have railways facilities.

From the above analysis, it can be concluded that there is a great demand of transportation facility to connect small sized or middle sized villages with roads to accelerate the pace of development of the tahsil.

4.6 Drinking Water Facility :

An attempt is also made to examine the availability to of drinking water facilities in Najibabad tahsil. Here, the main drinking water facilities are well and handpumps. The Table No. 4.10 shows the distribution of villages having water facilities by well or handpump or by any other source.

Table 4.10 reveals the fact that there are still some villages in Najibabad tahsil which are living still in primitive age using river water for drinking purposes, mostly located in the forest belt of the tahsil. The main source of drinking water facility is well followed by handpump. 94.78% villages use well water to drink and 53.98% villages use handpumps as a

TABLE 4.10

DISTRIBUTION OF VILLAGES HAVING DRINKING WATER FACILITY FROM DIFFERENT SOURCES ACCORDING TO SIZE OF VILLAGES (1971)

Category & size of villages	Naibabad Block			Kiratpur Block			Tahsi		
	% of vill-ages having wells	% of villeges having hand pump	% of villeges using river water	% of vill-ages having wells	% of villeges having hand pump	% of villeges using river water	% of vill-ages hav- ing wells	% of vill-ages having hand pump	% of villeges haing river water
I. Below 200	80.39	56.86	3.92	100.00	34.88	x	89.36	46.81	2.13
II. 200-499	91.57	67.47	3.61	100.00	32.20	x	95.07	52.82	2.11
III. 500-999	97.44	71.79	x	100.00	30.23	x	98.35	57.02	x
IV. 1000-1999	100.00	67.85	x	100.00	50.00	x	100.00	64.71	x
V. Above 2000	71.43	71.43	28.57	100.00	50.00	x	81.82	63.64	18.18
Total	91.50	66.80	2.83	100.00	33.55	x	94.78	53.98	1.74

source of water for drinking. All the villages in Kiratpur block have wells for drinking water. In Kiratpur block 33.55% of villages also use water from hand-pumps. In Najibabad block ~~the~~ the percentage of villages using handpump water is just double than the villages in Kiratpur block using handpump water for drinking purposes.

4.7 Marketing Facility :

The surplus production to be exchanged or sold off gives the concept and emergence of market. Markets are the places where the people sell their products and buy the articles for their use. As far as the development of any region is concerned the role of markets cannot be ignored. In the Indian context markets are of different types (i) weekly markets; (ii) Bi-weekly markets; (iii) Tri-weekly markets, (iv) daily markets as well as regulated markets and (v) Fair markets etc. The location and growth of these markets depend totally on the types of transport network.⁵ There are fixed days for the weekly markets called "Peeth" in local language for the different villages performing market facility.

Table 4.11 reveals the fact that Najibabad tahsil has 14 weekly markets, 2 Bi-weekly markets and three daily markets. Most of the weekly markets are in middle and large size of settlements. Block Najibabad has 10 weekly markets and 3 daily markets, here out of 10 weekly markets 5 are located

5. Bedekar, S.L.: Role of Regulated Markets in Development of Rural Areas : Market Town and Spatial Development; NCAER, New Delhi, 1972, pp. 99-102.

TABLE 4.11

**DISTRIBUTION OF WEEKLY, BI-WEEKLY AND DAILY MARKETS IN
RAJIBABAD TANSIL (1971)**

Category & size of villages	Rajibabad Block			Kiratpur Block			Rajibabad tehsil		
	No. of weekly markets	No. of bi week ly mar- kets	No. of daily markets	No. of weekly markets	No. of bi-weekly markets	No. of daily markets	No of weekly markets	No. of bi weekly markets	No of daily markets
I. Below 200	x	x	x	1	1	x	1	1	x
II 200-499	1	x	x	x	x	x	1	x	x
III. 500-999	5	x	1	x	1	x	5	1	1
IV. 1000-1999	3	x	x	1	x	x	4	x	x
V. Above 2000	1	x	2	2	x	x	3	x	2
Total	10	x	3	4	2	x	14	2	3

middle size of settlements 4 in large size villages and 2 daily markets are located in large villages and one in middle group villages. Localization of these markets is greatly affected by transport network, Centrality and the size of settlements. Large sized villages have a greater opportunity to become market centre because these villages have greater centrality and large population to commute around it and hence these villages will have developing trade and commerce by the passing of time.

4.8 Banking Facility :

Though post office also serves for saving of the surplus money but it do not provide loans for the agriculture, industry or for any other purpose. It is the bank which deals with all loaning matters. There are only two rurban settlements Nangal and Jallabad performing the banking service. Most of the loan for villages is provide by the cooperative banks and State Bank of India located in Najibabad and Kiratpur town.

4.9 Public Administrative Services :

From the beginning of civilixation, human societies have been maintaining norms and patterns for the welfare of their people. The maintenance of law and order, providing security, etc., several institutions have been setup for smooth functioning of the society, e.g. educational, religious, social, economic and of course administrative which takes care of these institutions and the people that abide by the norms setup by these institutions.

This study area has one top administrative unit centre at Najibabad which commands the entire region. The second order administrative set up is placed at places dividing tahsil into two blocks, namely Kiratpur and Najibabad, with Headquarters at Kiratpur town and Najibabad town respectively. There are four police stations located at Kiratpur, Najibabad, Nangal and Kangri.

4.10 Clustering of Social Amenities:

Having discussed the distribution of different amenities, at block level and in different population size groups of settlements our job becomes to know the concentration of these amenities to point out the central places. Table 4.12 gives the distribution of settlements according to the number of amenities present in the village.

The Table reveals the following facts :-

- a. In the small size villages of the category, less than 200, 26.60% of villages have one amenity 27.66% villeges have two amenities 18.09% villeges have three facilities and 22.34% villeges have four amenities only 3 settlements have amenities more than four.
- b. In the second category, pattern of category I has been extended towards 5 amenities. Most of the villeges have 2 amenities.

TABLE 4.12

**CONCENTRATION OF FACILITIES IN DIFFERENT SIZES
OF VILLAGES IN MAJIBABAD TAHSIL (1971)**

Category & size of villages	Number of Facilities								Total
	1	2	3	4	5	6	7	8	
I. Below 200	25 (26.60)	26 (27.66)	17 (18.09)	21 (22.34)	1 (1.06)	1 (1.06)	x (x)	1 (1.06)	94 (100.00)
II. 200-499	25 (17.61)	36 (25.35)	32 (22.53)	24 (16.00)	19 (13.38)	4 (2.82)	1 (0.70)	x (x)	142 (100.00)
III. 500-999	6 (4.96)	25 (20.66)	32 (26.45)	34 (27.27)	17 (14.05)	4 (3.31)	3 (2.43)	1 (0.83)	122 (100.00)
IV. 1000-1999	x (x)	2 (5.88)	6 (17.64)	14 (41.18)	7 (20.69)	1 (2.94)	2 (5.88)	2 (5.88)	34 (100.00)
V. Above 2000	x (x)	x (x)	3 (27.27)	x (9.09)	1 (9.09)	1 (9.09)	1 (9.09)	5 (45.45)	11 (100.00)
Total	57 (14.14)	89 (22.08)	90 (22.33)	94 (23.38)	45 (11.17)	11 (2.73)	7 (1.74)	9 (2.23)	403 (100.00)

- c. The third category shows a decreasing percentage of villages having 1 & 2 amenities, in comparison to category I & II. Most of the villages have 6 amenities. This pattern indicates that as the size of settlements increases the proportion of villages having more amenities increases.
- d. The fourth category of villages having population from 1000-1999 also indicate the same pattern as we have already observed. Most of the villages have four amenities, and followed by 5 amenities.
- e. The large size villages show the concentration of amenities as 45.45% of villages have more than 8 amenities. In this category 3 villages which constitute 27.27% of total villages of this category have 3 amenities, because of their remote location and little hinter land to serve.
- f. The overall analysis shows that most of the villages in the 1 to 5 amenities in the Tahsil.

From the above table, we can build up a hypothesis that distribution and clustering of the amenities is not associated with the size of settlement.

From Table 4.12 χ^2 calculated is equal to 173.70 and which is greater than χ^2 tabulated at 5% level of significance at 28 degrees of freedom. Therefore, we reject the hypothesis that clustering and concentration of amenities is not associated with the size of settlements. Hence we can say that concentration of facilities depends upon the size of settlement.

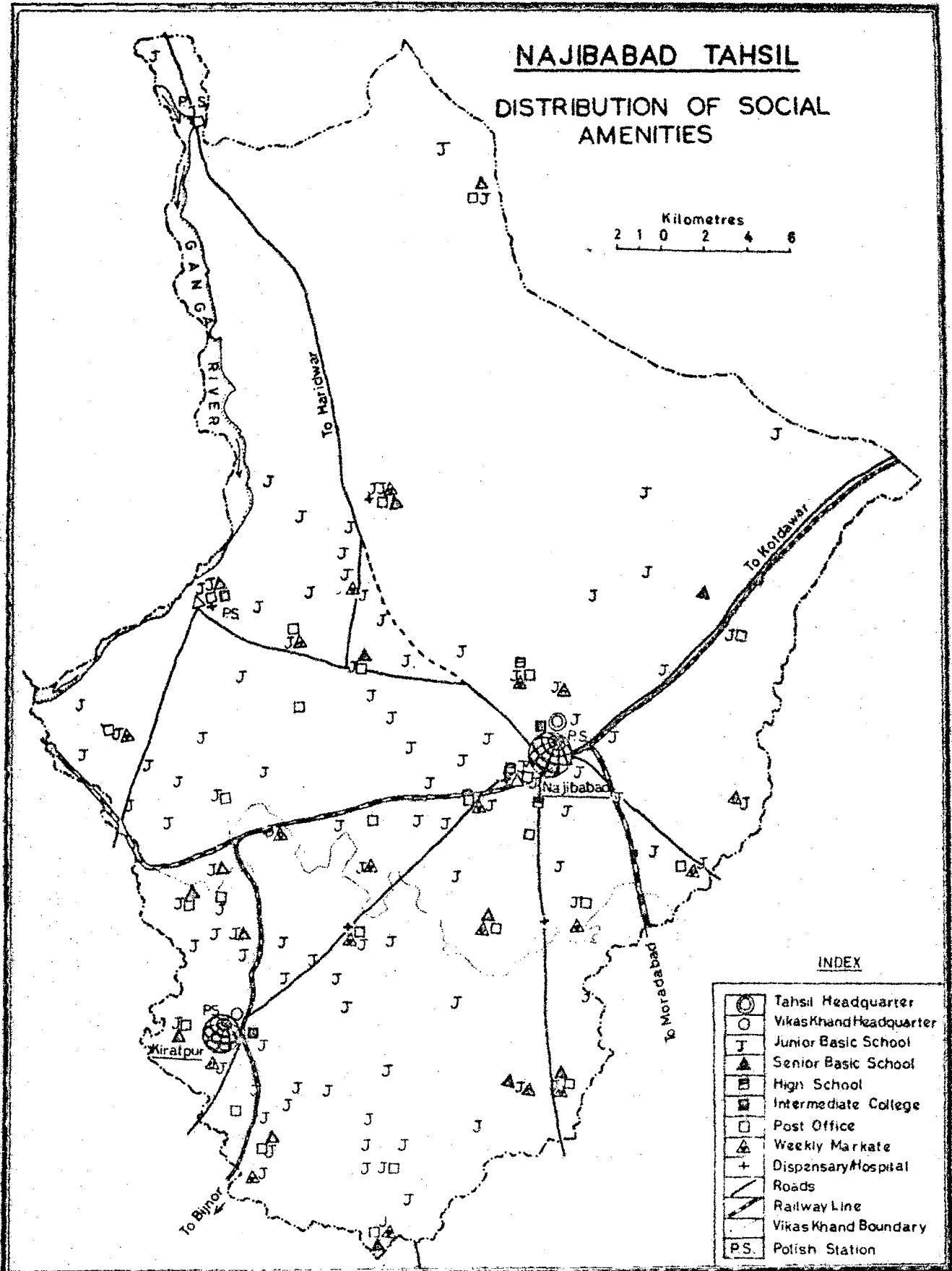


Fig.5

Large size of village have high probability for the concentration of facilities.

4.11 Conclusion :

For the overall development transport facilities play an important role. There are the medias by which the distance between the village and service centre can be reduced in terms of time. By this facility the settlements come closer to each other and will have greater interaction. In the Tehsil only 25 percentage village have primary education facility. What to speak of small size village, only 50% of village in 1000-1999 population have primary schools. In general, one primary school serve 2126 population. Most of the middle, high school and intermediate colleges are located in bigger villages. As far as the medical facility is concerned, there is lack of medical facilities in the tehsil. One medical facility serve 16667 people of rural population which is a very big number to be served by one medical facility communication facilities though do not affect much for the rural development even than these facility can minimise the cost of transportation. In the tehsil only 30.84% of villages are connected by Pucca roads. For the acceleration of pace of the development road connections are the prime need of the rural population for quick movement and to transport the raw material and crop to markets. In the overall analysis it is observed that most of the facilities concentrate in

large sized villeges and also higher order functions are located in large sized villege. The comparison of map (Figure No. 4) and map (Figure 5) also the prove the above mentioned hypotheses.

CHAPTER V

Hierarchy Among Rural Settlements

5.1 Introduction:

The objective of the studies on central places was for the identification of hierarchic order of service centres in any region for setting guidelines for regional development policies. These studies have been carried out to consider an important part of the study as to what degree the functional activity have a counterpart in real life. Almost all the human settlements perform certain functions and also render services performed by other settlements. All the settlements are inter-dependent. And within this context, if there is any relationship which shows the mutual understanding and inter-dependence between settlements, should prove helpful in preparing the policy of "Integrated Area Development"¹.

The present chapter of the study seeks to identify with this methodology the hierarchy of settlements and to determine the levels of development based on it. The level of development has been determined on the basis of composite score of social facilities enjoyed by each settlement.

1. Sen. Lalit, K.: "Planning Rural Growth Centres for Integrated Area Development" NICD, Hyderabad, 1971, pp. 80-81.

5.2 Concept of the Functional Hierarchy:

The concept of functional hierarchy deals with the spatial organisation as well as certain activities of human interaction within such a system. In fact, there is certain similarity and regularity between the size of settlements and type of functions they perform. In any region, the centrality is the by-product of central functions both in quantity and quality of any settlement. The central function settlements are few in any region, but a number of settlements around it enjoy the facility provided by the central function settlements. However, the nature of central function settlements varies from one to another and also varies with the number of functions. There are many factors that effect the central function. But two factors are worth mentioning which affect quality of central function such as; (a) the number and types of functions performed; and (b) the level at which they perform. It is true that all the settlements do not have all sorts of functions; but some settlements perform all function at the same level.

Thus, the hierarchy of settlements is undoubtedly related with the hierarchy of central functions. As mentioned earlier that the quantity of central function can be determined after examining the individual function, medical, education et.c. However, a central function includes many sub-functions. This could enable one to identify different levels or degrees at which

they are performed. On this basis the hierarchy of settlements can be determined or what can be called functional hierarchy².

5.3 The Scale of Hierarchy :

The scale of functional hierarchy is determined by the importance of any function. It can be measured by taking separate functions or sub-functions. Because the level of importance greatly effects the determination of functional hierarchy. For example, educational facility has different level of importance. here primary school comes in the bottom in comparison to college. Secondly, the importance of the function is also affected by the number of settlements performing the same function. Therefore, the settlement performing a number of services will be more important than the settlement lacking these functions fully or partly. If a settlement has certain functions which do not exist in any other settlements of that area, that particular settlement will be regarded as the central place for that function. Thirdly, the different type of functions of certain levels also tend to cluster at one place to achieve what may be called economy of social investments by grouping together mutually augmenting institutions. For example, a settlement having college will have a post office, a police station, or block office must have a post office, hospital etc. On the whole, the level of functional hierarchy becomes important in the whole fabric of the central place concept. To determine

2. Wannali, Sudhir: "Regional Planning for Social Facilities" NICD, Hyderabad, 1970, pp. 19-21.

the hierarchy of the settlements; various methods have been used. In the present study, scalogram method has been used to identify the hierarchy of settlements, based on composite score of social facilities where weightages has been given to each of the functions and sub-functions. But it is difficult to measure the relative importance of variety of functions. Thus weightage is given to the sub functions rather than the main function as different main functions may differ in their importance to warrant such a ranking³. Therefore, it is better to evolve a procedure to give weightage to various levels that brings down the subjectivity.

In the present study, the weightage of different functions and sub functions has been calculated according to their distribution among all the settlements on the basis that greater the scarcity bigger the importance in terms of centrality and hence higher the weightages. The formula⁴ adopted to calculate the weightage and composite score has been given below :-

$$C_j = \sum_{i=1}^K W_i X_{ij} \quad \text{where } W_i = \frac{N}{F_i}$$

where

W_i = weightage to the i th sub-function

N = Total number of settlements

F_i = Number of settlements having function/subfunction.

K = Total number of sub function under a given function.

C_j = Composite value for that function for j th settlement.

X_{ij} = Value for the i th sub-function in j th settlement.

