EVOLUTION OF SETTLEMENT PATTERNS AND SYSTEM IN JAIPUR DISTRICT, RAJASTHAN

DISSERTTION
SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

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IN
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BY
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Under the Supervision of
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ALIGARH (INDIA)
1995
CERTIFICATE

This is to certify that Mr. Izhar Ahmad has completed his M.Phil dissertation entitled "Evolution of Settlement Patterns and System in Jaipur district" Rajasthan under my supervision and guidance.

(Dr. Ateeque Ahmad)
DEDICATED

TO MY

FAMILY
ACKNOWLEDGEMENT

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(IZHAR AHMAD)
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INTRODUCTION

The present study on evolution of settlement patterns and system in Jaipur district shows that evolution of settlement and its growth in an area is outcome of, interplay of prevailing socio-economic, physio-cultural and techno-organizational factors in temporal and spatial aspect during the process of growth many more changes are found due to coming of different racial stock in the region and putting their imprints on physical land scape of the region in accordance with their cultural norms of society.

The scientific study of settlement geography began in Germany with Ritter's work whose theme of man-land interdependence provided base for the study of subject in early nineteenth century. Later, Kohl, Richthofen, Ratzel, Meitzen, Grandman, Christallar and Nitz in Germany, Blache, Brunches, Demogeon and Blanchard in France, Bowman Hall Kohn, Jordan and Hudson in U.S.A. Aurousseau in Austria, Houston, Chisolm and Hagget in Britain, Ahmad E., Singh and Mukharjee in India.

In India settlement studies get adequate attention only during 1960-70, R.L. Singh initiated a number of studies of rural settlement in Ganga valley, his work analysed the evolution of rural settlement in middle Ganga valley.
Theoretically the settlement pattern is based on their individual physical forms, spatial distribution and functional organization evolved through temporal succession in Geographical perspective. The spatial pattern of settlements depicts growth and density values of each individual settlement and explain their locational and inter-distance relationship over geometric space. The measurement of spatial pattern of settlement distribution in Jaipur district determined by computing the value of "Nearest Neighbour Index " (N - N Index). The other method of pattern analysis is the classical approach, traced from the toposheet of India with R:F 1:50,000.

To examine the spatial distribution in terms of spacing, degree of disperson, and concentration - quantitative techniques are used as follows:

i. \[ D = 1.0746 \frac{\sqrt{A}}{N} \]

\( D \) = Theoretical distance between points or settlements in hexagonal arrangement.

\( A \) = Area, and

\( N \) = Number of Settlements per unit area

ii. \[ RN = \frac{\theta}{E} \quad E = \frac{\sqrt{d}}{2} \]

\( RN \) = 0/ \( E \)

\( E = \frac{\sqrt{d}}{2} \)

\( = 2 \frac{0}{d} \)
If the value of \( r_E \) is greater than \( V \), then the distribution is termed as regular, when the value of \( V \) is greater than \( r_E \), it is termed clustered and term random is applied to a case when \( V \) and \( r_E \) are equal, i.e. variance – mean ratio is one. In the present study, the value of \( r_E \) is always more than \( V \), thus representing a regular rather than random pattern.

The deviation index of nearest neighbour has also been tested with use of normalizing index of random disturbances whose intensity has been measured by using following mathematical formula:

\[
D_i = \frac{r_o}{(1.0750 / \sqrt{d})}
\]

Values of \( D_i \) indicating clear tendency towards regularity.

The entire study has been divided into six chapters:

Chapter - I deals with General, Physical and Cultural setting of the region with emphasis on location Physiography, Geological structure, Drainage and Water Resources, Climate, Soils, Natural Vegetation, Transport and Communication, Landuse, Industry, Cropping Pattern and Demography of the study area.
Chapter - II deals with the Meaning, Definition, Scope, Significance and approaches of Settlement Study.

Chapter - III deals with the work review done so far.

Chapter - IV Analysis Spatial Distribution of Rural Settlements through various quantilative techniques.

Chapter - V Analysis the pattern of Settlements through classical approach.

Chapter VI deals with theoretical aspect of system analysis in Geography as well as urban studies, further system analysis of study area is proposed Ph.D Plan.

Bibliography.

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CHAPTER - I

GENERAL, PHYSICAL AND CULTURAL SETTING OF THE REGION

Location:

The district is situated in eastern part of Rajasthan and lies between 26°23' and 27°51' North, and between 74°55' 76°50' East longitudes. It is bounded on north by Sikar district of Rajasthan and Mahendragarh district of Haryana on south by tonk district, on the east by Alwar and Sawai Madhopur district and on the west by Nagaur and Ajmer districts.

In 1991 the area of the district was 14068.09 sq. kms. The district cover 4.11 per cent of total area of State and stands 9th in rank in area among the districts of State. Its population according to 1991 census 4,722,551, 2,496,799 males and 2,225,752 females. Urban population was 1,866,639, males 996,604 and 870,035 females. The territory now known as Jaipur district used to be part of the former Jaipur State. On the merger of Jaipur State into United States of Greater Rajasthan in 1949, a separate district of Jaipur was formed. The district then formed also included former Kishangarh State. At the time of reorganization of States in 1956 the Kishangarh area of district was transferred to Ajmer district. In the district, there are
DISTRICT JAIPUR
PANCHAYAT SAMITIES
IN DISTRICT

--- BOUNDARY ---
.. STATE ..
" " DISTRICT
" " TAHSIL
" " P. S.

FIG. 1.2
five sub-divisions namely Jaipur, Dausa, Kotputli, Sambhar and Amber and seventeen tahsils as well as 17 panchayat simities.

**Physiography:**

The district Jaipur has a roughly elliptical shape, broadest at centre and tapering towards east and west with a narrow area extending north wards. Jaipur district belongs to the northern part of the east Rajasthan up and has a checkered mosaic of rugged mountineous terrains, up lands, basins and dune fields. The capital city of Jaipur, located more or less centrally, is situated in a valley on the northern limit of Alwar hills of north Aravalli mountain system. The southern part of district belongs to south-Jaipur uplands, while North Eastern part is rugged and mountineous. The -sambhar salt lake basin and an extensive dune field to its north occupy western parts of the district. Major physiographic features of the district are given below.