3. Ibid.

4. Bhat, L.S., Micro Level Planning: A case of Study of Karnal Area, Haryana, 1976, pp. 60.

This method has been evolved with a consideration that if more than one unit gets located at one place it does not make it really ubiquitous. It simply increases the centrality of that place making the hinterland more dependent on the central place. Hence its weight does not get affected.

Table 5.1 given below shows the weightage given to sub-function in the Tahsil Najibabad.

TABLE 51

WEIGHTAGE (VALUES OF INDIVIDUAL FACILITIES AVAILABLE IN SETTLEMENTS OF NAJIBABAD TAHSIL IN 1971

Social Facilities	Number of settlements	Weightage
I. Education		
a. Primary school	101	3.99
b. Middle School	16	25.19
c. High school	3	134.33
d. College	1	403.000
II. Medical		
a. Dispensary/Hospital	5	80.6
b. Others	4	100.75
III. Electrification	198	2.04
IV. Transport		
a. Kutcha road	174	2.32
b. Pucca road	125	3.22
c. Railways	25	16.12

V. Drinking water		
a. Well/River	384	1.04
b. Handpump	215	1.87
VI. Communication		
a. Post office	26	15.46
b. Phone	6	67.17
c. P. & T	1	403.00
VII. Marketing facilities	21	19.19
VIII. Banking services	2	201.50
IX. Administrative services		
a. Police stations	4	100.75

To determine the hierarchy among settlements, the composite scores of each function have been added for all functions present in the village. That composite score gives the hierarchy of the settlements tahsil Najibabad. The Table 5.2 and Map (Fig. 6) disclose the hierarchy orders.

TABLE 5.2

DISTRIBUTION OF HIERARCHIC LEVEL AMONG THE SETTLEMENTS IN NAJIBABAD TAHSIL (RURAL AS WELL AS URBAN)

Hierarchy levels	Range of composite scores	No. of settlements	% of total rural settlements
I	Urban Centres	2	-
II	250 +	3	.74
III	100-250	5	1.24
IV	25-100	31	7.69
V	5-25	208	51.61
VI	Below 5	156	38.71

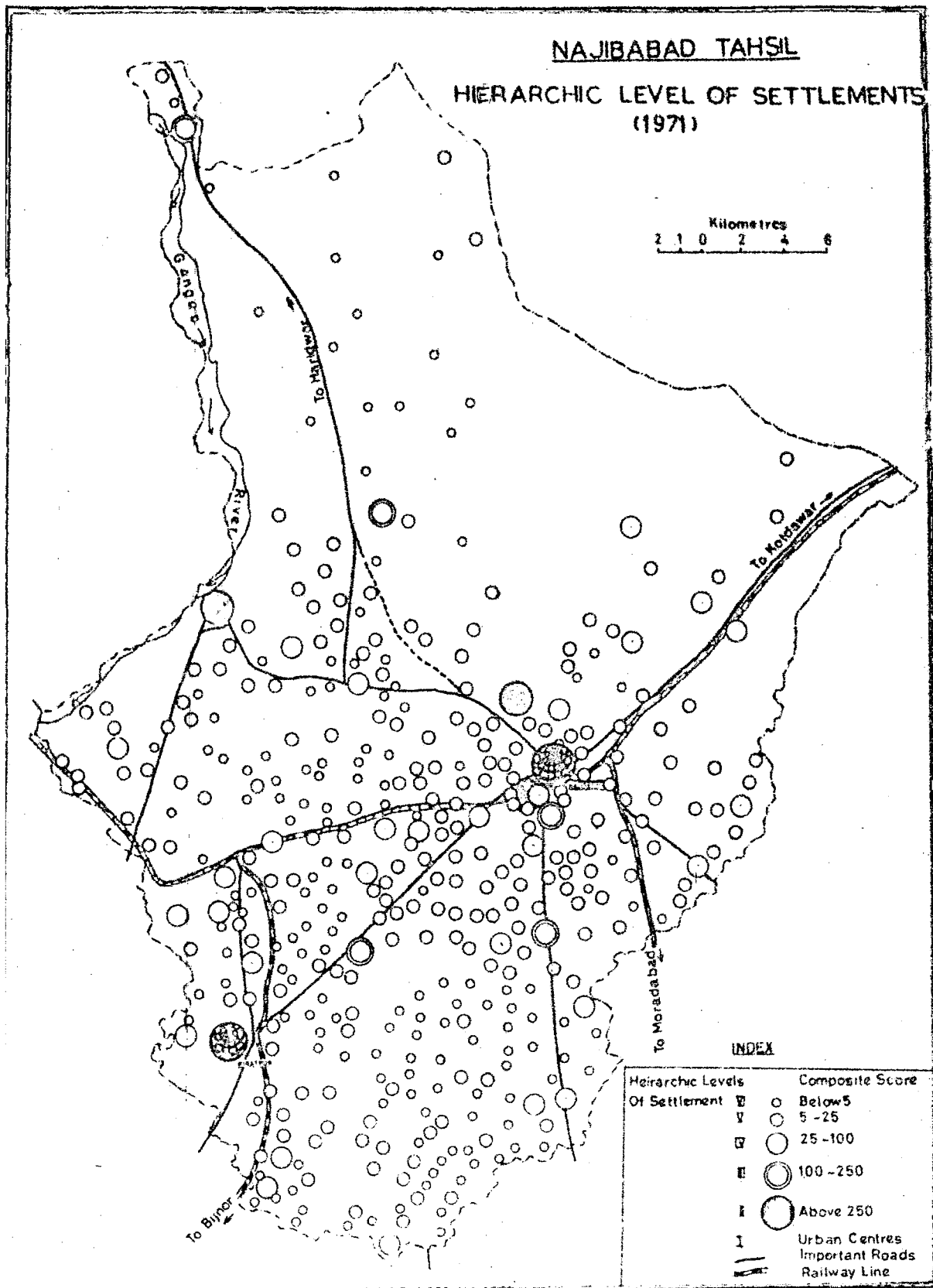


Fig.6

According to the Table 5.2 all the settlements in Najibabad Tahsil are divided into six hierarchic levels.

Table 5.3 gives more details regarding the size class analysis of hierarchic level of the settlements in Najibabad tahsil.

TABLE 5.3

**SIZE CLASS ANALYSIS OF HIERARCHIC LEVEL
OR LEVELS OF DEVELOPMENT IN NAJIBABAD TAHSIL (1971)**

Hierarchic level	Scores	200	200-499	500-999	1000-1999	2000 +	Total
I	Urban centres						
II	More than 250	x	x	1	x	2	3
III	100-250	2	x	2	x	1.	5
IV	25-100	3	4	11	10	3	31
V	5-25	35	65	60	23	5	208
VI	Below 5	54	74	27	1	x	156
Total		94	143	121	34	11	403

5.4 First Hierarchic Level of Settlements:

The two urban centres Najibabad and Kiratpur are the constituents of first hierarchic order. Since aim of the present studies is to deal with the rural settlements only, but in such hierarchic studies one should take all the settlements of the region into account because rural settlements and their hierarchic orders are always influenced by the presence of the urban centres which are the main services centres and provided

infrastructural facilities and marketing facilities to rural settlements. In this context undoubtedly urban centres become the first order settlements in any region. These two urban centres are the block head quarters of the tahsil. Both of the towns have regular market, centres and provide educational and medical facilities to rural settlements.

5.5 Second Hierarchic Level of Settlements:

In this category, there are three settlements, 2 from the villages having population of 2000 or more and one from middle sized villages. These three settlements are located along the road radiating from Najibabad. Two of these villages are located very near to Najibabad and working as second order service centres. The other one settlement in this level is situated in the western part of the tahsil serving the villages of its catchment area located away from urban centres. Most of these villages serves educational medical and marketing need of the population.

5.6 Third Hierarchic Level Settlements:

In this category, there are 5 settlements, two of small size villages, two from middle size villages and one from large size villages in tahsil. The map (Fig. 6) shows that these villages are located away from urban centres and second hierarchic settlements to serve the remote region of the tahsil. All of these villages are located along the pucca road and serving the educational and weekly marketing needs of the population.

5.7 Fourth Hierarchic Level Settlements :

This group is constituted by 31 settlements (7.69% of total village). The Map (Fig.6) shows their distribution. The pattern of distribution can be studied in six different loops radiating from Najibabad and Kiratpur towns along with the roads or near to the roads. These are the settlements which have mostly primary education facilities. Most of these villages are from 500-999 and 1000-1999 size groups of population, 35.48 and 32.20% of this category respectively. These villages serve to remote areas which come under very little urban influences.

5.8 Fifth Hierarchic Level of Settlements:

51.61 settlements of tahsil belongs to this category these villages are well spread in the country sides of the urban centres. 69.71% of these villages are from 200-499 and 500-999 population size groups of settlements. Middle sized villages are the mode for these villages forming fifth hierarchic order in the tahsil .

5.9 Sixth Hierarchic Level of Settlements:

The remaining villages fall in the category. Most of these villages belong to small sized villages or middle sized villages. Small sized villages constitutes 82.05% of village forming this hierarchic level. These are the villages which mostly dependent on higher hierarchic order settlements for primary education and other facilities.

5.10 Conclusion:

In the previous chapter a relationship has been established between population size of settlement and concentration of social amenities. Here also the comparison the map (Fig. 4) showing the distribution of settlements according to population size and map (Fig. 6), giving the distribution villages forming different hierarchic levels or levels of development, reveals that the level of development and size of settlements are associated with each other. It is because every amenity requires a population threshold and only large sized villages can provide the required threshold for the localisation of that particular amenity and hence the social amenities are attracted by large sized villages. Secondly, the comparison of Map (Fig. 5) and Map (Fig. 6) indicates that the level of the function is also associated with the size of villages, like primary schools are located in middle size or large sized villages while middle or high schools are located in only large sized villages.

CHAPTER VI

Socio-economic and Demographic Characteristics of the Settlements :

To accelerate the process of development of any region one should analyse the distribution of socio-economic and demographic characteristics of the settlements than it becomes very easy to diagnose and to give future planning for that region. In the chapter, an attempt has been made to show the distributions of socio-economic and demographic characteristics in different size of settlements on one hand and to establish relationship among these characteristics and the analysis of their interdependency of one one to analyse the influence of social amenities upon these characteristics on the other hand. Following characteristics are to be discussed here: (i) Distribution and density of population; (ii) Growth rate, (iii) Sex Ratio, (iv) Average house hold size; (v) Distribution of SC and ST population; (vi) Literacy rate and (vii) Female literacy; (viii) economic structure of settlements.

6.1 Distribution and Density of Population :

The analysis of the pattern of population distribution and density is the fundamental to the understanding of population geography of any area. It is the pattern of population distribution and density with which all other characteristics of population are intimately related. The distributional pattern of population does not merely reveals man's performances and areevsions in this occupance but is an eloquent expression of the synthesis of geographic phenomens operating in the area¹.

1. Chendra, R.C. : "Introduction to Population Georaphy",
Sidhu, M.S. : Kalyani Publishers, pp. 17.

The terms distribution refers to the way the people are spread over the earth's surface. The emphasis is, thus, on the pattern of actual place locations of the population. The people may be so spread as to yield a linear or dispersed or agglomerated pattern of population distribution. On the other hand, the term density of population refers to the ratio between population and land area. Land and people constitute the two vital elements of an area so the ratio between the two is of fundamental consideration in population studies.²

6.2 Distribution of Population

The distribution of settlements according to the size of settlements (Fig. 4), itself gives the pattern of distribution of population in Tahsil Najibabad. Since northern part of the tahsil is under forest (discussed in Chapter II), therefore, population seems to be agglomerated in the southern part of the tahsil. The valley of Malin nadi and other streams made of rich alluvium is the most economic active and potential part of the tahsil. Therefore, most of the settlements are located along these water courses. Other factors like transport network is also responsible for the distribution of village in Najibabad tahsil, since most of the large sized villages are located nearer to roads and railway lines.

6.3 Density of Population

The map (Fig. 7) reveals the facts regarding the distribution of population density in the tahsil Najibabad. Here high density of population is seen nearer to the towns and of course

2. Demko, G.J.: "Population Geography": A reader McGraw Hill Book Company, New York, 1957, p. 511.

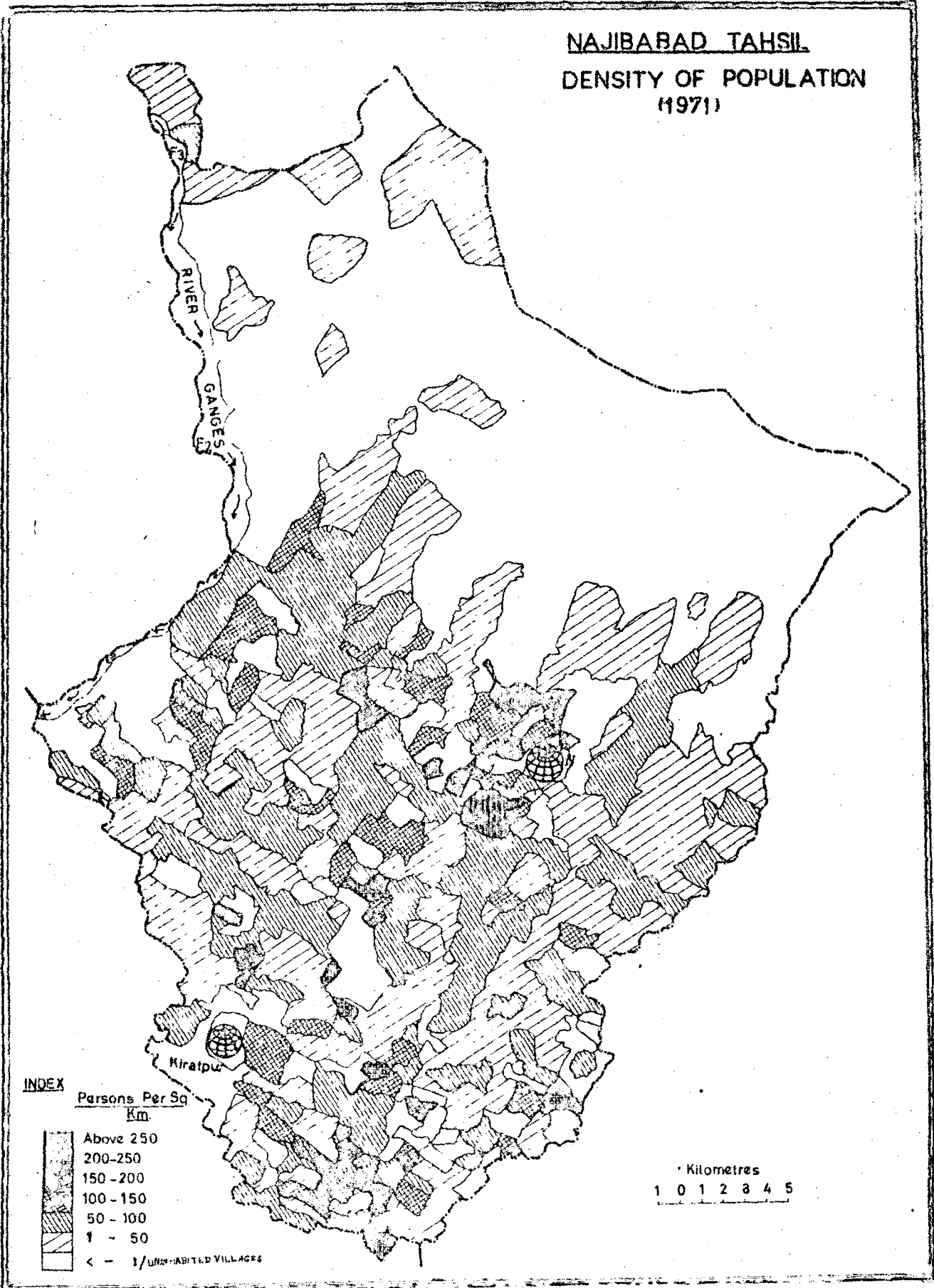


Fig. 7

along with the roads in the tahsil. The northern part of the tahsil is very dispersely populated because of the forest. The eastern part of the tahsil is also very less populated, with a density of population below 50 persons per sq.km. On another patch of high density of population is also located in the southern part of the tahsil. Here, density of population is 150-200 persons per sq. kilometers. The highly dense villages are located between Najibabad and Kiratpur towns.

TABLE 6.1

DISTRIBUTION OF DENSITY OF POPULATION ACCORDING TO SIZE OF SETTLEMENTS IN NAJIBABAD TAHSIL (1971)

Category	Size of settlements	Density of population persons per acre
I	Below 200	5
II	200-499	13
III	500-999	22
IV	1000-1999	32
V	Above 2000	40

Table 6.1 indicates high density of population in large sized villages. Small population sized villages of category I & II have a density of 5 and 13 persons per acre respectively. The middle sized villages (500-999) show a density of 22 persons per acre. Small sized villages of category I & II have a density of 5 and 13 persons per acre. With the time,

the population grows with the possess of time but area of village remains unchanged, therefore, according to the centrality it is the large size villages which experiences in migration a considerable increase in the population pressure. Therefore, density of population is higher in large size villages.