**Hills :** The hills of district are the member of the North Aravalli ranges. The ranges on North-Eastern side belongs to the Alwar hills while those in the east belongs to lalsot hills. Besides, there are a few Inslebergs near Bichun, Naila etc. The main peak in the district are Jaigarh
(648 mts.), Nahargarh (599 mts.) Barwara (786 mts.), Monoharpura (747 mts.), Bilali (775 m) and Bichun (656 m).

Plateaux and Plains: The southern parts of district belong to South-Jaipur upland varying in height from 360 meters to 450 meters above mean sea level and Northern part belongs to North-Jaipur upland varying in height from 450 meters to 600 meters above mean sea level. There are broadly three plains in district, varying in height from 150 meters to 200 meters above mean sea level, formed by Banganga river in the East and Dhund and Bandi both tributaries to the Banas in the Southern part.

The general direction of drainage is towards southern part of district, towards east in the eastern part of district and towards north-east in northern part of district.

Desert: The district has a semi-arid climate with an average rainfall of about 55.64 cm per year and does not include any desert terrain in strict sense the area witnessed phases of move arid climate in the past as evidenced by occurrence of successive layers of obstacle dunes in the south-western flanks of hill slopes. An extensive dune field covers the western parts of district in the Sambhar Jobner-Renwal-Ramgarh tracts.
Sand dunes are present along the border of Sikar district and about 0.25 per cent of area in Dausa tahsil in Jaipur district.

As strong winds blow from westerly and south-westerly direction, the sand movement may take place towards east or north-east directions, particularly during months from March to June.

The wind blows sands have given rise to different types of land form in the area. On the western side they form a rugged topography of dunes and inter dunes. In the south facing the hill slopes, they form obstacle dunes. In the vast areas, particularly near the river basins, they form undulating topography and also form linear dunes on the eastern side of the rivers. The wind blown sands are generally susceptible to gully erosion and are responsible for bad land topography in many places.

The sandy tracts and the marginal lands of these desert terrain have been cultivated or overgrazed thereby resulting in soil erosion and shifting of sand from this terrain to adjacent fertile lands the hills prevents the movements of sand particle and therefore, deposition of sand is a regular feature near foot-hills particularly during summer season.
Geological Structure:

Large parts of district covered by a thick mantle of soil, blows sand and alluvium. The area to the east and north of Jaipur is occupied by hill ranges over 200 meters above surrounding plain. The district is drained by a number of ephemeral streams of which Banganga and Sabi are important ones. Large area of district have been affected by sand encroachment through wind gaps and river valleys.

The oldest rock in the district are schists, gneisses, migmatites, quartzites and conglomerates of pre-Delhi formation. These rocks are mostly covered by mantle of sand and alluvium of recent to sub-recent age. Over lying these rocks with a major unconformity are the rocks of Delhi super group, which is made up of Raialo, Alwar and Ajabgarh groups. The Rocks of Raialo group comprise mainly dolomitic marble and minor quartzites the Alwar group consists of quartzite, Mica, schists and conglomerates, which either lie unconformably over the Raialo or directly over metamorphites of pre-Delhi formation. The Ajabgarh group is mainly made up of Schists, phyllites, marble and quartzite.
Drainage and Water Resources:

**Banas:** The Banas, principal river of Udaipur, which rises in Aravalli hills flows for 160 kms. near border of Jaipur region. It has number of tributaries such as the Dan, the Mashi, The Dhil, The Galwa and the Morel.

**Banganga:** The Banganga is about 164 kms. a river of Jaipur region, flowing first in south-easterly direction and then almost due east. The Banganga river originates in the hills of Bairath tehsil. It is non-perennial river. It passes through Ramgarh, Dausa tahsil, Baswa tahsil and then it enters Bharatpur district.

**Bandi:** The Bandi river a tributary Mashi originates from hills near Samod near Jaipur district. It posses through Phulera and Phagi tahsil before entering Tonk district.

**Mashi:** The Mashi River, a tributary of Banas originates from Ajmer district. Before entering in Tonk district, it transverses through Phagi tahsil.

**Morel:** Main tributary of Morel river is Dhund. It transverses the Chaksu tahsil before going Morel river near village Hingonia the Morel originates in Dausa tahsil and is a tributary of river Banas. It enters in Sawai Madhopur district.
Sabi: The Sabi river originates in Neem-ka-Thana tahsil. It enters Jaipur district in Viratnagar tahsil. After transversing in North-eastern direction, it leaves Jaipur district from Kotputli tahsil and goes to Alwar district. Other smaller rivers of note are Kantli or Katti and Mandha.

Lakes and Tanks: Jaipur district has only one natural lake which is at Sambhar in Phulera tahsil with an area of about 145 sq. kms. and is famous as one of the largest source of salt in the country. However, the district has a total of 116 tanks both big and small. Water from bigger tanks are used for irrigation and drinking purpose whereas small tanks serve only as a source of irrigation. Some of the bigger and important tanks maintained by State irrigation department are Jamwa Ramgarh, Hingonia, Chaparwara Chitoli, Madho Sagar, Kalakh Sagar, Sainthal, Kalakh Bachara, Masali Gudi Bund and Khesi.

Underground Water Resources: On the basis of finding of semi-detailed hydrological survey by ground water department, the available ground water exploitable potential of Jaipur district has been worked out to about 286.59 million cubic meters. This ground water in the district is mainly influenced by basin of Sabi and Bandi river where the greater part is underlain by ground and pebbles. The general depth of water below ground surface
varies from less than 5 meters to 25 meters. Here high yielding tube wells and feasible. These tube wells have mainly been successful with discharge generally varying from 5000 gallons/hour to 26000 gallons/hour. Around Jaipur city, the yield of wells and between 26000 and 100,000 l pm. There is no spring or spring head in Jaipur district.

**Climate:** The district has a dry climate except during south-west monsoon season. December to February is cold season after which the hot season commences and continue till about the third week of June when south-west monsoon sets in. The south-west monsoon season is comparatively short in this region and lasts only till mid-September. The period from second half of September to end of November is post monsoon or retreating monsoon season.

**Rainfall:** Records of Rainfall available for sixteen station in the district for periods ranging from 25 to 80 years the average annual rainfall in the district is 55.64 cm. The rainfall generally increases from North-West to South-East. But in Amber-Jaipur region the rainfall is a little higher than surrounding parts of the district. The rainfall during period June to September constitutes nearly 90 per cent of annual rainfall. The variation of annual rainfall from year to year is very large. In fifty year period from 1901 to 1950 the highest annual rainfall which amounted to 227 per cent of the normal occurred in 1917. The lowest
amount of rainfall in fifty year period was only 24 per cent of the normal which occurred in 1985. The rainfall was less than 80 per cent of the normal in 12 years out of which three years (1937 to 1939) were consecutive. But at some stations consecutive years (even upto five years) of occasions. The period 1937 to 1941 was generally low rainfall in the whole district although in varying degree in different parts.

On an average there are 32 rainy days (days with rain of 2.5 mm or more) in a year. This number varies from 28 at Mozamabad to 36 at Baswa and Amber. The highest recorded rainfall in 24 hours at any station in the district was 42.49 cm at Dausa on September 10th, 1924.

Temperature: The only meteorological observatory in the district is located in Jaipur city. The data of thus station may be taken as representing the weather conditions in the district as a whole the period from March to June is one of the continuous rise in temperature, May and first half of June being hottest parts of year. The mean daily maximum temperature in May is $40.6^\circ C$ and mean daily maximum is $25.8^\circ C$. The night temperature in June is a little higher than in May. In May and June maximum temperature may sometimes go upto $48.0^\circ C$. The setting in of the south-west monsoon after the middle of June lowers the temperature somewhat but the relief from heat is not marked because of
added discomfort from increase in humidity, brought in by south-west monsoon air. After the withdrawal of monsoons by mid-September, days become hotter and in October a secondary maximum in day temperature is recorded. The nights become progressively cooler. After mid-November both day and night temperature drop rapidly till January which is the coldest month with mean daily maximum temperature at 22.0°C and mean daily minimum at 8.3°C. In the association with cold waves which sometimes affect the district in the wake of western disturbances passing across north India during the cold season, minimum temperature, particularly in January and February may go down to a degree or two below freezing point of water. The highest maximum-temperature recorded at Jaipur was 47.8°C on May 25, 1932 and lowest minimum temperature was 2.2°C on two consecutive days in 1905 January 31 and February 1st.

**Humidity:** During south-west monsoon relative humidity is generally over 60 per cent. In rest of the year the air is dry. In the summer season which is also the driest part of the year afternoon humidity may low as 15 to 20 per cent.

**Cloudiness:** During south-west monsoon season skies are moderately to heavy clouded generally and over caste on some days. In the rest of the year clear or lightly clouded
skies prevail. But on a few day in winter season skies become cloudy when the district is affected by western disturbances.

**Winds:** Winds are generally light to moderate, but in summer and early south-west monsoon season, winds may strengthen on some days westerly or south-westerly winds prevail in south-west monsoon season. In the post monsoon and winter months winds are mostly from direction between West and North. In summer season the winds blow from direction South-West and North-West.

**Special Weather Phenomenon:** During the South-West monsoon season, the district is sometimes affected by depressions which originate in Bay of Bengal and move across central parts of country, covering wide spread heavy rainfall. Thunder storm occur practically in all months of year, but they are more frequent during period between May to September along with thunder storm, hail may also occur occasionally in the month from March to May. In the hot season dust storm also occur.

**Soils:** Soils of Jaipur district are alluvial in Nature. Geologically these have been derived from older alluvium of recent and sub-recent origin. Northern and north-western parts of district have deep to very deep soils which are yellowish-brown to dark-brown in colour. Their course texture ranges from fine sand to loamy fine sand and they
are well drained to excessive drained. On the other hand, the soils of the central, southern and eastern parts of the district are comparatively finer in texture.

On the basis of sub-soil characteristics, the soil of district have been classified into seven soil associations described as follows:

**Chomu Dune Association:** This category of soil is technically classified as very deep dominantly coarse textured (loamy sand to loamy fine sand), generally light yellowish-brown to dark yellowish-brown in colour. These soil have low fertility and most of the areas with these soil is unirrigated. Consequently rainfed Kharif crop like Bajra, Guar, Moth, Moong and Chanwla etc. are grown in most of the area. However, under irrigated conditions, Rabi crops of Barley, Wheat and gram are grown. Vegetables like cabbage, cauliflower, chillies, tomatoes, brinjals, lady's finger and cucurbits are also found to soil this category of soils.

**Basri Rajori Association:** These soils are very deep, dominantly medium textured (sandy loam to loam) yellowish-brown to dark-brown in colour. There are suited to almost all the climatically adopted crops of the region.

**Naraina – Dudu Association:** These soils are technically classified as very deep to shallow, medium in texture
(Sandy loam to loam) grey to dark greyish-brown in colour. Depth erosion and salinity alkalinity are the principal limitations of these soils. Growing of deep rooted crops and orchards may be avoided.

**Chandrana-Padasoli Association:** The area classified under this association is found to be having moderately deep to very deep soils dominantly fine treatment (clay loam to clay) and brown to very dark greyish-brown in colour. These are generally suited to all type of crops grown in the region, though very deep rooted crops and orchard do not find these soil as very favourable to their growth.

**Chandrana Bandikui Association:** Soil clubbed under this association are very deep and dominantly fine textured (clay loam to clay). These are yellowish-brown to dark greyish-brown in colour and found suited to the cultivation of all the adopted species of the region.

**Rajori-Chaksu Association:** Deep to very deep dominantly medium textured (sandy loam to loam) soils of this region are yellowish-brown to reddish-brown or weak red in colour. These are found to suit the growth of all the climatically adopted crop and vegetable of the area.

**Padasoli-Phagi Association:** This association contains soils which are moderately deep to very deep, dominantly fine
textured (clay loam to clay) and dark brown to dark olive grey in colour. The area predominantly is rainfed and dry farming is very commonly restored for the cultivation of Kharif crops like Bajra, Jowar, maize, Guar and Til. Rabi crops like Wheat, Barley, Gram and Mustard also grown.