The density of population is also affected by the distance from nearest town. Since urban centres have most of the social amenities prospects of employment, therefore, people shall tend to live nearer to urban centres. Therefore, an attempt is also made to examine the distribution of density around the urban centres.

TABLE 6.2

DISTRIBUTION OF DENSITY ACCORDING TO DISTANCE FROM NEAREST TOWN IN NAJIBABAD TAHSIL (1971)

Category	Distance from nearest town in km.	Density of population persons per acre
I	Below 3	22
II	3-7	16
III	8-15	16
IV	Above 15	14

Table 6.2 shows that density of population is higher in the villages which are nearer to urban centres. Distance of villages from nearest town and density of population are inversely related. It shows that pressure of population on land

decreases as we go away from towns. Villages which are three km away from towns show a density of 22 persons per acre. This ratio remains almost constant for next two categories of villages located at a distance of 3 to 15 kms away from urban centres. The difference between the density Ist and IInd category is very large. But for other categories of density becomes almost constant. It shows that influence of urban centres is very much upto a radius of three kms. After that this influence become weak firstly. Sccondly the semi urban villages also serve to the villages which are located away from urban centres and reduces the impact of urban centres.

The correlation matrix given in Table 6.16 shows that density of population is significantly correlated with (a) size of settlement; (b) sex ratio; (c) proportion of workers engaged in secondary activities; (d) distance from urban centres; (e) distance from pucca road and (f) percentage of workers. The first three indicators are positively related and the last three indicators are negatively related with density of population. Since it has already been said that density is the function of size of population and area of its habittance, but area remains the same, therefore, it is only the size of population which is affected by some factors. Large sized villages will show higher density of population because of their large population size in comparison to small sized village. The large sized villages become effective

service centres and will attract more people with the increasing facilities. In large size villages due to the medical facilities and general awareness the death rate is checked considerably, but birth rate remains almost same, therefore, a large part population is added resulting an increase in density. Higher the sex ratio higher would be marriage rates and hence high growth rate. Therefore, sex ratio effect size of population and hence there would be high density of population in village of high sex ratio. Since roads connection reduces the time of travel and commuting in urban centres, therefore, people will tend to line along road site this tendency results into high density of population nearer to roads and railway lines.

6.4 Growth Rate :

Perhaps no other attribute the population in any region contributes as much to its demographic dynamism as does the growth of its population. Population growth in an area is an index of its economic development, social awakening, cultural background, historical events and political ideology. Moreover, other population characteristics are internally related with the growth patterns experienced by region and derive their meanings and significance from it. An understanding of growth of population in any region is, thus fundamental to the understanding of inherent correlations not only between various demographic phenomena themselves but also between demographic phenomena and non-demographic phenomena. Growth

is a change in population inhabiting an area during a specific period of time, irrespective of the fact whether the change is positive or negative and generally is measured in percentages.

In this chapter our aim to analyse the growth rate in different population size of settlements and to seek some factors which are responsible for this variation in it. Table 6.3 gives the distribution of growth rate in different groups of settlement during the decade 1961-71.

TABLE 6.3

**GROWTH RATES DIFFERENTIALS BY SIZE OF SETTLEMENTS
IN NAJIBABAD TANSIL (1961-71)**

Size of villages	No. of villages	Average growth rate
Below 200	94	37.45
200-499	143	45.28
500-999	121	24.58
1000-1999	34	20.60
Above 2000	11	28.98
Total	403	37.50

The tahsil experienced an overall average rural growth rate of 37.50% during the 1961-71. The Table 6.3 reveals that the small sized villages experienced higher rate of growth while this growth rate trend goes on decreasing with the increasing size of settlements. But the villages of large

sized with a population of more than 2000 do not show this tendency, this category experienced 28.98% of growth rate during 1961-71. Since most of the medical and other facilities are located in large sized villages therefore, these villages shall have large in migration and also high natural growth rate with the reduction in death rate. Hence growth rate is expected higher in large sized villages.

TABLE 6.4

**DISTRIBUTION OF VILLAGES ACCORDING TO SIZE
POPULATION AND GROWTH RATE IN NAJABABAD TAHSIL (1961-71)**

Category	Below -75	75to -37.5	37.5 6.0	0 to -37.5	37.5 to 75	75 to 112.5	& above 112.5
Below 200	3	3	6	53	24	7	16
200-499		3	9	120	22	2	x
500-999		1	4	77	9	x	x
1000-1999		2	x	23	2	1	x
Above 2000			x	6	x	x	x
Total	3	9	19	279	57	10	x

Table 6.4 shows the analysis of the distribution of villages according to size of population (as it had = 1961) and growth rate groups for 1961-1971.

There are overall 31 villages which have experienced negative growth during the decade and most of these villages are is the small size villages. There are 279 villages which have experienced a growth rate upto 35.7. 57 villages which

have experienced 37.5 to 75% growth rate during the 1961 to 1971 period. Most of the villages in -below 200 population show higher growth rate during the decade 1961-71. From Table 6.4, we can also observed that the small size villages are change prone whatever the direction and amount of change may be.

The population growth rate in rural areas is always affected by social, economic, demographic factors and also by facilities provided to the villages. The spread of innovation is always inversely related to the distance between its point of origin (urban centres) and its destination. Therefore, the distance from town also becomes very important factor reflecting the effect of the amenities available in the urban centres and its utility by the villages located around it. Table 6.5 shows that population growth rate is higher in the villages which are nearer to urban centres comparatively. Due to medical facilities death rate is also reduced considerably. Hence, the growth rate becomes high for such villages, the villages having medical facility or located nearer to town. The growth rate show a diminishing pattern with the increase in distance from urban centres, because of higher mortality and low migration difference. But the village which are in remote areas again show high growth rate, it is because that large sized villages become second or third order service centres and replanish the need of urban centres.

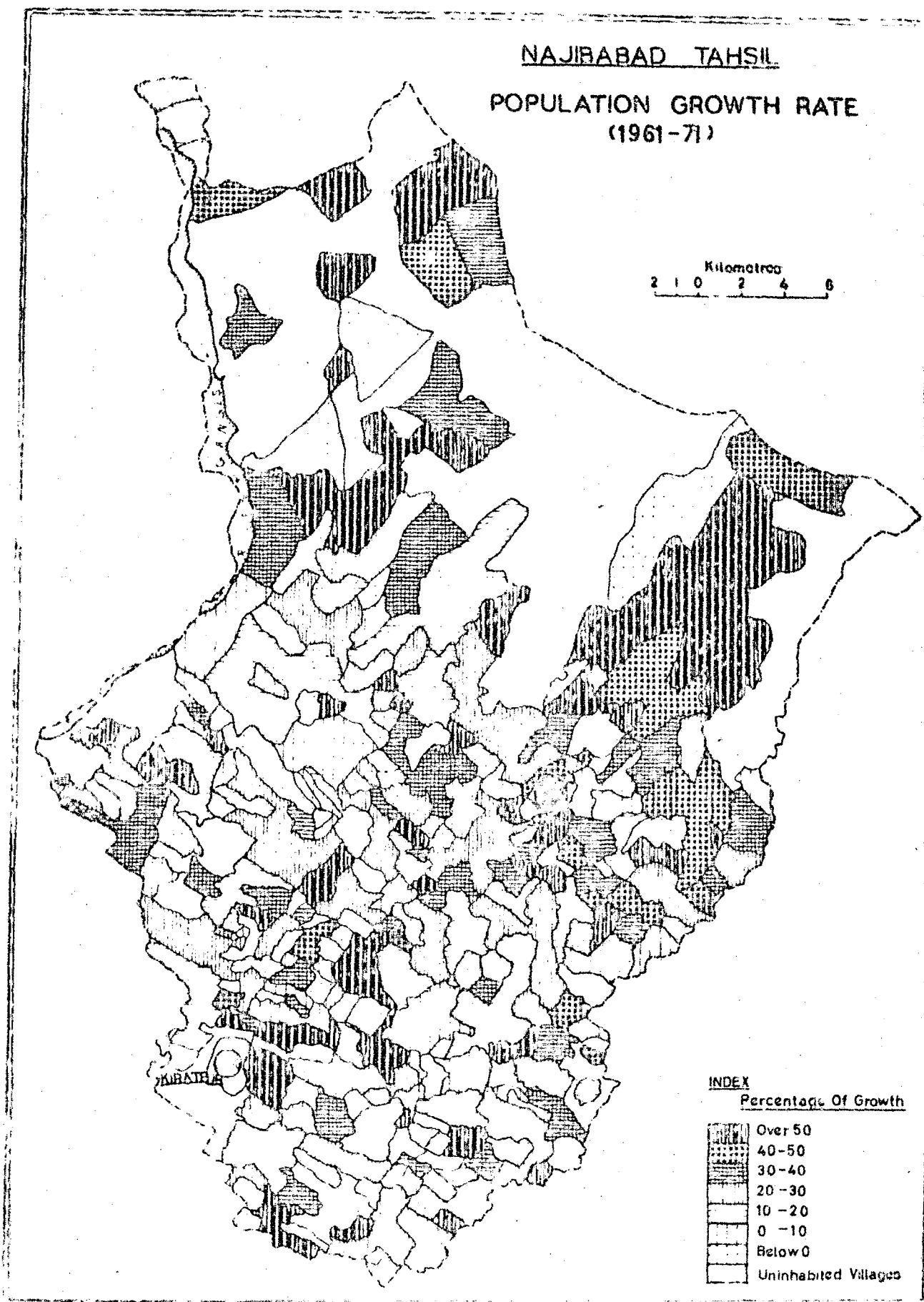


Fig. 8

If we compare the growth rate with size of settlements from Map (Fig. 8) and Map (Fig. 4) respectively, we find that the small-sized villages show high growth rate it is because they have low population ad denominator. If in a small a village birth takes place, proportion in growth is high in comparison to the share of a birth in large sized village. The map (Fig. 8) shows that areas of high growth rate are generally adjoined with negative growth areas. Miscounting of population of a settlement divided in two villages can be the cause of distorted growth rate for both revenue villages. The growth rate is significantly related with proportion of secondary workers and sex ratio as seen in the correlation matrix (Table 6.16). Since most of the workers engaged in manufacturing comes from scheduled caste population and backward class population, and having low literacy therefore, growth rate will be high for such village. Secondly higher wage rate in secondary sector will play an important role to nurish rather more children as compared to agricultural worker. Thirdly infant mortality will also be low in such villages where secondary sector is high. The workers engaged in construction work come from muslim population who generally avoid family planning measures, therefore, encourage the population growth. High sex ratio will effect marriage rate, resulting in increased number of births. Hence growth rate would be high in such villages where sex ratio is high.

TABLE 6.5

GROWTH RATE DIFFERENTIALS ACCORDING TO DISTANCE FROM
NEAREST TOWN IN NAJEBABAD TAHSIL (1971)

Distance from nearest town in km.	Average growth rate
Below 3	43.34
4-7	39.19
8-15	24.14
Above 15	55.00

6.5 Sex Ratio :

Sex ratio (number of females to per 1000 males) is an index of the socio-economic conditions prevailing in an area and is a useful tool for Regional Analysis³. In itself, the sex ratio is a function of three factors of sex ratio at birth, differential in mortality of the two sexes at different stages of life and sex selectively among the migrants. But for the analysis of the sex-ratio we do not have enough data for explaining the variations in sex ratio. Hence only an attempt is made in order to see the distribution of sex ratio spatially and in different size of villages.

The villages in the tahsil Najibabad experiences a average 854 sex ratio. The map (Fig. 9) shows the spatial distribution of sex ratio in Najibabad tahsil. It is observed that sex ratio is less in the villages located nearer or too far to urban centres.

3. Franklin, S.H.: "The pattern of sex ratio in Newland",
Economic Geography, Vol. 32, 1956, p. 168.

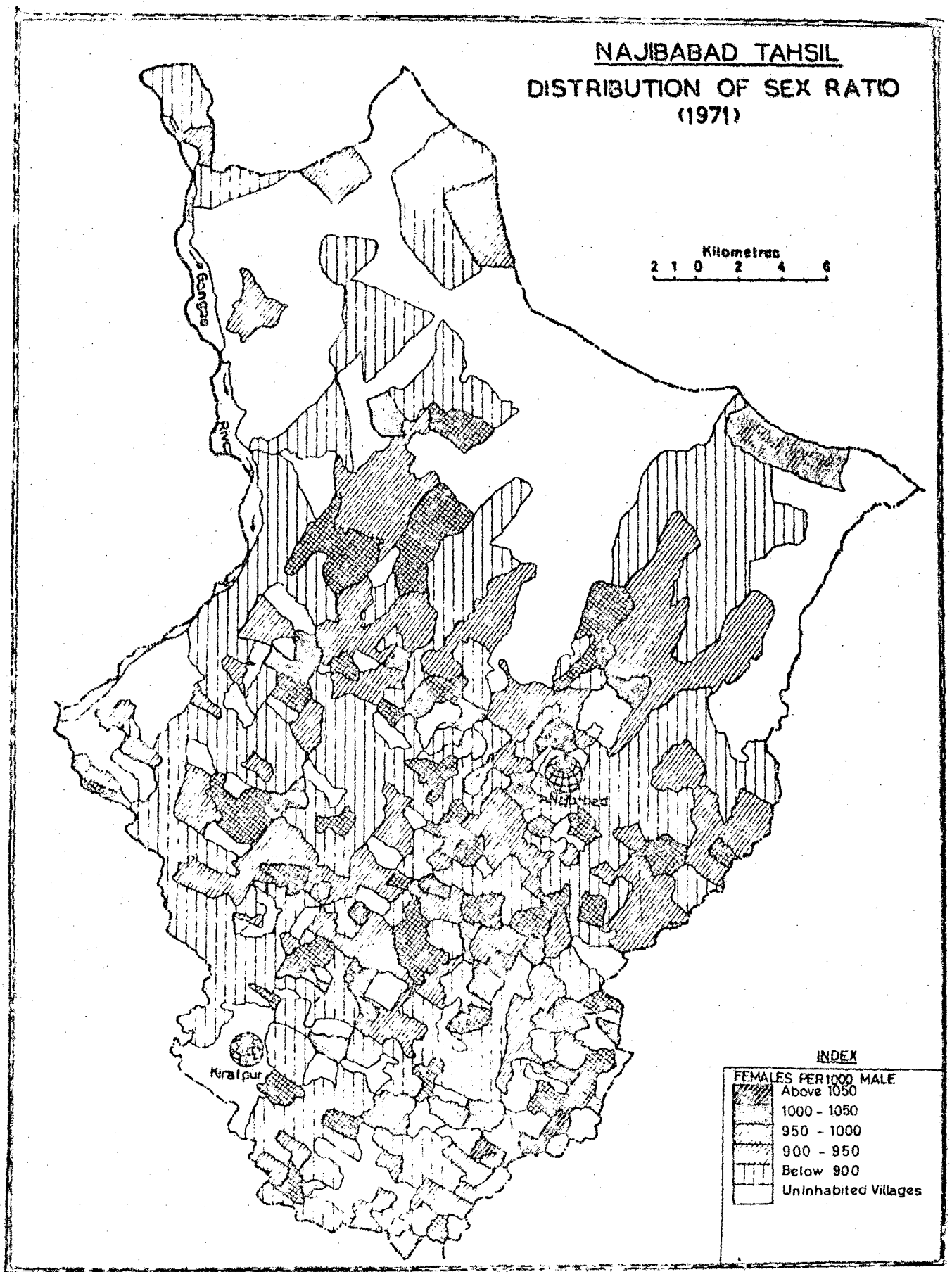


Fig. 9

As discussed earlier, the growth rate is higher in the villages which are nearer to urban centres because of the male selective in migration, therefore, this factor will reduce the proportion of females in the population. Table 6.16 shows that sex ratio is significantly related with average household size, percentage of workers engaged in primary activity, growth rate, dependency ratio. Repeation of female birth and the demand of male birth increases the size of family. Therefore, the areas where average household size would be high sex ratio shall also be high. In the areas of agrarian community educated people migrate to the city or more to some places to get higher education and employment also. This leads to male selective migration resulting in high sex ratio.

TABLE 6.6

DISTRIBUTION OF SEX RATIO IN DIFFERENT POPULATION SIZE OF VILLAGES IN NAJIBABAD TAHSIL (1971)

Size of villages	No. of villeges	Average sex ratio
Below 200	94	772
200-499	142	840
500-999	122	851
1000-1999	34	873
Above 2000	11	886
Total	403	854

Table 6.6 shows that sex ratio increases as the size of settlements increases. The small size of villages (specially 200) experiences a sex ratio 772 female per 1000 males. The village of 200-499 population have 840 females to 1000 males. In the society of agrarian based economy where spread of innovation is very low, such society will be having discrimination for female birth, therefore, in such areas sex ratio shall be low.

6.6 Average Household Size:

Household size is also one of the socio-demographic factors which shows the levels of development and gives an impressions of its relationships with other socio-economic and demographic factors. Table 6.7 shows the distribution of average household size according to size of settlements.