**Natural Vegetation:** About 2 per cent of total classified area was under forests in the district in 1960-61. Subsidiary edaphic type of dry tropical forests and found in the district where the Dhokra (Anogeissus pendula) is most common free. Other species found are Babul (Accacia arabiea), Khejri (Prosopis spicigra) Dhak (Butea monosperma), pipal (Ficus religiosa), Barh (Fieus bengalensis), Khair (Acacia catechu), Jamun (Syzygium cumini), Shisham (dalbergia Sissoo) and Siris (Albizzialebbek). The forest area in the district is categorised as reserved, protected and unclassified.

The area under forest in Jaipur district in year 1976-77 was about 62 thousands hectares, which came to 4.42 per cent of total area of the district. The timber obtained from the forest of the district is utilized for the manufacturing of agricultural implements. Besides, it is used for the roofing as well as for the fuel purposes. Forest belts are found in Ramgarh, Bairath and Kotputli areas on the side of the roads and mainly in Shekhawati and Torawati border hills. Grass birs which supply good fodder
Grasses are found in arid plains in Jaipur, Bairath and Lalsot areas. Amerbel, Chirmi, Malkangori and Neemgiloy are some of the climbers found in Jaipur district. While undergrowth consists generally of AK, Berjhasi, Khimp, Lagru and Khansama.

**Cultural Setting:**

**Land Use:** The soil of the district is by and large sandy but these are certain areas towards the east and southern parts of district where the soil is for the most part is either black or rich alluvial soil the total geographical area of district is 1,396,917 hectares where as total reporting areas for land utilization purposes was 1,399,069 hectares for 1988-89. The land use pattern in the Jaipur district is as follows:

**TABLE - 1.1**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Land Use</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Forest</td>
<td>70,702</td>
</tr>
<tr>
<td>2.</td>
<td>Area under non-agricultural use</td>
<td>85,040</td>
</tr>
<tr>
<td>3.</td>
<td>Barren and un-cultivable land</td>
<td>97,364</td>
</tr>
<tr>
<td>4.</td>
<td>Other un-cultivable land</td>
<td>108,334</td>
</tr>
<tr>
<td>5.</td>
<td>Cultivable waste land</td>
<td>64,210</td>
</tr>
<tr>
<td>6.</td>
<td>Fellow land</td>
<td>148,665</td>
</tr>
<tr>
<td>7.</td>
<td>Net sown area</td>
<td>824,754</td>
</tr>
<tr>
<td></td>
<td><strong>Total Area</strong></td>
<td><strong>1,399,069</strong></td>
</tr>
</tbody>
</table>
Irrigation: The district is generally non-drought prone but there are large number of wells and irrigation facilities. Even though majority of farmers have these facilities yet they are largely dependent on monsoon for successful crop. If sufficient monsoon does not occur then total production of crop reduces substantially. The next main source of irrigation is wells. The area irrigated by wells and tube wells in district is 348,480 hectares followed by canals 2399 hectares, Tanks irrigate 571 hectare and other sources put together contribute 369 hectares the total net irrigated area in 1989 comes upto 351,819 hectares.

All the food crops except sugarcane, account 329922 hectares under irrigation. Besides thus 136 hectares area of sugarcane and 169 hectares of cotton was irrigated. The total gross irrigated area in 1989 was 414770 hectares. Minor irrigation scheme were developed to some extent.

Cropping Pattern: The main crop of the district is the Rabi crop grown in the month of October and harvested in March. The crop consists of grains like Wheat, Barley and Gram. Wheat is sown on irrigated and non-irrigated land. Barley replaces wheat on unirrigation lands when soil is light, irrigation water is scanty or its mineral content is high. When the monsoon are scanty then the area cultivated by barley increases. In the case of Gram generally irrigation
## TABLE - 1.2

<table>
<thead>
<tr>
<th>Name of Crop</th>
<th>Area in hectares</th>
<th>Production in metric tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Food Crops</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Bajra</td>
<td>392515</td>
<td>283112</td>
</tr>
<tr>
<td>2. Jowar</td>
<td>59570</td>
<td>23388</td>
</tr>
<tr>
<td>3. Maize</td>
<td>12940</td>
<td>9342</td>
</tr>
<tr>
<td>4. Wheat</td>
<td>180026</td>
<td>394940</td>
</tr>
<tr>
<td>5. Barley</td>
<td>58428</td>
<td>109249</td>
</tr>
<tr>
<td>6. Rice</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>7. Small Millets</td>
<td>45</td>
<td>23</td>
</tr>
<tr>
<td><strong>B. Pulses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Gram</td>
<td>58328</td>
<td>48959</td>
</tr>
<tr>
<td>9. Other Kharif Pulses</td>
<td>50893</td>
<td>15280</td>
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<td>10. Tur</td>
<td>1345</td>
<td>713</td>
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<tr>
<td>11. Other Rabi Pulses</td>
<td>1458</td>
<td>1181</td>
</tr>
<tr>
<td><strong>C. Commercial Crops</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Sesamum</td>
<td>4336</td>
<td>2401</td>
</tr>
<tr>
<td>13. Rape and Mustard</td>
<td>94545</td>
<td>64530</td>
</tr>
<tr>
<td>14. Line Seed</td>
<td>256</td>
<td>103</td>
</tr>
<tr>
<td>15. Ground nut</td>
<td>28896</td>
<td>23610</td>
</tr>
<tr>
<td>16. Caster seed</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>17. Sugarcane</td>
<td>192</td>
<td>2921</td>
</tr>
<tr>
<td>18. Red chillies</td>
<td>1455</td>
<td>1022</td>
</tr>
<tr>
<td>19. Potatoes</td>
<td>28</td>
<td>58</td>
</tr>
<tr>
<td>20. Tobacco</td>
<td>484</td>
<td>58</td>
</tr>
<tr>
<td>21. Cotton</td>
<td>175</td>
<td>60</td>
</tr>
<tr>
<td>22. Sun hemp</td>
<td>77</td>
<td>12</td>
</tr>
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</table>
is not required it is also sown together with Wheat and Barley. The Kharif crops also contribute to the supply of foodgrain to the district. It is generally sown in May - June and harvested in September. The main crops that are sown during the season are Jowar, Bajra, Groundnut, Maize, Pulses e.g., Urad, Moong and Moth. Sesamum are also grown. Fruits and vegetables also grown in abundance in areas surrounding the city of Jaipur and more so in the areas of Sanganer and Amber. The crops are grown on commercial basis to fulfil the needs of the city. The fruits mostly include papaya guava, mango and citrus fruits. Area under cultivation for crops in the region and its production in tonnes for the year 1988-89.