TABLE 6.2

DISTRIBUTION OF AVERAGE HOUSEHOLD SIZE IN DIFFERENT CATEGORIES OF POPULATION SIZE OF VILLAGE IN NAJIBABAD TANSIL (1971)

Size of villages	No. of villages	Average household Size
Below 200	94	5.0
200-499	142	5.2
500-999	122	5.4
1000-1999	34	5.7
Above 2000	11	5.4
Total	403	5.3

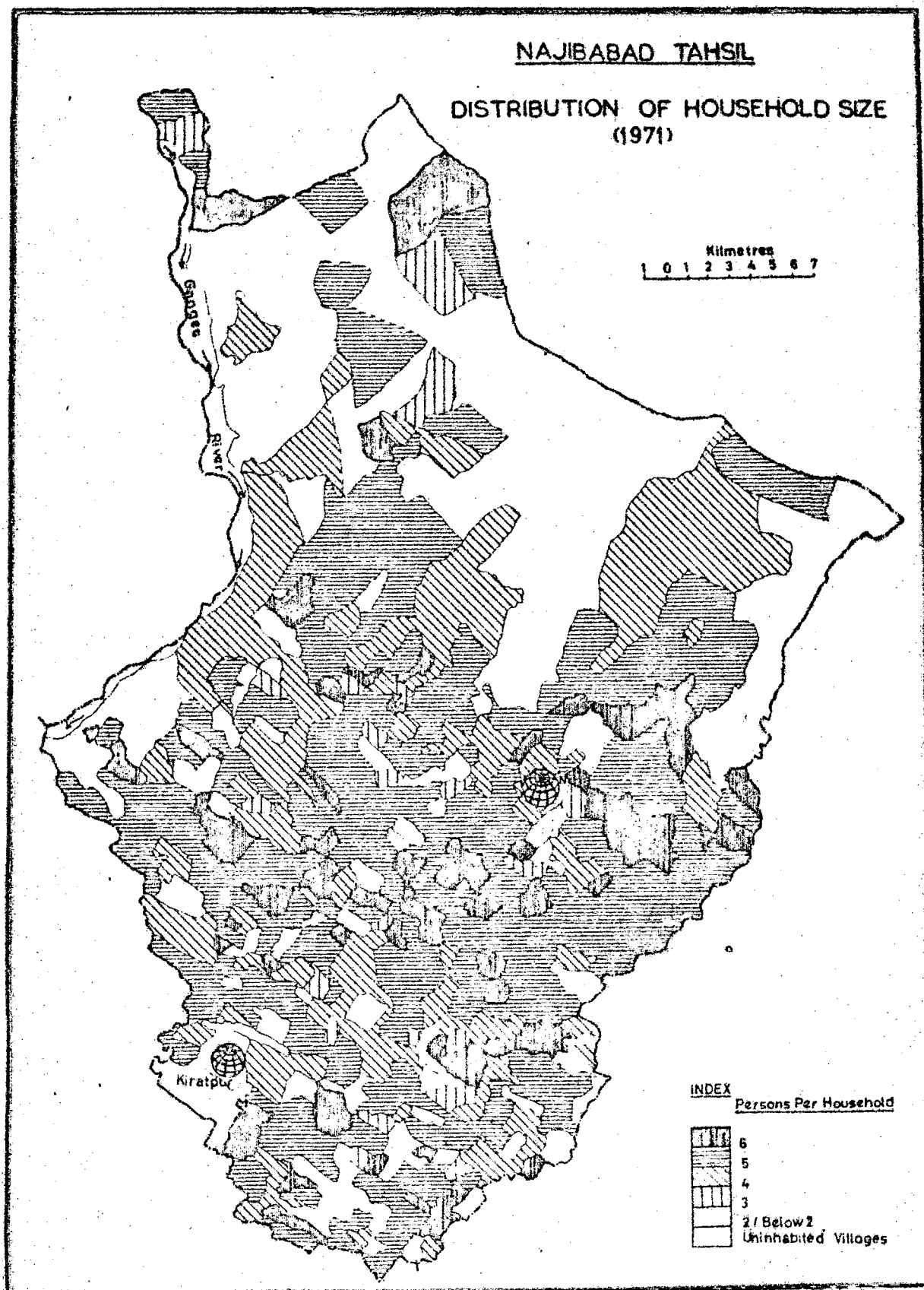


Fig-10

Table 6.7 shows that size of household is higher in large sized villages.

Table 6.16 shows that average household size is significantly positively related with sex ratio, dependency ratio and positively with primary workers, proportion of workers and inversely related with workers and female literacy. In village economy, higher demand of human labour in agriculture will increase the number of persons in a family will decrease. Willing for male birth the couple goes on to produce more children, if the female birth is repeated regularly. This sort of tendency shall be high in the remote areas where education is very low. The tertiarisation, based on high level of literacy, aware about the loss and gains of large family size, will reduce the household size. The Table 6.8 shows that household size is higher in large sized villages, it is because of the fact that there is a tendency of people living in joint families, therefore, the average household size is high there. Maps (Figs. 10 and 16) show that where literacy is higher average household size is low and where literacy is low average household size is high. The causes of this variation are already discussed above.

Table 6.8 gives the distribution of settlements in different household size groups. It shows that 54.49% of villages have 5 to 6 person per household, followed by 20.84% of villages which have 4 to 5 persons per household.

TABLE 6.8**DISTRIBUTION OF VILLAGES ACCORDING TO HOUSEHOLD SIZE IN NAJIBABAD TAHSIL (1971)**

Average household size (persons)	No. of villages	% of villages to total villages
Below 3	10	2.48
3-4	22	5.46
4-5	84	20.84
5-6	220	54.59
6-7	40	9.93
& Above 7	27	6.70
Total	403	100

A considerable percentage of villages (16.63%) have more than 6 persons per household. Only 94% of villages have less than 4 persons per household. The map (Fig. 10) shows that the villages which have higher household size are located in the middle in a belt spreading East and West and in the southern part of the tahsil. The villages which have low household size belong to very very small sized villages.

6.7 Distribution of Scheduled Caste & Scheduled Tribe Population:

The scheduled caste, scheduled tribe and backward castes population is the replenishing stock of population to fulfill the need of labour force, working mostly in the prime sector as agricultural labourer. Therefore, the rural sector's economy is very much influenced by this part of the population. The low literacy rates are found in the scheduled caste and in other

backward castes, therefore, these castes are less prone to the change in the process of development and are characterized by high growth rate which influence the total structure of the population, therefore, the analytical study of the distributional pattern of scheduled caste and scheduled tribe population becomes necessarily important for population geography or demographic studies.

The villages of Najibabad tehsil have 26.37% of scheduled caste population with a sex ratio of 1180 female and 0.84% scheduled tribe with a sex ratio of 912.

TABLE 6.9

DISTRIBUTION OF SCHEDULED CASTE AND SCHEDULED TRIBE POPULATION BY SIZE CLASS OF VILLAGES IN NAJIBABAD (1971)

Size of villages	% of scheduled caste population to total population of category	% of Scheduled tribe population	% of scheduled caste population to total population of tehsil
Below 200	23.70	0.07	4.86
200-499	29.23	0.61	19.44
500-999	27.69	0.37	41.73
1000-1999	29.02	0.12	23.52
Above 2000	15.20	3.22	10.45
Total	26.37	0.84	100.00

Table 6.9 reveals the fact that population of scheduled caste is concentrated in the middle sized villages having 41.73% of scheduled caste population to rural population of Tehsil. The villages of 1000-1999 population have 23.52 percent scheduled caste

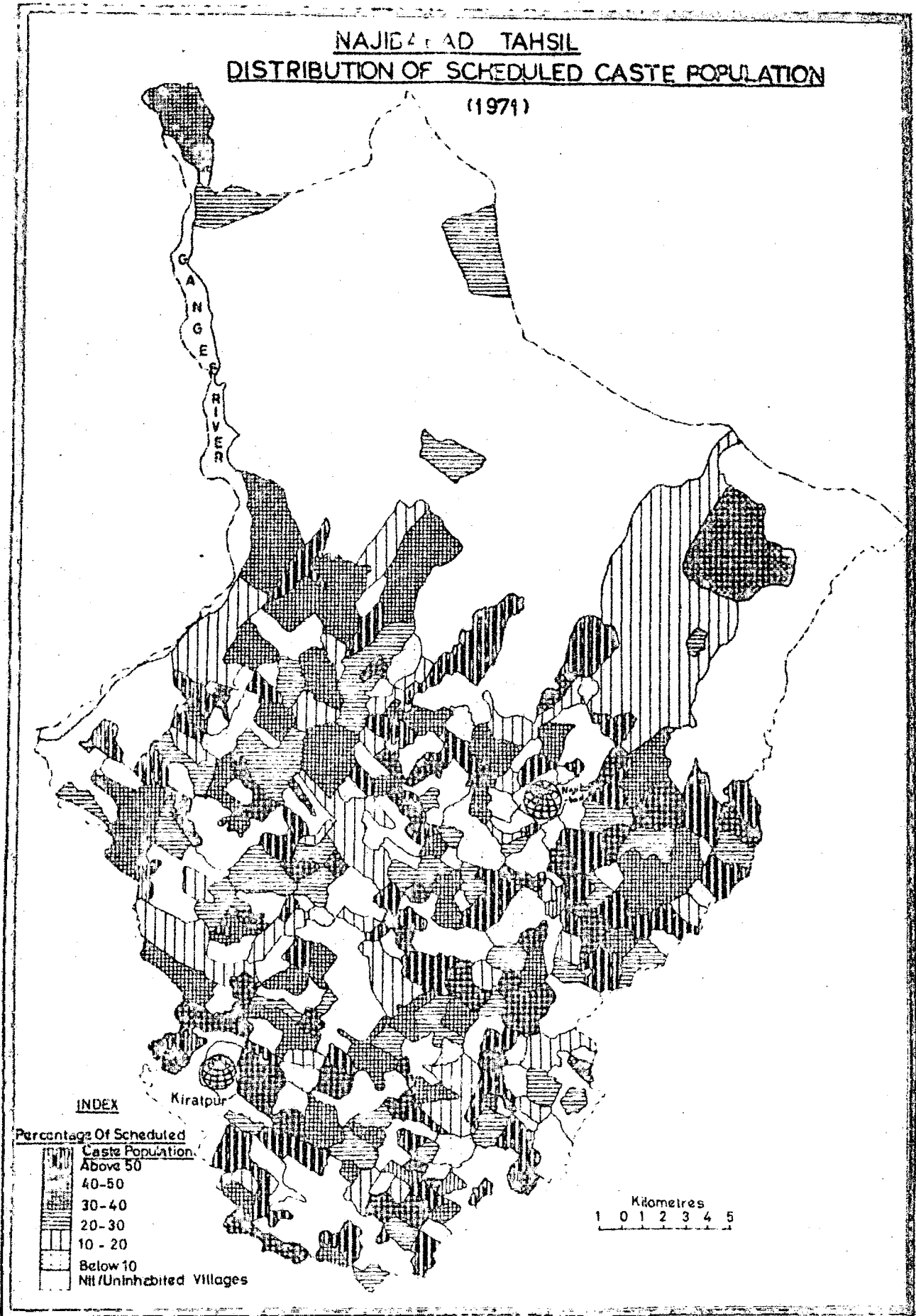


Fig. 11

CONCENTRATION AND DIVERSIFICATION OF S.C. POPN.
 AMONG RURAL SETTLEMENTS IN NAJIBABAD TAHSIL
 (1971)

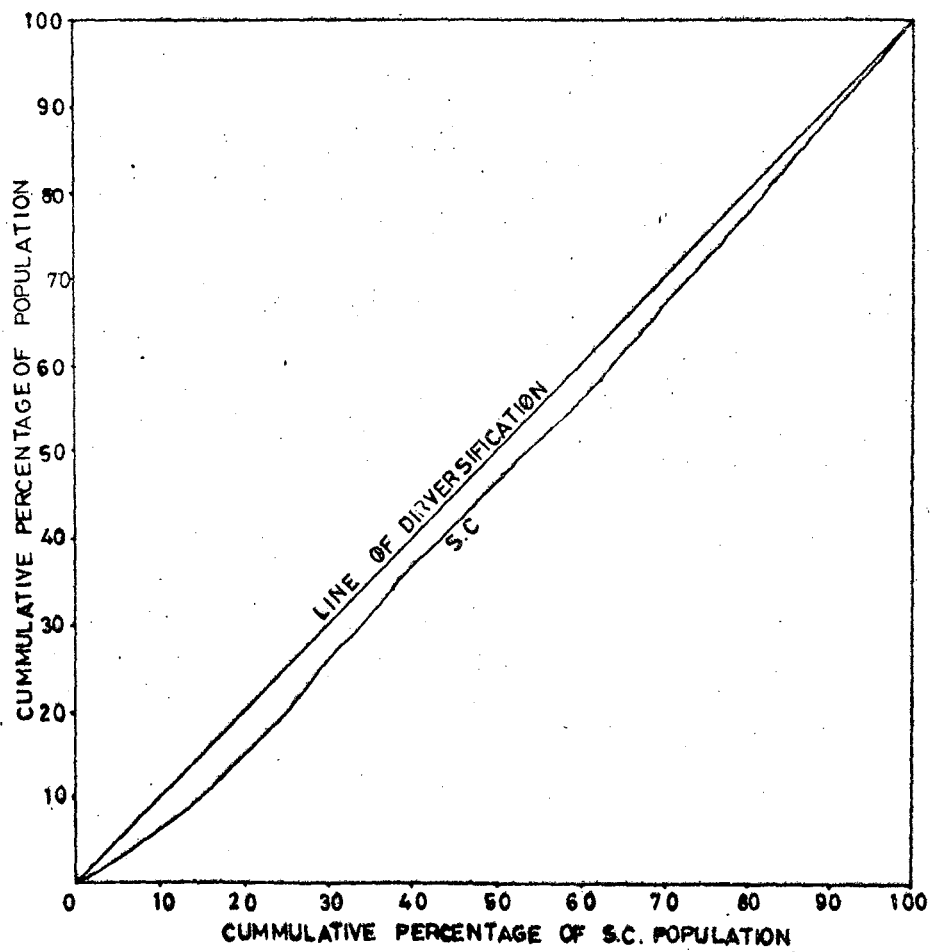


Fig.12

population. The small-sized and large-sized villages have 4.86 and 10.45% of scheduled caste population respectively. If we consider the proportion of scheduled caste population to the total population of that category we find that this proportion is highest (29.23) in the village falling in the 200-499 category followed by 1000-1999 category of villages where this proportion is found 29.02%. The large-sized villages show only 15.20% of scheduled caste. Most of the scheduled tribe population live in large sized villages.

The map (Fig. 11) shows the distribution of percentage of scheduled caste population to total population in Najibabad tahsil. The map does not reveals any sort of agglomeration for scheduled caste population, but it reveals a fact that the villages, having high percentage of scheduled caste population are evenly distributed so that the demand for the labour of the villages can be met easily.

To analyse the concentration of scheduled caste population in the different groups of settlements classified according to population size, a Lorenz curve has been shown (Fig. 12) This shows that proportion of scheduled caste population is almost evenly distributed in all categories of villages in the Tahsil.

6.8 Literacy :

For the population geography, the literacy is that qualitative attribute of population which is fairly reliable index of socio-economic development of an area. The trend in the literacy are indication of the pace at which a particular society is getting transformed. Literacy is essential for eradicating poverty and mental isolation, cultivating peaceful relation and permitting free play of democratic process. In India, all those persons who can both read and write with understanding in any language are classified as literate - a definition proposed by the United Nations population Commission. The literacy rates depends upon so many factors like; (i) Type of economy; (ii) Degree of urbanization, (iii) Standard of living; (iv) Degree of development of means of transportation and communication and of course the availability of educational amenities.

Table 6.10 gives the details regarding the literacy and female literacy in the rural settlements in Najibabad Tehsil.