Distribution of Industries: At the end of year 1988-89 there were 15 industrial areas in the district covering total area of 2881.55 acres of land, out of which the total area developed or developing total to 2,604.80 acres and number of plots allotted in the process was 2373. All these departments were done by Rajas then Industrial Development and Investment Corporation. In 1989 these were 34 spinning mills and composite mills with unstabled capacity of 809,380 spindles and 3019 looms and total workers on the rolls were 44661. Out of the total number of 611 industries in 1985-86 whose returns were analysed the fixed capital amounted 1518.41 crores where as working capital amounted to 255.84
crores and productive capital was 1262.56 crores. These industries provided employment to a total of 68,077 workers.

Regarding employment in public sector units in the district the total employment in the year ending 1988, was of order of 134,011 persons. In the employment exchange the application on line register at the end of the year 1989 was 169,472 person where as number of application registered during the year was 22,987. The number of vacancies notified during the year was 787. Industrially Jaipur district is considered as one of the leading district in the State. The main reason being that it is the capital of the State and easily assessable by road and rail from all important trade centre of State as well as of the country. Among the large scale industries in the district mention may be National Engineering Industries. The Jaipur spinning and weaving Mill Ltd., Man Industrial Corporation Sambhar salts. Jaipur Metals and Electricals Ltd., Poddar Spinning Mills, Kamani Engineering Corporation etc. The main small and cottage industries of the district relates to manufactures of printing textile, marble statues, enamel works, precious stone, cutting and polishing, brass and lacquer work, cotton and woollen carpets etc.

Transport and Communication: As compared to 1981 census the district has made remarkable progress in the field of transport and communication. There is a metre gauge section
as well as broad gauge suction of western railway, which connects with major towns in Rajasthan as well as places like Delhi, Agra, Ahmadabad, Kanpur, Kachikunda on metre-gauge section and with Bombay, Delhi, Kanpur, Allahabad, Patna and Calcutta on broad gauge section. Air service also connects the city of Jaipur to places like Bombay, Delhi, Agra, Aurangabad, Udaipur and Jodhpur. Besides, the Indian Airlines there are also other private Airlines that operates on these routes, which was decreased congestion and pressure on existing Airlines.

Jaipur is also connected with wide network of roads of which National high ways and State high ways play an important role. Road connects the capital city with all district head quarters.

National high way 8, 11 and 12 passes through the district. National high way 8 connects Jaipur with Delhi, Ahmadabad and Bombay, where as National high way 11 connects Jaipur with Bikaner and Agra, National high way 12 connects Jaipur with Tonk, Kota, Bhopal and Jabalpur. The total length of National high ways that passes through the district comes upto 438 kms., painted roads accounts for 2061 kms., Metalled road were 247 kms. and graveled road 24 kms.
Demographic Structure:

Growth and Distribution: The total population of the district was 4,722,551 in 1991, of which the male and female numbered 2,496,799, 2,225,752 respectively. The population is predominantly rural in character as 2,855,912 (60.47 per cent) of people live in 2990 inhabited villages while only 1,866,639 person (39.53%) reside in twenty urban centres. There are 98 uninhabited villages in the district without population.

Highest rural population (73.8 per cent) resides in Dudu Panchayat Samiti followed by 73.7 per cent in Govindagarh Panchayat Samiti and minimum in Jhotwara Panchayat Samiti 36.1 per cent. In urban areas of district Jaipur shares 81.34 per cent of the total urban population of the district, while minimum in Jobner town only 0.51 per cent. There is no change in urban area of the district during last decade 1981-91.

The population of the district has increased little less than four times (389.39 per cent) in present century. It has been growing steadily and has more than doubled over the past 30 years having risen from 18.91 lakh in 1961 to 47.22 lakh in 1991. From the study of variation in population growth of the district since 1901. It is seen that the first two decade 1901-11 and 1911-21) witnessed a
GROWTH OF POPULATION SINCE 1901 OF DISTRICT JAIPUR

FIG. 1.5
<table>
<thead>
<tr>
<th>Census Year</th>
<th>Population</th>
<th>Percentage variation over 1901</th>
<th>Sex Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>1212812</td>
<td>-5.80</td>
<td>903</td>
</tr>
<tr>
<td>1911</td>
<td>1142522</td>
<td>-17.94</td>
<td>913</td>
</tr>
<tr>
<td>1921</td>
<td>937601</td>
<td>-13.82</td>
<td>882</td>
</tr>
<tr>
<td>1931</td>
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<td>1941</td>
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<td>1951</td>
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<tr>
<td>1981</td>
<td>3436172</td>
<td>+38.42</td>
<td>894</td>
</tr>
<tr>
<td>1991</td>
<td>4722551</td>
<td>+37.44</td>
<td>891</td>
</tr>
</tbody>
</table>

Source: Primary District Census Handbook of Jaipur - 1991
decrease of 5.80 per cent and 17.94 per cent respectively, but after 1921, there has been steadily increase in the growth rate of population. The highest growth rate however, has been recorded during 1971-81. Among the reasons contributing to the fall in population during period 1901-1921, mention may be made of the epidemics of influenza, plague and small pox. In absolute terms the population of the district increased by about 35.09 lakhs during the past 90 years (1901-91) of this about 3.12 lakhs were added during the first fifty years of present century, while during last 10 years alone about 13 lakhs added to the district population.

In 1991 census the district has recorded a growth rate of 37.44 per cent as compared to the State growth of 28.44 per cent. The growth rate in the rural areas of the district during the decade works out to 30.67 per cent while in urban areas it comes to 49.27 per cent meaning thereby that the population of the district has grown at a faster rate in urban areas than its rural counter parts.