TABLE 6.10

DISTRIBUTION OF LITERACY RATES IN DIFFERENT SIZE OF VILLAGES IN NAJABABAD TANSIL (1971)

Categories & size of villages	% of literates	% of literates to total literates in tahsil	% of literates to total rural population of Tahsil
I. Below 200	15.44	4.25	0.68
II 200-499	16.29	17.63	2.82
III 500-999	16.39	40.64	6.51
IV 1000-1999	16.29	21.42	3.43
Above 2000	14.27	15.96	2.85
Total	16.29	100.00	16.29

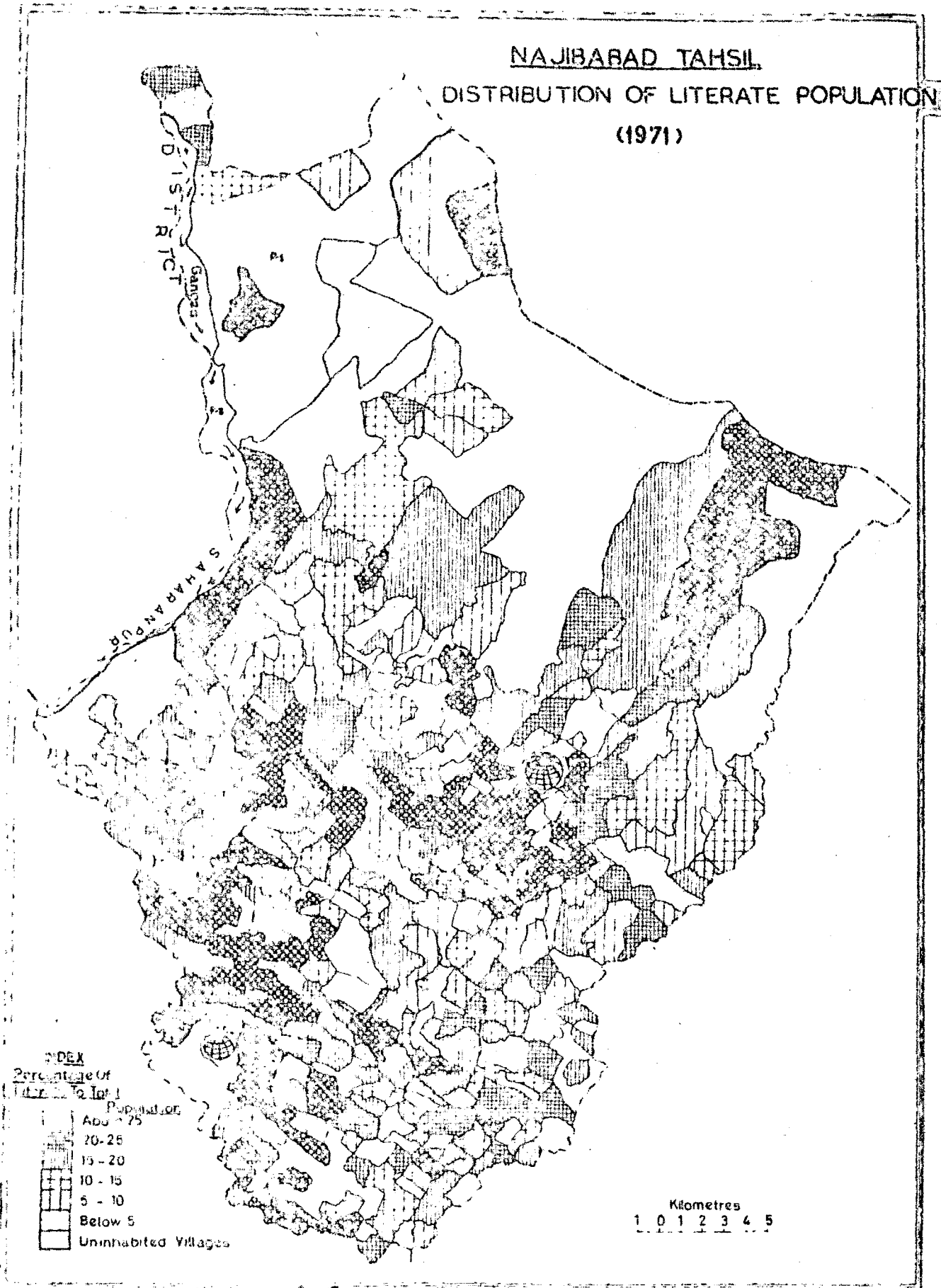


Fig 13

Table 6.10 reveals that 40.64% of literates of tahsil are concentrated in middle sized villages (500-999). 21.42% The villages of 1000-1999 population have 21.42% literates of the tahsil. If we see the percentage of literates to total literates of the same category, we find that large sized villages have lowest level of literacy as compared to any other category. This proportion is also low for small size villages. The IInd, IIIrd and IVTH categories of villages have almost constant rate of literacy. Only 16.29% of rural population of Najibabad Tahsil was literate in 1971. In 1961, this percentage of rural literates to rural population was only 9.31. This growth in literacy has been due to the increase in educational amenities at primary level.

The map (Fig. 13) shows the distribution of percentage of literates in Najibabad tahsil and reveals the fact that literacy rate is high in the villages which are nearer to the urban centres or semi urban centres because of the availability of educational facility and the influence of urban civilisation promoting the idea of being educated in the rural population. The villages located in interior, show low level of literacy.

The rural population of tahsil has 6.44% female literacy. The small sized villages of -below 200 and 200-499 population have 5.16 and 4.44% female literacy respectively. Female literacy is higher in the middle and large-sized villages.

The comparison of map (Fig. 13) and map (Fig. 5) shows a clearcut association of distribution of educational facilities

CONCENTRATION AND DIVERSIFICATION OF LITERACY
AMONG RURAL SETTLEMENTS IN NAJIBABAD TAHSIL
(1971)

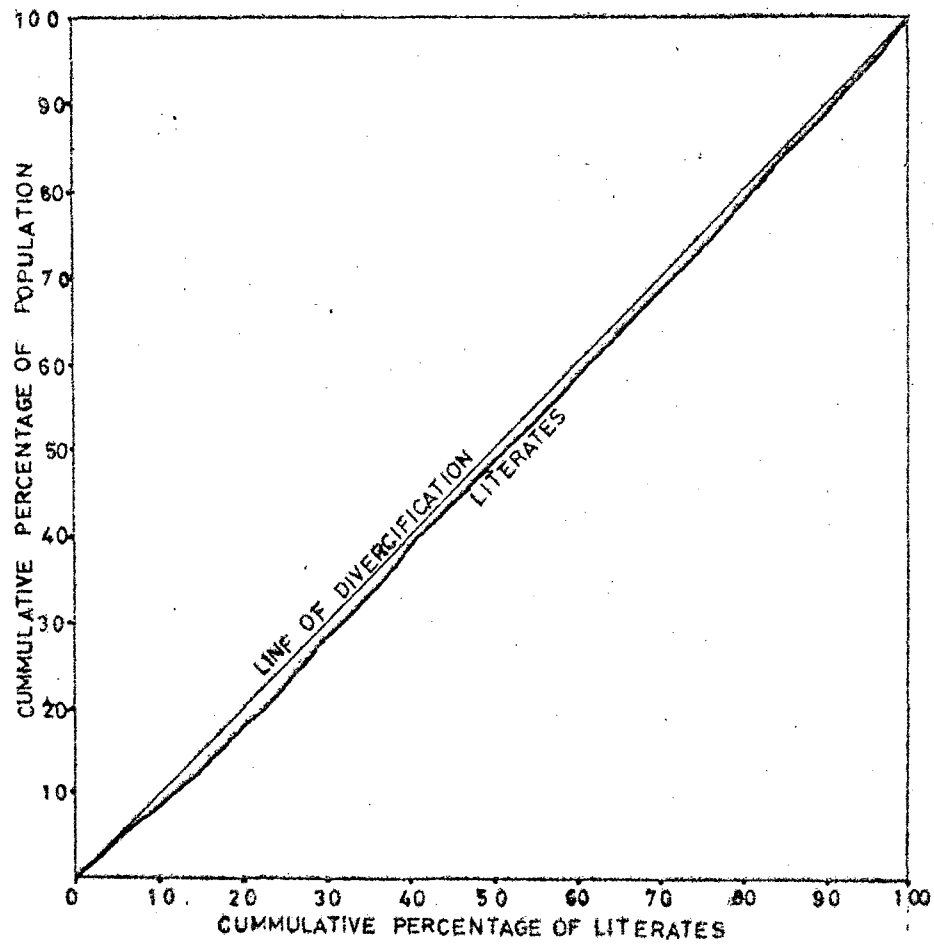


Fig.14

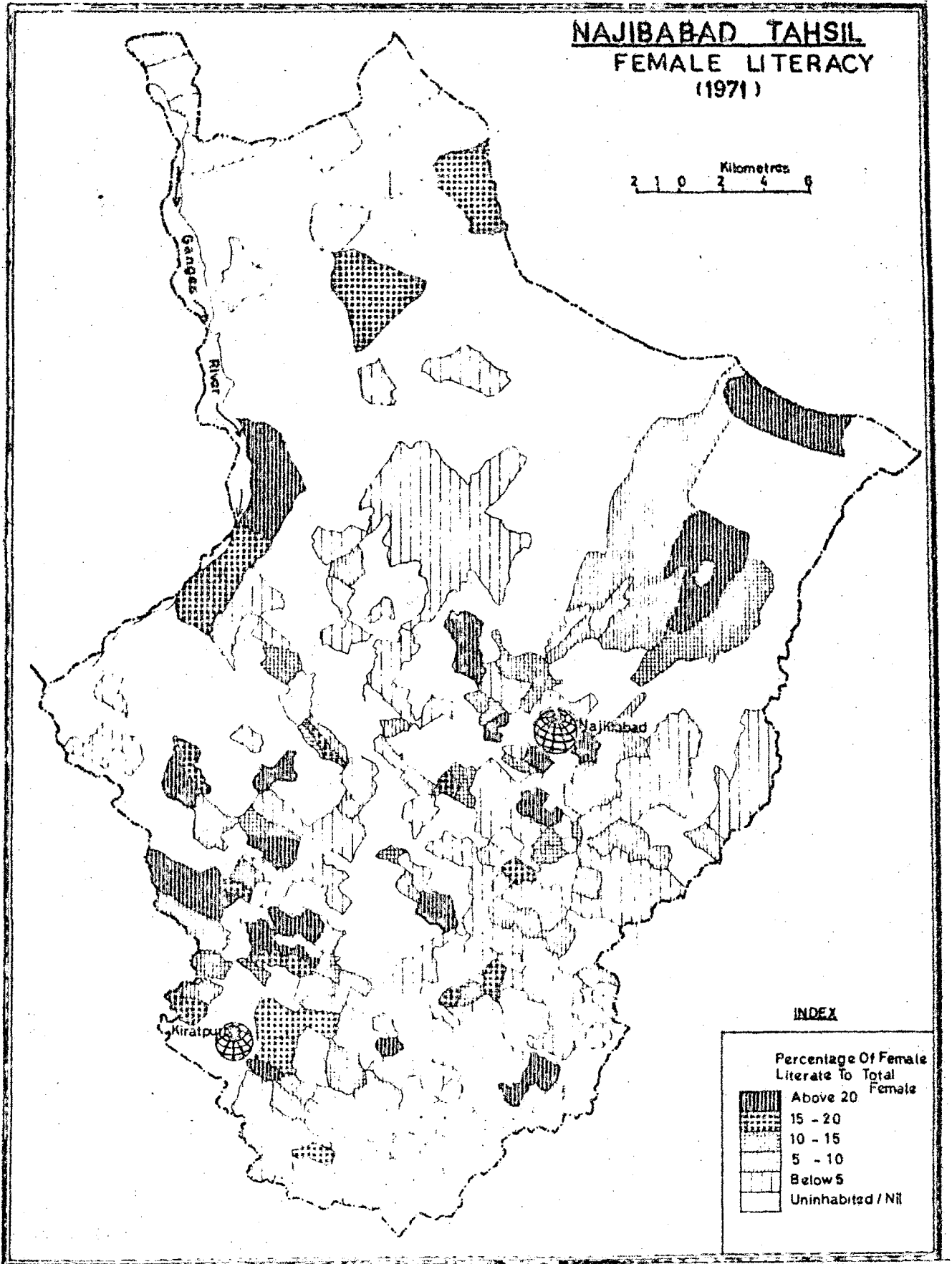


Fig. 15

and literacy rates, where the educational facilities are concentrated the proportion of educated population is high. The distribution of educational facilities also have an association with the female literacy rates. In the rural economy, parents, generally do not send their daughters to school located in other villages. Only those villages which have educational facilities, have female literacy high (Fig. 15). Map (Fig. 15) also show that female literacy rates are higher nearer to urban centres. The Lorenze curve (Fig. 14) shows that the literacy rates are almost evenly distribution in all groups of settlements.

Table 6.16 gives the correlation coefficient between literacy rate and other socio-economic and demographic characteristics and amenity scores. The literacy rates are significantly, positively related with, availability of social facilities, non primary worker and inversely related with sex ratio, primary workers, distance from nearest town and distance from road. As discussed above literacy rates shall be high where educational facilities shall be available. The proportion of non primary workers shall be higher where literacy rates are higher, therefore, awareness about the education will lead them to send their children to schools. High sex ratio will certainly lower down the proportion of educated people because in villages the female literacy is very low. The distances from road and urban centres reflect the probability of a student going to avail these educational facilities concentrated in urban areas. The spread of innovation is also higher

nearer to urban centres which will force the population living nearer to urban centres to send their children to school , with the changing environment and need of education.

6.9 Economic Profiles :

The economy of any region, no doubt is always rooted in the very soil of the region. The time factor introduces the temporal changes in the economic structure of the region with the process of development. The economic structure is the sum of bifurcated working force in different sectors of the economy. According to the census in India the economic structure is divided into three economic sectors namely; (i) Primary Sector; constituted by (a) cultivators; (b) Agricultural Labourers; (c) Forestry; (d) Mining and Quarring; (ii) Secondary Sector; includes (a) workers engaged in manufacturing household industries or other than household industries and in (b) construction (iii) Tertiary Sector includes the workers engaged in (a) transportation; (b) trade and commerce and (c) other services, In all workers are divided into 9 industrial categories.

The distribution of the work force engaged in different industrial categories is the function of the level of development of the region. In agrarian society primary sector will monopolise the economic structure. In the industrialised areas the considerable work force is diverted from primary sector to secondary or to tertiary sectors of the economy.

The present study also deals with the distribution of workers engaged in different industrial categories. Since Najibabad tahsil is situated in the upper Ganga plain, the soil is rich alluminium giving rise to the strong commercial agriculture, coordinated with climate and irrigation facilities. The northern part of the connected with the considerable forest area attracting a small portion of workforce engaged in lumbering and forestry.

TABLE 6.11

BLOCKWISE DISTRIBUTION OF WORKERS ENGAGED IN PRIMARY, SECONDARY, AND TERTIARY SECTORS IN NAJIBABAD TAHSIL (1971)

Blocks	Percentage of workers engaged in			
	Percentage of workers	Primary sector	Secondary sector	Tertiary sector
Najibabad	29.46	83.65	8.09	8.26
Kiratpur	29.19	81.94	8.60	9.46
Total	29.36	82.78	8.23	8.99

Table 6.11 shows that Najibabad block is lagging behind in the secondary and tertiary sectors in comparison to Kiratpur block. Percentage of workers (29.46) in Najibabad block is more than the percentage of workers in Kiratpur block.

Table 6.12 shows that the proportion of workers engaged in primary sector is dominated by cultivators and agricultural labours in both the blocks. The percentage of cultivators is larger than the proportion of agricultural laborers. Najibabad block has 1.52% workers engaged in forestry. The mining and

TABLE 6.12

DISTRIBUTION OF PERCENTAGE OF WORKERS ENGAGED IN DIFFERENT INDUSTRIAL CATEGORIES IN BOTH THE BLOCKS OF NAJIRABAD TAHSIL (1971)

Blocks	%age of workers	Percentage of workers								
		Culti- vators	Agri- cult- ural labo- rers	Fore- stry Fish- ing etc.	Min- ing & Qua- rry- ing	Manu- fact- uring	Constru- truc- tion	Trade & Comm- ence	Tran- sport	Other servi- ces
Najibabad block	29.46	43.03	33.98	1.52	0.07	7.66	0.43	2.29	1.83	5.42
Kiratpur block	27.10	49.63	31.45	0.85	0.01	8.14	0.46	2.35	0.44	6.02
Total	29.36	48.13	33.34	1.25	0.06	7.79	0.44	2.47	1.48	5.56

quarry activity is almost negligible in the tahsil having only 0.06% of workers engaged in it. Kiratpur block has 8.14% of workers engaged in manufacturing because of the predominance of sugar industry in comparison to Najibabad block. In the tahsil only 0.44% of workers are engaged in construction work, 2.47 percent in transportation, 1.4% in trade and commerce and 5.56% in other services.

6.10 Size Class Analysis of Economic Structure

The size of the settlement is also a determining factor of the economic structure. The small settlements always show the dominance of primary sector. As the settlement grows up certain amenity took place, the level of education also increases hence the new economic structure stands forward to show a shift of works from primary sector to industrial sector or tertiary sector. Table 6.13 shows the dominance of primary workers in small sized village. The cultivators proportion in work force decreases while the proportion of agricultural labourers increases in the larger sized villages, it might be due to division of land. The secondary sector and tertiary sectors show a opposite picture to that of primary sectors. As the size of settlement increases the secondary and tertiary activities increases.

Table 6.16 shows the relationship between socio, economic, demographic and some geographical characteristics of the settlements. It records that proportion of workers is significantly related with

TABLE 6.13

DISTRIBUTION OF PERCENTAGE OF WORKERS ENGAGED IN DIFFERENT INDUSTRIAL CATEGORIES IN DIFFERENT SIZE OF SETTLEMENTS IN NAJIRABAD TAHSIL (1971)

Size of villages	%age of workers	Percentage of Workers								
		Culti-vators	Agri-cult-ural Labo-urers	Fore-stry Fish-ing etc.	Min-ing & Qua-rry-ing	Manu-fact-uring	Cons-truc-tion	Trade & Comm-ence	Trans-port	Other services
Below 200	30.52	60.00	26.60	0.69	0.00	5.21	0.17	1.24	1.04	3.66
200-499	29.02	57.47	29.29	1.46	0.00	6.41	0.32	0.50	0.94	3.62
500-999	29.56	48.54	32.74	1.01	0.03	8.03	0.17	1.60	2.34	5.14
1000-1999	29.20	41.94	38.90	1.59	0.20	7.42	0.47	3.11	1.64	4.95
Above 2000	29.13	36.43	34.65	2.29	0.02	10.22	1.07	5.07	1.17	9.91
TOTAL	29.35	48.13	33.34	1.25	0.06	7.79	0.44	2.47	1.48	5.56

(i) Density of population; (ii) Sex ratio, (iii) Dependency ratio. The relationship between proportion of workers is positive with Density of population i.e. the villages which have high density (found mostly is large size villages discussed earlier) also have high proportion of workers. Naturally where proportion of workers will be high the dependency ratio will decrease and hence the relationship between dependency ratio and proportion of workers is found negative. The proportion of female worker is generally low in India. It might be mis-reporting due to some sociological factors forcing for a wrong information. Therefore, the relationship between sex ratio and proportion of workers will also be negative.

As far as the explanation for the workers engaged in different industrial sector in Tahsil Najibabad is concerned, it is seen that primary sector is significantly (i) negatively related with level of literacy, proportion of workers; secondary workers, tertiary workers, female participation, female literacy, the social facilities provided to the settlements and (ii) positively related with distance from nearest town and distance from nearest road. In the process of development the places which are greatly exposed to urban influence get their socio and demographic structure changes (discussed earlier). Therefore, the villages which are in remote areas or located away from road and town will show low level of literacy therefore, most of the workers of such villages will be engaged

in primary activities. Villages which are nearer to roads and urban centres show a shift of working force from primary sector to non primary sector. The female literacy also affects proportion of primary workers and show a shift from agricultural sector to tertiary sector, services. Naturally where secondary sector and tertiary sector will be high primary sector will be low.

The proportion of workers in secondary activities is significantly related with growth rate, density of population, literacy and female participation, transport network and distance from nearest town. As discussed in the previous paragraph that the villages which are located near to road or town will show a increasing proportion of workers in either secondary sector or tertiary sector, because most of the industries are located along road and near to urban centres. Where literacy rates will be high, naturally, the people finds jobs in tertiary sectors. The village where employment probability is high will experience a considerable in migration resulting an increase in growth rate.

The proportion of workers engaged in tertiary activities is influenced significantly by literacy rate. Female literacy, sex ratio, social amenities given to village, transportation facilities and urban influence as shown in Table 6.16 which gives the correlation coefficients between proportion of workers engaged in tertiary sector and other explanatory socio-economic demographic and other infrastructural factors. The process of

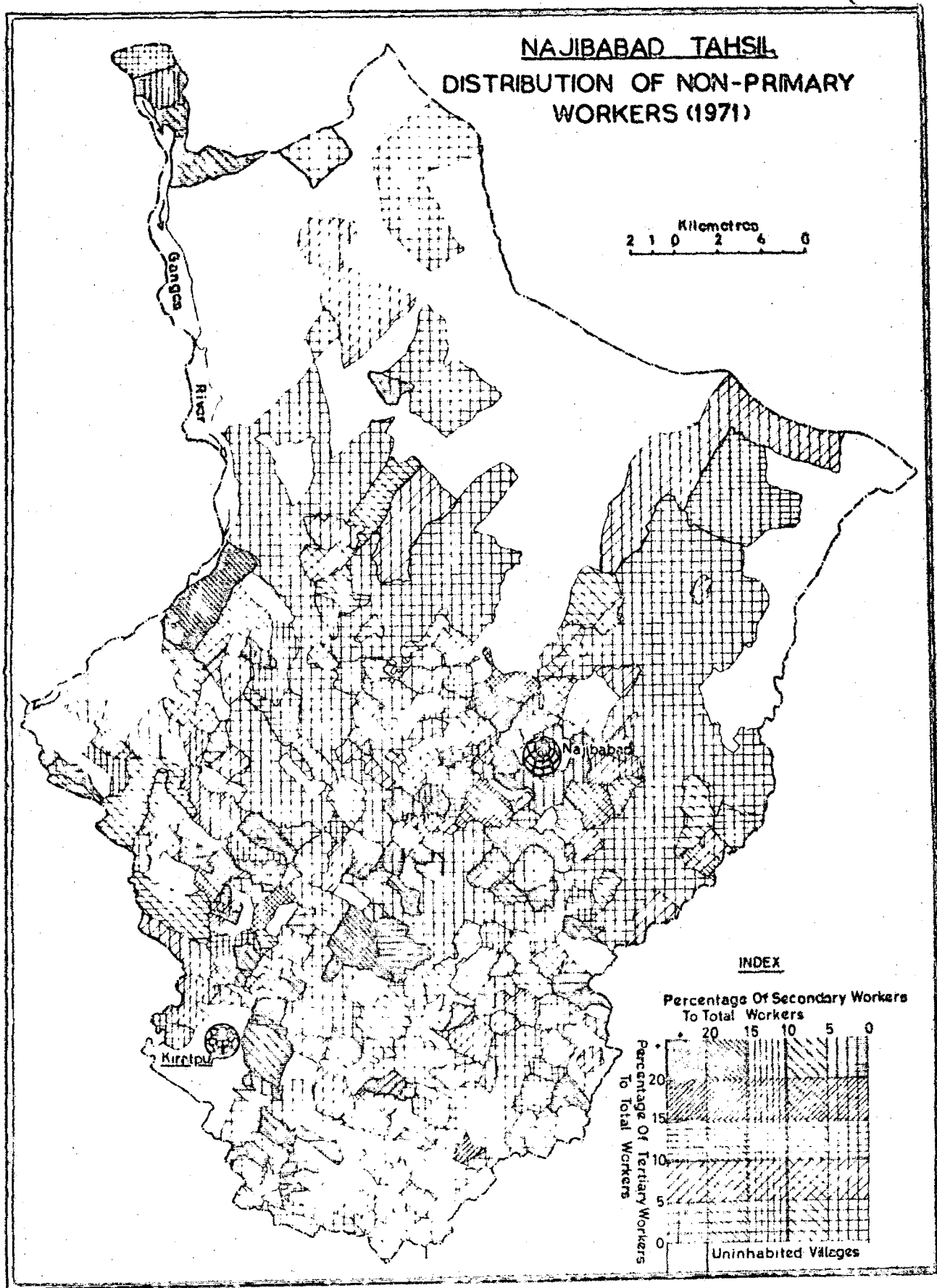


Fig. 16

tertiarisation in the economy is always influenced by the level of literacy which is influenced by infrastructural and social facilities given to the villages. As discussed earlier, the female literacy is influenced by the transportation facilities and educational facilities and also the nearness of the town where most of the workers engaged in tertiary activities coming daily from nearby villages, therefore, the process of tertiarisation will be influenced by these above mentioned factors. The map (Fig. 16) give the spatial distribution of nonprimary workers. It shows that proportion of workers engaged in secondary and tertiary activities is higher in the villages which are located nearer to Najibabad and Kiratpur town, and in the village located between these two towns long the road sides. The villages of large size have large proportion of workers engaged in non primary sectors. Around the Najibabad town the proportion of workers engaged in tertiary activity is high while around Kiratpur town the proportion of workers engaged in secondary activities is high it is because of the fact that most of the sugar factories are located in Kiratpur town supported with its hinterland which is a sugarcane producing area of the tahsil.

6.11 Female Participation :

Female participation is also a indicator for the development. Female participation rates generally high in rural sector as agricultural labourers or in tertiary sectors. The work done by female is not only an addition to work force but

TABLE 6.14

FEMALE PARTICIPATION IN DIFFERENT SIZE OF VILLAGES IN NAJIBABAD TAHSIL (1971)

Size of villages	Female participation rate (in %)	Percentage female workers to			Proportion of female workers to total workers	Female literacy
		Cultivators	Agricultural labourers	Other services		
Below 200	1.67	25.00	37.50	26.39	5.54	5.16
200-499	1.12	36.20	39.82	8.14	1.56	4.48
500-999	1.09	28.75	32.91	16.62	1.66	6.49
1000-1999	0.99	27.27	41.15	12.92	1.42	6.48
Above 2000	1.27	10.00	23.48	37.39	1.98	7.96
Total	1.13	27.55	34.25	19.93	1.78	6.38

also increases the economy of the family and reduces the wastage time of waste which altogether affects socio-economic and demographic structure society. Table 6.14 explains about the female participation in the tahsil Najibabad.

The female participation in tahsil is only 1.13%. Female participation is higher in the small sized villages and goes on decreasing as the size increases. But in large sized villages, female participation again increases. If we relate this female participation th with the size of villages than we find that proportion of female workers engaged in primary sector is cultivators or agricultural labourers to total female workers is very large and as the size of settlement increases this proportion decreases. So it explains that female participation in small villages is high and it is used as cultivators or agricultural labourers. This ^{proportion} goes on decreasing in the larger village. But again female participation increases because of the female literacy which gives rise in the proportion of female workers engaged in other services. If we see the percentage, the female workers constitute only 5.54% of work force for small sized villages and decreases as the size of settlements increases. But this proportion again increases for large size villages because most of the females are engaged in other services which is based on the education. The percentage of female workers to total workers is also related with the distance from nearest town. Upto 3 kms distance from town the proportion of female workers is 4.78%, 5-7 Kms distance,

and 8-15 Kms distance this proportion is 1.64% and 0.57% respectively. The villages which are in remote areas i.e. located more than 15 kms away from urban centres, proportion of female workers is increased upto 1.57%.

6.12 Dependency Ratio

Dependency ratio shows the number of dependents per worker. This proportion is the function of the type of economy, aging of the population and female participation. Where most of the population is found in lower age and old age group of population, the workforce is reduced considerably, where female participation is high, dependency ratio will be low.

Table 6.15 shows that in the tahsil there are 241 non dependents per 100 workers. In the small size villages, dependency ratio is smaller because of child labour and female participation is high. With the increase in size of villages dependency ratio also increases, it is because of the female participation decreases as the size of settlement increases, but for the large sized villages female participation becomes high. From Table 6.15 it can also be explained that dependency ratio is low where proportion of primary workers is more.

In the above discussion, it can be concluded that economic structure of the villages is dependent with its size distance from nearest town, female literacy, level of literacy, female participation and transport network.

From the correlation matrices given in Appendixes III & IV for different size categories of population and distance categories from urban centre, we can say that degree and direction relationship among socio-economic and demographic characteristics of village vary from one category to another.

TABLE 6.15**DISTRIBUTION OF DEPENDENCY RATIO IN DIFFERENT
dist SIZE OF VILLAGES IN NAJIBABAD TAHSIL (1971)**

Size of villages	Dependency ratio	Female participation	Percentage of literates	Percentage of primary workers	Proportion of female dependents
Below 200	2.28	1.67	15.44	87.29	64.48
200-499	2.45	1.12	16.29	88.22	63.51
500-999	2.38	1.09	16.59	78.32	64.48
1000-1999	2.42	0.99	16.25	82.40	65.08
Above 2000	2.43	1.27	14.27	73.29	65.55
Total	2.41	1.13	16.01	82.78	64.62

Table 6.16 gives the correlation coefficients among the various indicators representing the socio-economic and demographic characteristics, infrastructural facilities, social amenities (measured in terms of scores) and urban influence, in the villages of Najibabad Tahsil. From the table we can establish the following relationships :-

- a. Size of settlements depends upon the available social amenities.
- b. Sex ratio and household size increases with increasing size of villages.
- c. Higher the size of villages, higher is the density of population.
- d. Density of population decreases with the increasing distance from urban centres and transport network.
- e. Population growth is related to sex ratio and secondary workers, i.e. with higher sex ratio and proportion of workers, the population growth will also be higher.
- f. Literacy rate, increases with the increase in social facilities and proportion of non primary workers. With the increasing distance from transport network and urban centres, literacy rate decreases. Here, transport network plays a very important role for the determination of literacy.
- g. Female literacy increases with the increase in social facilities, proportion of tertiary workers, proportion of workers and female participation. The increasing, distance from urban centres, pucca roads, household size and dependency ratio show a decrease in female literacy of scheduled caste

TABLE 6.16
CORRELATION MATRIX

	1 10	2 11	3 12	4 13	5 14	6 15	7 16	8 17	9
X ₁	1.000								
X ₂	-0.021	1.000							
X ₃	0.574**	-0.012	1.000						
X ₄	-0.059	-0.049	-0.031	1.000					
X ₅	-0.011	-0.56	0.036	0.047	1.000				
X ₆	-0.012	0.071	0.062	-0.172**	0.067	1.000			
X ₇	-0.085	-0.073	-0.133**	-0.009	-0.054	0.160**	1.000		
X ₈	-0.070	0.028	-0.101*	0.020	-0.081	0.196**	0.435**	1.000	
X ₉	-0.073	-0.022	-0.123*	0.086	-0.310**	-0.324**	-0.196**	-0.381**	1.000
X ₁₀	0.087 1.000	0.136**	0.158**	0.006	0.176**	0.075	0.273**	0.369**	-0.566**
X ₁₁	0.052 0.049	-0.051 1.000	0.074	-0.090	0.277**	0.272**	0.114*	0.046	-0.777**
X ₁₂	0.044 -0.126*	-0.132** 0.126*	0.105* 1.000	-0.050	0.111*	-0.144**	-0.585**	-0.410**	0.017
X ₁₃	0.153** -0.107*	0.135** -0.325**	1.89** 0.188**	0.047 1.000	-0.218**	-0.066	-0.436**	-0.356**	0.376**

Contd.../-

TABLE 6.16 (contd.)

	1 10	2 11	3 12	4 13	5 14	6 15	7 16	8 17	9
X ₁₀	0.112 [*] -0.057	0.084 -0.204**	0.122** 0.159**	0.043 0.275**	-0.060 1.000	-0.150**	-0.266**	-0.182**	0.215**
X ₁₅	0.037 -0.133**	0.025 -0.191**	-0.137** -0.097	-0.081 0.029	-0.193** 0.043	-0.117* 1.000	0.065	-0.037	0.218**
X ₁₆	-0.096 -0.142**	0.055 -0.242**	-0.135** -0.002	-0.023 0.083	-0.234** -0.029	-0.134** 0.083	-0.023 1.000	-0.093	0.281**
X ₁₇	0.319** 0.034	-0.008 0.292**	0.085 0.023	-0.069 -0.016	0.162** -0.051	0.150** -0.044	-0.005 -0.139**	-0.026 1.000	-0.264**

Note: * = significant at 5% level of significance; ** - significant at 1% level of significance.

X₁ = population size settlements, X₂ = growth rate, X₃ = density of population
 X₄ = percentage of scheduled population; X₅ = percentage of literate; X₆ =
 female literacy; X₇ = percentage of workers; X₈ = female participation rate;
 X₉ = primary workers; X₁₀ = secondary workers; X₁₁ = tertiary workers; X₁₂ =
 dependency ratio; X₁₃ = sex ratio; X₁₄ = average household size; X₁₅ = distance
 from town; X₁₆ = distance from pucca road; X₁₇ = amenities score.

- population show low female literacy.
- h. Proportion of workers increases with the increase in female participation and non primary workers. Higher sex ratio, dependency ratio and average household size reduce the proportion of workers.
- i. Female participation with increase in non primary workers and female literacy. Higher the sex ratio, dependency ratio and average household size, lower would be female participation.
- j. Proportion of secondary workers increases with increasing female literacy. The increasing distance from urban centres and roads show decreasing proportion of secondary workers.
- k. Proportion of tertiary workers increases with increasing literacy rate, female literacy, social amenities. As the distance from town and pucca roads increases, the proportion of tertiary workers decreases.
- l. Dependency ratio increases with increasing, literacy rates, proportion of workers and social amenities. Increasing female literacy, proportion of workers, sex ratio, average household size show decreasing dependency ratio. The increasing distance from town and transport network shows an association with decreasing dependency ratio i.e. in the remote rural areas dependency ratio will be low.
- m. Sex ratio is higher in the larger, fast growing and dense villages. The increasing literacy rates, proportion of workers female participation, secondary workers, tertiary workers show decreasing sex ratio (still discrimination for female births).
- n. Household size is large in large and dense populated villages. Higher the proportion of primary workers, sex ratio and dependency ratio, higher is the household size. Increasing female literacy, female participation and proportion of tertiary workers show decreasing household size.

CHAPTER VII

Factors Affecting the Localization of Social Amenities

In the previous chapter the interrelationship among socio-economic and demographic characteristics of Najibabad tahsil has been explained on the basis of each individual village as one observation. The behaviour of change of socio-economic and demographic characteristics of villages classified in different population size categories has also been examined in relation to urban influence measured in terms of distance of village from its nearest town and in relation to transport network, measured in terms of distance of villages from Pucca road. Relationship of social amenities (measured in terms of amenity score) with socio-economic and demographic characteristics of villages in Najibabad Tahsil has also been established.