Among the tahsil Jaipur has recorded the highest growth of 48.13 per cent during the decade as against 25.02 per cent in Phagi tahsil. Analysing growth rate in rural areas, the highest growth rate of 35.27 per cent has been recorded in Virat nagar tahsil, followed by Barsi tahsil 35.07 per cent and minimum in Phulera tahsil 20.98 per cent.
As regards urban population of the tahsil it recorded a very high growth rate and varies from 136.87 per cent in sanganer tahsil to only 16.43 per cent in Baswa tahsil.

The average density of population in the district is 336 person per sq. km. There is sharp variation in the density of rural and urban areas of the district. In rural areas the density of population is only 211 person per sq. km. while in urban areas it is 3557 person per sq. km. which is 17 times more than the rural areas. In the rural areas of the district Sikrai Panchayat Samiti has highest density of population which is 320 person per sq. km. while minimum is 117 person per sq. km. The urban areas of Jaipur is thickly populated which has a density of 6959 person per sq. km. to 1981 km. and minimum in Naraina town 340 person per sq. km.

Sex-Ratio: There has been a sharp fluctuation in sex-ratio in the district over decades. Since 1901 the population of females in the population of district as a whole has always on the lower side as compared to males. There are 891 females to a thousand males in Jaipur district as a whole the sex ratio in rural areas is 903 but in urban area ratio is only 873. According to 1991 census proportion of female to total male population is highest in Sambhar Panchayat Samiti the sex-ratio is being 930 and minimum in Jhotwara Panchayat Samiti 884 females per 1000 males.
At town level the highest sex-ratio is recorded in Viratnagar town 994 while the lowest in Bandikui town with 849 females per 1000 males.
CHAPTER - II

MEANING, SCOPE, SIGNIFICANCE AND APPROACHES
APPROACHES OF RURAL SETTLEMENTS

The term 'Settlement Geography' is derived from German 'Siedlungs Geographie', which involves the study of visual imprints made by man upon physical landscape in the process of cultural occupancy. Dominant corporate group always occupy the best site of land and allows other non-corporate group to live together in order to carry out the socio-economic activities within organization framework. Thus occupation of land is the first step for settling process, and during process of settling certain cultural feature are developed that generate sense of belongingness among the people.

The evolution of settlement is outcome of interplay between socio-economic condition, physical and ecological setting of the area. The layout plan, structure and composition of building is manifestation of physical condition of area. With the advent of Science and technology and imposing socio-economic condition, the character of settlement not much reflection of physical condition, as in the past.

Modern geographical studies of rural settlements in modern context began with Ritter's work in early nineteenth
century. His theme of inter-dependence among the elements of land scape gave abroad base to early settlement Geography including studies of rural house types, settlement pattern and colonization as results of complex man-land relationship. Geographer interested in various attributes of rural settlements around 1920 were vidal de la Blache, Demogeon, Brunhes, Ahlmann and Arrouseau laid foundation of distinct branch of settlement Geography. The world wide interest in this branch was created when International geographical Union (I.G.U) published its report in 1928 and different papers and articles on different aspect of settlement such as type, form, pattern, site, inner plan, morphology evolution, the pattern of physical growth and so on.

Many scholar gave view regarding the meaning and definition of rural settlement. According to K.H. Stone¹ "The Settlement Geography is description and analysis of distribution of building by which people attach themselves to land and calls for a focus of attention on building where are they, and why they are there." According to Jordan,² Settlement Geography may be defined as, "study of form of the cultural land scape, involving orderly description and attempted explanation".


R.L. Singh is of the opinion that settlement geography deal with the facilities built in the process of human occupancy of land and their grouping. The nature and distribution of their facilities are related to the art and mode of living on one hand, and physical factors such as water supply, slopes, forest and swamps on the other. House and high ways, the two fundamental facilities of settlement, and topographic expression of their grouping or arrangements. Their external forms reflects architectural styles of time and thus reflects the changes in human occupancy of area and past cultural land scape. So, settlement as an occupancy unit represents an organized colony of human being, including the building in which they live or work or store or use and the tracks or streets over which their movement take place.

Scope:

Settlement Geography has a pivotal role in geography. It is intimately related with many sub-fields of geography including population, agriculture, transport, military and historical geography. Settlements are among the three essential needs of man, the food, clothing and

shelter or place of residence. All the Geographies are primarily concerned with distribution and recognition of its spatial pattern of phenomenon, population distribution and recognition of its spatial pattern still remain unsolved problem and it is generally agreed that use of settlement pattern still holds best guide for ascertaining the probable arrangement of the people within enumeration area and most meaningful pattern of population distribution for at least considerable part of earth surface can be distinguished by reference of settlement map.

The commodity approach of agriculture geography is comparable to the study of individual settlements, and regional study in agriculture geography, which focuses attention on crop combinations and forms problems of a particular area corresponds to the problems and aspect of city region relationship and relationship of various settlement within a particular region. Settlements patterns are related to pattern of agricultural land use. Highways and streets are a fundamental concept in human geography and not unlike the houses, provides a common link between settlement geography and other branches of geography. Settlement as an assemble emerges from arrangement of houses and high ways, transportation prescribes a measure of relationship between areas and each becomes an essential aspect of geography changes in the transport technology do
influence the settlement pattern of an area. The treatment of settlement patterns, constitutes an integral aspect in study of the geography of transportation.

Settlement geography and historical geography have a common genetic approach. The present is the key to past this concept is profitable in the study of the origin of settlements and evolution of their morphology. Historical geography is defined as study of past geography or geographical changes through time. The significance of place name as source material in examining the facts of historical geography is now generally recognised in the absence of documentary evidence, these features related as they are to various group of people and their cultural patterns in different periods of land occupancy, become quite helpful in presenting past scenes of terrain, vegetation and mode of land use.

**Significance:**

The ultimate goal of human activity is his own welfare while settling some where on earth. Multi-dimensional factors are involved in attaining, sustaining and improving human well being, various dynamic aspects of settlements need to be studied through scanning all along spectrum. The significance of settlement study refer to following.
1. It is providing clear understanding of where, how and why of the people in temporal frame.

2. Provides better understanding of modernised need in settlements themselves due to increasing number of nuclear families, and day to day changing behaviour of the inhabitants.

3. Provides better picture for the location and deployment of new facilities, i.e. supply of drinking water, electricity, irrigation, education and medical facilities etc.

4. Provides better understanding of agriculture and pioneer settlements inter-relationship.

5. Provides better understanding for the planned development of an area.

6. Close interrelation between spatial structure of economy and settlement structure.

7. It provides better understanding of socio-culture values and ethos of people.

9. Provides knowledge regarding varied architectural styles and their cultural background.

10. It provides human settlement approach at global level.

**Approaches:**

Two popular approaches in geography as explained by Hartshorne are (i) Systematic, (ii) Regional. Studies on settlements has been in both rural and urban through these approaches. Rural Settlements have mostly been studied systematically at micro level hamlet and village along with their occupancy, setting, morphology, size and shape and functions etc. The second approach to study settlements of regions as a whole comprising their hestogenesis-morphogenesis, spread, distribution, pattern and types, and their comparative distinctiveness and regional variation also do abound in old German studies as well as in newer geographic world in terms of historical period of their investigation and development of geography. Comparative studies on regional basis emerged during last two decades of 60's and 70's i.e. study of Japan and Northern Indian Settlements. Recently, theoretical approach has been emphasised through the studies of Bunge, Haggett and other who were influenced by quantitative revolution.
All approaches—systematic, regional or theoretical in settlement studies, attempted invariably to explain the form, function and genesis inductively and deductively, sometimes applying only empirical qualitative approach while at the others deductive, theoretical and quantitative ones separately as well as jointly. Among the inductive studies, Singh\(^1\) pioneer work of the middle Ganga valley is fairly obvious. The deductive studies comprise all the work analysed through nearest neighbour/randomness technique and techniques applied for spacing and shape analysis and nesting, hierarchy and functionality involving various indices. Dickinson\(^2\) express the theme of settlement geography in terms of structure, process and stage. The most important theoretical framework for the study of rural settlements has been evolved by C.A. Doxiadis,\(^3\) who is originator of the Science of human settlements. He enunciates five principles which are elucidated with the help of hypothetical diagram. The first principle is the maximization of man's potential contacts with natural elements

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(water, trees etc.) and cultural elements (buildings, roads etc.). The second principle is minimization of effort required for making actual and potential contacts according to general principle of least effort. The third principle is optimization of man's protective space at every movement individually or in group in any situation, temporary or permanent. The fourth is the optimization of quality of man's relationship with his environment, consisting of nature, society, shells (building and houses), Network, local street, road and telecommunication etc. The fifth principle is that man organizes his settlements in an attempt to achieve an optimum synthesis of previous four principles.

Although Doxiadas presented the most significant theoretical model or framework, but not applicable universally to study the complex settlement system within these framework, one can apply three basic approaches supplemented by better developed quantitative techniques.

Spatial Approach:

Approach of spatial organization is a form of system approach which helps in comprehending the settlement as a whole. It may be analysed through different concepts among which very pertinent in rural settlement geography are:

(i) Type, pattern and classification
(ii) Functional integration and hierarchy
(iii) Local identity (e.g. village structure)
(iv) Planning and rationalization

Demogeon developed the concept of spatial organization in context to morphology structure. He presented the classification of French settlements into different types according to shape and also dealt with principle distributional pattern of rural settlement type. Schaefer initiated the modern orientation following the work of German geographers. Modern geographers are also following him in the study of settlement through analysis of pattern and process as they express the spatial organization in environmental space through their approach interrelationship of man, nature and society is better expressed in any cultural landscape. A number of studies on morphology, size and shape of settlement do speak some sort of organization of space ranging from room, hamlet, village to town to megapolis.

Ecological approach

Genetic approach

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CHAPTER - III

REVIEW OF THE WORK DONE SO FAR

Unlike many other fields of geographical investigation, the study of settlements, has with few exceptions received relatively little attention in recent years. Geographers have approached the study of rural settlement in many ways. For example in 1930's the French Geographer, Jean Brunhes, concentrated on such detailed aspects as regard variations in house design, building methods and materials and the influence of the physical environment on these features. Others have attempted to clarify the historical development of rural settlement patterns by a study of place names and a variety of documentary evidence.

Early description of human settlements are found in the works of Herodotus¹ (440-25) B.C. who wrote about settled places and about the customs and tradition of their inhabitants. But much of the information given by him was based on hearsay. A few references of the towns and cities are found in the book of trabo (63 B.C. - 20 A.D.).²

Honssen (1880) and Dahlmann (1840) have made detailed field studies and have found that the coexistence of both individual and group farm settlement in northern Europe have been directly influenced by physical and historical factors.¹

Dickinson identifies a particular pattern of settlement i.e. the cheereboard pattern because in such settlement lanes intersect each other at right angles.²

M.B. Pithawala (1938) studied the evolution of settlement pattern in the lower Indus basin. C.D. Despande (1942) published a comprehensive study of the settlement types of Bombay, Karnataka comprising the four southern district of the British province of Berlay (Now in Karnataka State), and examined the role of geographical factors in the evolution of settlement types. His study revealed that fresh water supply was the main determining factor so far as the site of rural settlements in the drier part of the area was concerned. He also remarked that the pattern of settlement was influenced on the one hand by the relief and communication while on other hand by the nature of agricultural operations.

Ali (1942) rightly points out that population cum settlement pattern is hydrographic in nature, notes, table being a very important factor in the location of villages. The areas of moderate to high rainfall have a large number of settlements while those receiving scanty rainfall have fewer settlements.¹

Finch and Trewartha (1942) mention a number of factors which determine the pattern of settlement like topography, elevation and slopes, nature of soil, forest area distribution of water, existence of springs that contribute to dispersal.²

Stanisłowski (1946) state that Latim planning method were later extended to the New World by the Spanish and the Portuguese who had centuries of experience of building and operating villas, pueblos, and ciudades from Roman structures.³

Mukherjee (1947) in his doctoral thesis on the Hoogly and its Region - a Study of Human Adjustment to Changing Environment, devoted sufficient space to the changing character of settlement in the region.