Now, our job is left to see and examine the factors which are responsible for the concentration and distribution of social facilities. Social facilities cannot be given to each and every settlement due to the lack of finance and because each facility requires minimum threshold of population. So the task of planner becomes very difficult to provide the facility to each settlement. Therefore, in order to seek for the factors which are related to social facilities a number of indicators have been selected and a correlation matrix has been prepared. In the next step, stepwise regression analysis has been made taking amenities score as dependent variable and other factors independent in order to see the contribution

of each significant indicator relation to localisation of social amenities, in each step with the addition of new indicator.

7.1 Selection of Indicators :

For explaining the variation in the dependent variable (amenity score) a number of variables have been selected.

7.1.2 Size of Settlements :

Since size is the most important factor which is very much associated with the centrality and provide population threshold to amenities. It has been also observed that most of the higher functions exist in larged size villages, therefore the growth of the large size villages or semi urban areas is effected by the process of inmigration. As the size of villages increases the need of more social facilities also in increases therefore large size villages will attrarot more social amenities. Secondly, if the facilities are located in large sized villages. These can be utilized effectively by the population living in that village and by its surrounding villages. Therefore, with this consideration this factor becomes one of the most important factor affecting the concentration of social facilities.

7.1.3 Density of Population :

Density of population is an indicator which indicates the concentration of the population within the given area. Higher density means higher pressure on resources. Density of population

will be high generally in large sized villages. It will increase the multicollinearity in stepwise regression analysis. But high density of population can also be seen in small sized villages. Density is also a function of (i) the interactions among villages and (ii) immigration. Therefore, this indicator is also included in order to explain the variation in the amenity score.

7.1.4 Non Primary Workers:

In the village economy generally the proportion of workers engaged in secondary and tertiary sector is low but it reflects the advancement of the area. As far as secondary sector of economy is concerned particularly in the sugarcane belt where crushers are located along the road side in the rural areas, does not show much association with the attainment of education etc. But the process of tertiarisation generally is based upon the educational attainment of the population living in villages. Therefore, higher proportion of tertiary activity will be able to attract the localisation of amenities. Therefore, these two indicators (workers engaged in secondary activities and workers engaged in tertiary activities) have been selected to explain the variation in the social amenities score.

7.1.5 Distance from Nearest Town:

This indicator is directly related with the distribution of social amenities. As the distance from nearest town increase

the possibility of the localisation of educations, medical and other facilities becomes low. This indicator has negative relationship with the localisation of social amenities. For the villages located much away from urban centres, the size and density of population increases indicating the feeding impact of urban centres and emerging subcentres to serve long distance and village. Therefore, this distance becomes indicative of concentration of social amenities in the remote areas.

7.1.6 Distance from Road:

The distance of a settlement from the road affects economy and the general awareness of inhabitants of that settlement. Therefore, as this distance will increase there would be least possibility for the localisation of social amenities because the worker who will serve in that particular amenities will like the easily approachable place. Therefore, social amenities will have a tendency to be localised nearer to Pucca road.

7.1.7 Literacy Rate:

This is the indicator which reflects the level of general awareness of the people of a village. Therefore, the villages which have high literacy rate will attract more facilities to be localised there. Therefore, this indicator has positive relationship with the localization of the social facilities.

Table 7.1 shows the correlation co-efficients among the variables selected.

Form

TABLE 7.1

CORRELATION MATRIX

Variables	1	2	3	4	5	6	7	8
(Y) Amenity score	1.000							
(X1) Size of villages	0.319**	1.000						
(X2) Tertiary workers	0.292**	0.052	1.000					
(X3) Literacy	0.162**	-0.011	0.277**	1.000				
(X4) Density of population	0.085	0.574**	0.074	0.036	1.000			
(X5) Secondary workers	0.034	0.037	0.099*	-0.075	0.158**	1.000		
(X6) Distance from road	-0.139**	-0.096	-0.234**	-0.234**	-0.242**	-0.142**	1.000	
(X7) Distance from town	-0.044	0.037	-0.191**	-0.193**	-0.025	-0.133**	0.083	1.000

Note: * - Significant at 5% level of significance.

** - Significant at 1% level of significance.

From the Table 7.1 we find that there are only four indicators (i) size of settlement; (ii) proportion of workers engaged in tertiary workers; (iii) literacy rates and (iv) distance from road, which have significant correlation coefficients with amenity score at 1% level of significance. The first three indicators are positively related and the fourth indicator is negatively related with the social amenity score.

In the stepwise regression analysis first three indicators have been taken into account in order to see their explanatory power to explain the variation in the social amenity score. Table 7.2 shows the results of stepwise regression analysis.

From Table 7.2 we can conclude that (X1) size of settlements explain the maximum proportion of variation in the amenity score (ie. for the localisation of social amenity) followed by (X2) proportion of workers engaged in tertiary sector and (X3) literacy rates. The increase in R^2 value by adding literacy rates is very marginal but still contributes for explaining the variations, in the social amenity score.

The regression coefficients from step one to step three show a consistently significant values. The values of F - Ratio test are also significant hence we can conclude that regression coefficients are not zero, i.e. all these three independent indicators affect the localisation of social facilities.

TABLE 2.2

RESULTS FROM STEPWISE REGRESSION ANALYSIS

Variables	Regression coefficient	Standard error (S.E.)	t value	R ²	Increase in R ²	R ⁻²	F
Step I							
X1	0.052	0.005	6.728*	0.10176	x	0.10176	45.263*
Step II							
X1	0.030	0.005	6.700*	0.1781	0.07634	0.1911	43.066*
X2	1.237	0.204	6.057*				
Step III							
X1	0.040	0.005	7.270*	0.196249	0.0181	0.1918	32.305*
X2	1.270	0.202	6.283*				
X3	-0.077	0.026	-3.007*				

Notes : *- Significant at 1% level of significance.

The stepwise regression analysis is not done beyond third step though X6 (distance from road) has significant correlation coefficient with Y (amenity score). But its contribution for increase in R^2 is negative therefore stepwise regression analysis has been done upto only third step.

From Table 7.1 and 7.2 , the following hypotheses can be accepted:-

- a. Size of villages influence the localisation of social amenities, i.e., bigger the size of village higher would be concentration of social amenities.
- b. Literacy rate influences the localisation of social amenities i.e., villages having higher literacy rate will have concentration of social amenities.
- c. The villages having high percentage of tertiary workers shall have concentration of social amenities.
- d. Transport network do influence the localisation of social amenities.

CHAPTER VIII

Conclusion:

To accelerate the pace of development in any area, field investigations should be carried out at micro level. The area under study, Najibabad Tahsil is located in tarai belt. The distribution of settlements in this area is influenced by the physiography; presence of forest belt in the northern part forcing the people to settle down in the southern part of the tahsil. With the result attractive and restrictive forces the settlements, located at 1.69 km apart on an average are randomly distributed in the economic active region adjoining with forest belt in south.

The villages in the forest belt, generally, have smaller size of population and a very low level of development. Even the villages of bigger population show a sign of backwardness, dominance of primary activities and experienced very less infrastructural facilities and social amenities.

On the whole Najibabad tahsil has 405 inhabited villages out of these two are urban centres and 402 rural villages. Najibabad town is the tahsil headquarter and block headquarter as well with the population of 42586 and Kiratpur town is a block headquarter with a population 25147 according to 1971 census. Both urban centres have higher order function to serve the rural and urban population of their hinter land.

The population size of villages decreases with the increasing distance from urban centres upto a distance of 15 km and then onward sized villages again increases. The density of population is found related positively with size of villages. Size of villages is dependent on its centrality geared by the presence of social amenities and infrastructural facilities. Therefore, the village which are the periodic, weekly or regular markets are characterised by high density of population. Smaller villages experienced rather high growth rate during 1961-71 decade in comparison to large size village though the change in size of population is large in the large-sized villages.

The distribution of social amenities is influenced by the size of villages. Large sized village show the concentration of social amenities and most of them are connected with good transport network. Small size villages deprives of social amenities, it is because these village do not provide minimum population threshold required to feed back that social amenities. In tahsil, one primary school serves 1587 rural population which seems to be rather very large population to be served by one primary school effectively to enhance the primary education.

The villages in Najibabad tahsil show their varying socio-economic and demographic characteristics with the varying distances from urban centres and transport network especially with pucca roads. The villages exposed to greater

urban influence show high sex ratio, high dependency ratio, high level of literacy, female literacy and increasing proportion of non primary workers. The intensity of urban influence diminishes with the increasing distance from urban centres, resulting into different socio-economic and demographic characteristics of the villages. The scheduled caste population seems to be evenly distributed in total so that the demand of labour in agriculture or agro based industries can be met easily. Transport network also influencing the structures of villages. Transportation not only brings the two settlements closer but also gives opportunities to people to seek employment in non primary sector. With the smooth flow of man and material the good transportation facilities increases the possibility of an optimal use of facility located in distant settlement. Good transportation facilities not only brings change in rural economy but also reduce the in migration (Burden) towards service centres.

The availability of social amenities have influenced the literacy rate, female literacy, non primary work force, ultimately making an direct or indirect impact upon socio-economic and demographic structures of rural settlements. Therefore, the future planning to accelerate the process of development government should provide the good transport facilities and social amenities to the villages.

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APPENDIX ITHE NEAREST NEIGHBOUR ANALYSIS AND ITS METHODOLOGICAL EXPLANATION

The Nearest Neighbour Analysis involves the measurement of distance from an individual point to its nearest neighbour irrespective of direction. It helps in distinguishing three kinds of basic distributions of points (settlements over an area) namely : 1. uniform; 2. random; and 3. clustered or aggregated. The problem of the Nearest Neighbour Analysis is that of finding a single index for any given pattern, running on a continuous scale, i.e. from extreme when all the points are clustered to other extreme, a situation in which all the points are distributed uniformly.

NEAREST NEIGHBOUR ANALYSIS:

Statistical analysis of the near neighbour measure, which, as the name suggests, is a straight line measurement of the distance between any settlement and its nearest neighbour in space. It was originally developed by plant ecologists P.J. Clark and F.C. Evans, to measure the patterns of incidents of different species, and subsequently applied to the study of settlements patterns. It indicates the degree to which any observed distribution of points deviates from what might be expected if the points were distributed in a random manner within the same area. A random distribution of points is defined as a set of points on a given area for which any point has had the same chance of occurring on any sub-area as any other points;

that any sub-area of specified size has had the same chance of receiving a point as any other sub-area of that size, and that the placement of each point has not been influenced by that of any other point.¹

Nearest Neighbour Analysis involves a comparison between the observed mean distance of a set of points (settlements) and the expected mean distance in a random pattern. The observed mean is expressed as the actual mean distance of all points from their nearest neighbouring point, which is;

$$r_A = \frac{\sum_{i=1}^n d_i}{N} = \frac{D}{N} \quad 4-1$$

where r_A or d_0 is the mean nearest neighbour distance as observed, d_i is the distance from the i th point to its own nearest neighbour, and n is the number of settlements (points) in the pattern, (or D is the total actual distance between point and N is the number of points). The expected mean distance is a random pattern, or r_E ; or \overline{dr}

$$r_E \text{ or } \overline{dr} = \frac{1}{\sqrt{2}} \sqrt{P} \quad 4-2$$

where p is the density of points per km or mile, which sometimes alternatively written

$$r_E = \frac{1}{\sqrt{2}} \sqrt{N/A} \quad 4-3$$

where A is the area and N is the number of settlements of the territory being examined.

1. Ibid.

The Nearest Neighbour measure R_n (sometimes designated simply R) is obtained by dividing the observed average nearest neighbour distance by the expected mean distance, i.e.

$$R = \frac{r_A}{r_E} \quad \text{or} \quad \frac{\overline{d_0}}{\overline{d_r}} \quad 4-4$$

The calculated value for R will fall somewhere on a continuous scale ranging from 0 to 2.1491. The smaller the value the more clustered the pattern. When $R = 0$ all the points (settlements) overlap, i.e. they fall at the same place. The higher the value (2.1491) the more regular or uniform the pattern with the extreme at this end of the scale indicating points distributed in an hexagonal pattern, each having six equidistant nearest neighbours. If the $r_A = r_E$ the pattern is random, and $R = 1.0$. Or if the value of R falls between ratio zero or below 1 they may be explained as approaching cluster. If the R value falls between 1 and 2.149 the settlements are approaching even or uniform distribution provided that the value r_E is significantly different from r_A otherwise the pattern should be considered as random and the difference between r_A and r_E is attributed to the chance factors only. (The limit of which at 5% and 1% level of significance 2.1491 and 1.96 respectively). Hence, if the set of observations are a sample or treated as such, the probability that the pattern could have been different from the random pattern just by chance can be established by a statistical test. The standard error (S.E.)

of the expected mean nearest neighbour distance has been found to be:

$$S.E. = \frac{0.26136}{\sqrt{N^2/A}} = \frac{0.26136}{\sqrt{N(N/A)}} \quad 4-5$$

where N is the number of points, and A is the area.

When this is related to the difference or the observed and the expected nearest neighbour mean distances, a statistic Z is derived as given below:

$$Z = \frac{rE - rA}{S.E.} = \frac{\bar{r}_E - \bar{r}_A}{S.E.} \quad 4-6$$

This has a normal distribution, and is a standard normal variate with the Z score properties of zero mean and unit standard deviation. It can thus be used to test the probability of chance occurrence, or to test the significance of the difference between rA and rE distances. The larger the values of the statistic Z , the greater the probability and that the observed patterns is non random. A very small difference will result in a Z value very close to zero. This test requires that n is at least 100. The appearance of the number of points or settlements in the denominator of the expression (4 - 6) for the Z statistic is a reminder that the standard error is reduced as 'sample' size increases. An error that can be attributed to chance when a small number of observations (settlements) is involved may be significant in a pattern with a larger number of points. Thus the larger the number of points, the greater probability that the same

differences between observed and expected mean nearest neighbour distance in a consequence of non-random factors.

Summarily the patterns of distribution of settlements on the basis of the value R may be classified as follows :

<u>R Value</u>	<u>Pattern</u>	<u>Remark</u>
0	Complete Clustering	-
0 - 1	Approaching Cluster	If Z standard normal variate is significant at 1% level of significance (*)
1	Random	-
2.1491	Approaching uniform	-
2.149	Even or uniform	If Z is significant at 5% level of significance.

For Najibabad Tehsil:

N = Number of villages = 403
 A = (Area) = 1234.7 Sq.km. (including forest area of 378.9 sq.km.)

$$r_A \text{ or } \bar{D}_0 = .719$$

$$r_E \text{ or } \bar{D}_F = \frac{1}{2\sqrt{N/A}} = 0.875$$

$$R = 0.821 \text{ (including forest area)}$$

$$R = 0.987 \text{ (excluding forest area)}$$

$$\text{standard error of } \bar{D}_F = \frac{0.26126}{\sqrt{N^2/A}} = 0.019.$$

$$Z = \frac{\bar{D}_0 - \bar{D}_F}{\bar{D}_F} = 0.527$$

Calculated Z value is less than value of t (tabulated at 1% level of significance)

hence, it can be concluded that settlements in tahsil are randomly distributed.

* The value of t at 5% and 1% level of significance are 2.58 and 1.96 respectively.

APPENDIX IISPACING OF SETTLEMENTS (MATHUR'S METHOD)

The present method assumes that the spacing is the average distance among the settlements in any given area. It was, originally, used to depict isarithmic lines patterns of linear distances among 'farm-houses' in the U.S.A. This method is somewhat different to that of the Nearest Neighbour Analysis.

In this method, the formula applied in determining average distances among settlements within a given area is as follows :-

$$D = 1.07 \sqrt{\frac{A}{N}}$$

where

A is the total area

N is the total number of settlements

D is the average distance from one settlement to another; and

1.07 is the theoretical distance between points (settlements) in hexagonal arrangement.

In Najibabad Tahsil:

D = 1.87 kms (including forest area)

D = 1.69 kms (excluding forest area)

For Kiratpur Block D = 1.23 kms

For Najibabad Block D = 1.73 (excluding forest area).

For the Correlation Tables shown in Appendix IIIIII-A , III-B, III-C, III-D, III-E, III-F, variables notations are as follows :

- X1= Population size of villages;
- X2= Growth rate;
- X3= Density of Population;
- X4= Percentage of Scheduled caste population;
- X5= Percentage of literate;
- X6= Female literacy;
- X7= Percentage of workers;
- X8= Female participation
- X9= Percentage of primary workers;
- X10=Percentage of secondary workers;
- X11= Percentage of tertiary workers;
- X12= Dependency ratio;
- X13= Sex ratio;
- X14= Average household size; and
- X15= Distance from nearest town.

APPENDIX III-A

CORRELATION MATRIX FOR THE VILLAGES OF BELOW 200 POPULATION

	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15					
X1	1.000									
X2	0.031	1.000								
X3	0.697**	-0.018	1.000							
X4	0.150	0.047	0.122	1.000						
X5	-0.125	-0.190	-0.001	-0.155	1.000					
X6	-0.373	0.133	-0.188	-0.174	-0.205*	1.000				
X7	-0.357**	0.131	-0.274**	0.015	-0.031	0.190	1.000			
X8	-0.280**	0.033	-0.202*	0.040	-0.118	0.228*	0.441**	1.000		
X9	0.478**	-0.002	0.274**	0.047	-0.163	-0.337**	-0.279**	-0.489**	1.000	
X10	-0.058	0.234*	0.008	0.111	-0.001	0.084	0.501**	0.611**	-0.404*	1.000
X11	-0.459**	-0.046	-0.274**	-0.083	0.231*	0.237*	0.156	0.024	0.829**	-0.044
	1.000									
X12	0.166	-0.130	0.150	-0.034	0.147	-0.223*	-0.594**	-0.486**	0.034	-0.242*
	0.189	1.000								
X13	0.436**	0.173	0.301**	0.097	-0.283**	0.047	-0.441**	-0.379**	0.544**	-0.229*
	-0.439**	0.152	1.000							
X14	0.230*	-0.036	0.186	-0.018	0.058	-0.185	-0.433**	-0.239*	0.370**	0.129
	-0.330**	0.247*	0.360**	1.000						
X15	-0.018	-0.062	-0.160	0.027	-0.163	-0.113	0.009	-0.051	0.309**	-0.205*
	-0.289**	-0.084	0.122	0.020	1.000					

Note: *- significant at 5% level of significance; ** - significant at 1% level of significance

APPENDIX III-B

CORRELATION MATRIX FOR THE VILLAGES HAVING A POPULATION OF 200-499

	1	2	3	4	5	6	7	8	9	10	11
	12	13	14	15							
X1	1.000										
X2	0.126	1.000									
X3	0.809*	0.066	1.000								
X4	-0.006	-0.217**	0.214**	1.000							
X5	-0.062	-0.040	0.008	0.035	1.000						
X6	-0.111	0.086	0.042	0.158	0.318**	1.000					
X7	0.007	0.099	-0.157	-0.040	-0.148	-0.177*	1.000				
X8	-0.017	0.067	-0.031	0.001	-0.071	-0.136	0.174*	1.000			
X9	-0.026	-0.164*	-0.246**	-0.024	-0.533**	-0.248**	-0.060	-0.025	1.000		
X10	-0.021	0.189	0.200*	0.049	0.084**	0.144	0.071	0.023	-0.864**	1.000	
X11	0.050	0.045	0.218**	-0.006	0.339**	0.288**	0.091	0.028	-0.670***	0.225**	1.000
X12	0.133 1.000	-0.089	0.136	0.115	0.030	0.063	-0.555**	0.210*	0.060	-0.112	0.0333
X13	0.005 0.194*	0.114 1.000	-0.069	-0.009	-0.107	0.188*	-0.310**	-0.061	0.124	-0.117	-0.072
X14	0.034 0.112	-0.047 0.226**	-0.020 1.000	-0.045	-0.156	-0.075	-0.144	-0.078	0.094	-0.064	-0.077
X15	0.083 -0.113	0.095 -0.149	-0.320** -0.037	-0.224** 1.000	-0.244**	-0.296**	0.187*	-0.067	0.329**	-0.265**	-0.251*

Note: * = significant at 5% level of significance; ** = significant at 1% level of significance.

APPENDIX III-C

CORRELATION MATRIX FOR THE VILLAGES HAVING POPULATION 500-999

	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15					
X1	1.000									
X2	-0.036	1.000								
X3	0.299**	-0.117	1.000							
X4	-0.224*	0.093	-0.222*	1.000						
X5	0.074	0.001	0.106	0.068	1.000					
X6	0.035	0.024	0.070	-0.154	0.513**	1.000				
X7	0.103	-0.277**	0.033	0.006	-0.165	0.087	1.000			
X8	0.067	-0.128	0.006	0.091	-0.041	-0.977	0.232**	1.000		
X9	-0.244**	0.041	-0.201*	0.194*	-0.443**	-0.118	0.150	-0.150	1.000	
X10	0.196*	0.025	0.105	-0.205*	0.003	-0.091	0.071	0.175	-0.634**	1.000
X11	0.150 1.000	-0.069	0.178*	-0.081	0.575**	0.229*	-0.134	0.059	-0.766**	-0.008
X12	-0.062 0.047	0.212* 1.000	0.014	-0.014	0.085	-0.072	-0.822**	-0.194*	-0.032	-0.011
X13	0.063 -0.077	0.109 0.154	0.073 1.000	-0.151	-0.243**	-0.331*	-0.220*	0.013	-0.015	0.135
X14	-0.077 -0.113	0.056 -0.075	-0.053 0.084	-0.039 1.000	-0.118	-0.124	0.043	-0.146	0.078	0.020
X15	0.052 -0.124	0.000 -0.102	-0.128 -0.014	-0.086 0.005	-0.204 1.000	0.021	0.085	0.012	0.000	0.159

Note: * - Significant at 5% level of significance; ** - significant at 1% level of significance.

APPENDIX III-D

CORRELATION MATRIX FOR THE VILLAGE HAVING A POPULATION 1000-1999.

	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15					
X1	1.000									
X2	0.221	1.000								
X3	0.338*	0.040	1.000							
X4	-0.200	0.092	-0.273	1.000						
X5	0.228	-0.253	0.317	-0.040	1.000					
X6	-0.190	0.087	-0.445**	0.090	-0.619**	1.000				
X7	0.256	0.048	-0.004	0.099	-0.044	0.126	1.000			
X8	-0.431**	0.143	-0.073	0.017	-0.046	0.227	-0.422*	1.000		
X9	0.025	0.062	-0.615**	0.296	-0.538**	0.681**	0.227	-0.060	1.000	
X10	0.018	-0.000	0.627**	-0.271	0.554**	-0.608**	-0.048	-0.020	-0.867**	1.000
X11	-0.139 1.000	0.268*	0.268	-0.189	0.194	-0.305	-0.197	0.097	-0.614**	0.587**
X12	0.145* 0.349*	0.205 1.000	0.523**	-0.389*	0.463**	-0.413*	-0.440**	0.233*	-0.672**	0.536**
X13	0.154 0.251	0.065 0.365*	0.331* 1.000	0.017	-0.023	-0.340*	-0.213	-0.123	-0.142	0.270
X14	-0.058 -0.063	0.080 0.053	0.084 -0.188	-0.316 1.000	-0.056	0.128	0.33**	-0.051	0.013	0.030
X15	-0.045 -0.149	0.111 -0.247*	-0.341* -0.167	0.138 0.326	-0.196 1.000	0.231	0.520**	-0.152	0.265	-0.241

Note: * - significant at 5% level of significance; ** - significant at 1% level of significance.

APPENDIX III-E

CORRELATION MATRIX FOR THE VILLAGES HAVING A POPULATION ABOVE 2000

	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15					
X1	1.000									
X2	-0.076	1.000								
X3	0.614*	-0.227	1.000							
X4	-0.354	-0.557	-0.141	1.000						
X5	0.144	-0.520	0.300	-0.081	1.000					
X6	0.009	0.249	-0.056	0.047	-0.715*	1.000				
X7	-0.079	0.432	-0.263	0.138	-0.185	0.099	1.000			
X8	-0.095	-0.169	-0.080	-0.248	0.351	0.079	-0.240	1.000		
X9	-0.239	0.516	-0.178	0.153	-0.556	0.365	0.664*	0.067	1.000	
X10	0.236	-0.491	0.071	0.023	0.266	-0.030	-0.608*	0.200	-0.820**	1.000
X11	0.164 1.000	-0.373	0.220	-0.265	0.647*	-0.561	-0.499	-0.083	-0.843**	0.383
X12	0.002 0.436	-0.449 1.000	0.222	-0.056	0.089	-0.048	-0.979**	0.163	-0.634*	0.625*
X13	0.085 0.265	-0.039 0.641*	0.307 1.000	-0.122	-0.195	0.117	-0.642*	-0.302	-0.221	0.096
X14	0.349 -0.431	0.759** -0.236	0.254 0.065	-0.611* 1.000	-0.395	0.341	0.163	0.123	0.490	-0.386
X15	-0.604* -0.395	0.618* -0.585	-0.701* 0.475	-0.054 0.180	-0.217 1.000	-0.148	0.596	0.028	0.560	-0.541

Note: *- Significant at 5% level of significance; **- Significant at 1% level of significance.
Variable notations as given in Appendix III-A.

APPENDIX IV-A

CORRELATION MATRIX FOR THE VILLAGES LOCATED AT A DISTANCE UPTO 3 KMS
FROM TOWNS

	1 10	2 11	3 12	4 13	5 14	6 15	7	8	9
X ₁	1.000								
X ₂	-0.072	1.000							
X ₃	0.651**	0.006	1.000						
X ₄	-0.062	-0.053	-0.058	1.000					
X ₅	-0.049	-0.121	0.001	0.011	1.000				
X ₆	-0.083	0.183	-0.044	-0.082	-0.107	1.000			
X ₇	-0.097	0.167	-0.403**	0.110	-0.184	0.308 ^o	1.000		
X ₈	-0.087	0.177	-0.175	0.083	-0.134	0.211	0.883**	1.000	
X ₉	0.042	-0.096	-0.019	0.169	-0.227	-0.464**	-0.412**	-0.430**	1.000
X ₁₀	0.005 1.000	0.357**	0.051	0.109	0.220	0.213	0.013	0.683**	-0.499**
X ₁₁	0.053 -0.124	-0.139 1.000	-0.017	-0.270*	0.104	0.386**	0.049	0.019	-0.798**
X ₁₂	0.005 -0.431**	-0.141 0.196	0.059 1.000	-0.235	0.060	-0.063	-0.762**	-0.523**	0.091

Contd.../-

APPENDIX IV-A (Contd.)

	1 10	2 11	3 12	4 13	5 14	6 15	7	8	9
X ₁₃	0.191	-0.020	0.391**	-0.002	0.079	-0.341*	-0.702**	0.650**	0.661**
	-0.446**	-0.543**	0.280*	1.000					
X ₁₄	0.181	-0.023	0.237**	-0.118	0.151	-0.543**	-0.499**	0.389**	0.571**
	-0.265*	-0.472**	0.242	0.570**	1.000				
X ₁₅	0.102	0.182	-0.088	0.120	0.215	-0.101	-0.110	-0.050	0.270*
	0.057	-0.346	0.073	0.179	0.280*	1.000			

Note: *- significant of 5% level of significance; ** - significant at 1% level of significance.

X₁ = population size of villages; X₂, growth rate; X₃ = density of population; X₄ = percentage of scheduled caste population; X₅ = percentage of literate; X₆ = female literacy; X₇ = percentage of workers; X₈ = female participation; X₉ = percentage of primary workers; X₁₀ = percentage secondary workers; X₁₁ = percentage of tertiary workers; X₁₂ = dependency ratio; X₁₃ = sex ratio; X₁₄ = average of household size; X₁₅ = distance from nearest town.

APPENDIX IV-B

CORRELATION MATRIX FOR THE VILLAGES LOCATED AT A DISTANCE
OF 4-7 KMS FROM TOWNS

	1 10	2 11	3 12	4 13	5 14	6 15	7	8	9
X1	1.000								
X2	-0.042	1.000							
X3	0.571	-0.019	1.000						
X4	-0.056	-0.093	-0.044	1.000					
X5	-0.149	-0.025	-0.004	-0.057	1.000				
X6	-0.122	-0.037	-0.090	-0.148	-0.018	1.000			
X7	-0.165	0.072	-0.188	-0.131	-0.239*	0.438**	1.000		
X8	-0.001	0.290**	-0.033	0.162	-0.075	0.186	0.154	1.000	
X9	0.010	-0.142	0.028	0.029	-0.486**	-0.293**	-0.295**	-0.002	1.000
X10	0.115 1.000	0.159	0.087	0.050	0.145	-0.83	0.008	0.214**	-0.412**
X11	-0.066 -0.024	0.079 1.000	-0.070	-0.058	0.467**	0.362**	0.319**	0.098	-0.901**
X12	0.123 -0.020	-0.100 0.026	0.142 1.000	0.106*	0.238**	-0.292**	-0.037**	-0.248**	-0.013

Contd.../-

TABLE IV-B (Contd.)

	1 10	2 11	3 12	4 13	5 14	6 15	7	8	9
X13	0.220* 0.185	0.108 -0.528**	0.157 -0.197	0.193* 1.000	-0.356**	-0.001	-0.100	0.202*	0.390**
X14	0.048 0.202*	0.004 -0.013	-0.047 -0.215*	0.117 0.196	-0.085 0.166	-0.085 1.000	-0.092	-0.209*	-0.089
X15	-0.028 -0.048	0.071 -0.131	-0.180 0.112	-0.180 0.128	-0.011 -0.147	-0.087 0.031	-0.247** 1.000	-0.071	-0.006

Note: * - significant of 5% level of significance; ** - significant at 1% level of significance.

X1= population size of villages; X2 growth rate; X3= density of population; X4= percentage of scheduled caste population; X5 = percentage of literate; X6= female literacy; X7- percentage of workers; X8= female participation; X9= percentage of primary workers; X10= percentage secondary workers; X11= percentage of tertiary workers; X12= dependency ratio; X13= sex ratio; X14= average of household size; X15= distance from nearest town.

APPENDIX IV-C

CORRELATION MATRIX IN THE VILLAGES LOCATED AT A DISTANCE 8 TO 15 KMS FROM TOWNS

	1 10	2 11	3 12	4 13	5 14	6 15	7	8	9
X1	1.000								
X2	-0.083	1.000							
X3	0.638**	-0.111	1.000						
X4	-0.086	-0.042	-0.085	1.000					
X5	0.055	-0.056	-0.048	-0.087	1.000				
X6	0.126	-0.025	0.082	-0.250**	0.100	1.000			
X7	-0.027	-0.118	-0.026	0.137	0.116	-0.258**	1.000		
X8	-0.126	0.263**	-0.136	-0.021	-0.141	0.369**	-0.246**	1.000	
X9	-0.176*	0.193**	-0.133	0.077	-0.027	-0.277**	0.264**	0.517**	1.000
X10	0.119 1.000	0.039	0.170*	-0.074	0.030	-0.006	-0.084	-0.029	-0.668**
X11	0.283** 0.171*	-0.125 1.000	0.179*	-0.037	0.072	0.054	0.046	0.065	-0.454**
X12	0.041 0.040	0.279** -0.023	0.057 1.000	-0.130	-0.007	-0.145*	-0.388**	-0.429**	0.166*
X13	0.141 0.145*	0.277* 0.080	0.092 0.252	-0.027 1.000	-0.235**	0.130	-0.101	-0.209**	0.059

Contd..../-

APPENDIX IV-G (contd.)

	1	2	3	4	5	6	7	8	9
	10	11	12	13	14	15			
X14	0.111 0.046	0.077 0.046	0.137 0.168	-0.169* 0.099	-0.106 1.000	-0.052	-0.166*	-0.154*	-0.003
X15	0.122 0.004	-0.103 0.021	0.020 -0.166	0.045 -0.061	0.181* 0.055	0.043 1.000	-0.040	0.134	-0.109

Note: *- significant at 5% level of significance; **- significant at 1% level significance.

X1= Population size of villages; X2= growth rate; X3= density of population
 X4= percentage of scheduled caste population; X5= percentage of literate; X6= female literacy; X7=percentage of workers; X8= female participation; X9= percentage of primary workers; X10= percentage secondary workers; X11= percentage of tertiary workers; X12= dependency ratio, X13= sex ration; X14 = average household size; X15= distance from nearest town.

APPENDIX IV-E

CORRELATION MATRIX IN THE VILLAGES LOCATED AT A DISTANCE OF MORE THAN
15 KMS FROM TONS

	1 10	2 11	3 12	4 13	5 14	6 15	7	8	9
X1	1.000								
X2	-0.082	1.000							
X3	0.388**	-0.154	1.000						
X4	0.075	-0.199	0.264	1.000					
X5	0.058	-0.270	0.097	0.101	1.000				
X6	-0.015	-0.219	-0.075	-0.068	0.048	1.000			
X7	-0.144	-0.066	-0.098	-0.261	0.099	0.141	1.000		
X8	0.060	0.062	0.107	0.122	0.001	-0.181	-0.044	1.000	
X9	-0.440**	0.274	-0.457**	-0.058	0.152	0.096	0.042	-0.053	1.000
X10	0.286* 1.000	-0.172	0.436**	0.076	0.110	-0.037	-0.201	0.102	-0.253**
X11	0.443** 0.379**	-0.215 1.000	0.295*	-0.013	0.143	-0.125	0.160	-0.009	-0.304**
X12	0.098 0.198	-0.177 0.367**	0.203 1.000	0.132	0.129	-0.219	-0.251	-0.029	-0.336*
X13	0.143 0.165	0.192 -0.122	0.142 0.199	-0.035 1.000	-0.442**	0.061	-0.579**	0.199	-0.044
X14	0.185 0.149	-0.010 -0.147	0.330* -0.014	0.027 0.422**	-0.098 1.000	0.021	-0.224	0.238	-0.017
X15	0.033 -0.211	0.174 -0.045	-0.224 -0.174	-0.315* 0.012	-0.253 -0.118	-0.186 1.000	0.163	-0.040	0.169

Subscription are as given as in previous table.