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S. Sinha (1950) related Bharbharia, a tribal village in the Chota Nagpur Plateau, Bihar. The village is inhabited mostly by the 'Hos', who are now engaged in agriculture. He analysed the landscape of the village with habitations on uplands and fields at the lower levels and discussed the role of environment on the mode of life of all the communities living in the village.

Blache (1952) has found that the concentration and dispersion are the result of physical influence on human environment. ¹

He further states that human being select lines of contact between different geological formations and varieties of topography give new and marked tendency to converge or even to concentrate at the angles of slopes or at the intersection of different gradients. Again he says that the agglomeration of settlements itself becomes a locational force for the establishment of settlement. The sum total of human needs is after all only a certain amount of variety in food supply, sufficient water pasturage for domestic animals, fuel and building materials and so on.

Ahmad, E. (1952) made a commendable study of the rural settlement types in U.P. He grouped the rural

settlements in the four types - compact, cluster and hamlet, fragmented or hamletted and dispersed settlements.\footnote{Bruhnes (1952) defines settlement pattern by using the term 'Nucleated instead of 'compact' whereas Vlache and finch called it clustered and 'compact' respectively.}

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\begin{itemize}
\end{itemize}
the villages in Assam, Rajasthan, Maharashtra and Karnataka are still found surrounded walls and that in Ganga plain open type of villages with detached hamlets are a general rule.

Clarks and Evans (1954) have devised a new quantitative technique e,g. measures pattern of rural settlements. This is called nearest neighbour technique.¹

Singh, R.L. (1955 traced the evolution of settlement in the Middle Ganga Valley between Allahabad and Patna from the pre-historic times to the present day. He distinguished four main types of settlements (1) compact (2) Semi compact (3) fragmented (4) sprinkled.

Bhattacharya, A.N. (1956) made a study of settlement patterns in the upper Ganga plain of U.P. and attributed agglomerated pattern to caste affinities.

Viswanath, M.S. (1956) studied the settlement pattern of the deltaic district of Thanjavur. He observed that the linear settlement mere found predominantly in the alluvial tract and along the sandy wort.

Mukherjee (1956) has taken an extensive area extending westwards from Moradabad and Bijnor districts of U.P. and across the Yamuna to five eastern districts of the

Punjab and to two northern district of Rajasthan. These settlements were of clustered type of polygonal shape and very big in size. He clearly emphasized that six principal factors: geographical, economic, historical, religious ethnic and mythological were responsible.¹

Bradford (1957) focuses on settlement planning and says that Roman were much interested in it and had evolved a well-organized quadrate system.²

Bhattacharya and L.N. Verma 1957 studied the settlement in the son valley and observed that the rice cultivation and the security question were contribution factors, in helping the growth of hamlets near marshes and fields.

Finch and Trewartha (1957) define the nucleated settlements as those which have all the dwellings of a "mauza" concentrated in one central site to form compact settlements, houses being clustered with each other. They call these settlements 'nucleated' or 'compact' while Blache calls them clustered.³

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Bertrand (1958) observes that the strong kinship relationships are a major characteristics of the social structure in many rural areas of the U.S.A. individual section of a dwelling site is primarily influenced by the location of the residence of another member of the family.\(^1\)

Kaushik (1959) focuses on pattern of settlements and states that dispersal is not the typical settlement in the newly settled regions of the world like North America, Argentina and Australia. According to him forests have resulted in dispersal type of settlement.\(^2\)

C. Nronala, R. Ramchandran and A.V. Thiru (1960 have studied in detail the three villages each representing a distinct area - Vittalam on an upland area, Muhammadpuram at the foot of the hill and Nelambus in a valley respectively. In Vittalam settlement pattern is of modified linear type settlement pattern in Muhammadpuram is very much dependent on the nature of arable land available. In Nelambur settlement pattern is linear.

Bose and S.P. Malhotra (1961) studied the village Chirai, a desert village in Jodhpur district, Rajasthan. It has both the characteristics - a compact settlement and scattered homesteads. The 'dhanis' (scattered homesteads)

can be seen around a compact nuclear settlement.¹

Singh, R.L. (1961) settlement as an occupancy unit representing an organised colony of human beings including the buildings in which they live or work or store and the tracks or street over which their movements take place. He stressed the relationship between the settlement and roads.²

Ahmad Aijazuddin (1962) dealt in great deal with the pattern of rural settlements in the Indian desert. He analysed their spatial distribution in the perspective of the character of the region which has been a refuge area for the uprooted people from the fertile Gujarat or Ganga plain. He laid stress on the interesting relationship between the size of villages and the availability of drinking water.³

M. Chisholm (1962) observed that the religious minded people have staunch faith in the existence of God or Deity which sometimes is the basis of all settlements.⁴

Ullman and Dacey (1962) suggests that large centres have a far greater range of services and functions than smaller ones. Relationship between size and functional range is curvilinear with each new addition in population new functions are added.¹

Kirk and Stone (1965) defines settlement Geography as the description and analysis of the distribution of buildings by which people attach themselves to the land and calls for a focus of attention on where the buildings are they and why they are there.²

Jones (1965) states that the pattern of settlement is determined on the basis of the location of houses and highways. The pattern of settlement exhibits the relationship between one dwelling and the other. The site may also have no bearing on pattern.³

Dube (1965) pointed out that from times immemorial the village has been the basic unit in the organization of Indian Social Polity. Time and interplay of historical and sociological factors have influenced the structure, organisation and ethos of these communities in many

---


significant ways.¹

Bhattacharya, (1966) made a comprehensive study of rural settlements of Murshidabad n. Bengal. He described the distribution pattern of rural settlements. The size and the form of the settlements are closely related to both physical and cultural forces of the site. He has also thrown light on the impact of changing river courses and social, economic and political factors in bringing about changes in the distributional pattern of settlements.²

Haggett Peter, (1965) found that time is an important factor in determining the location of settlements. With the lapse of time development have been taking place according to a variety of reasons, social political and economic which have a direct bearing on human settlements.³

Jordan, (1966) modifies the definition of settlement Geography given by stone and says that, it may be defined as the study of settlement morphology, and adds that "description of the form should come before explanation. He defines settlement morphology in terms of vertical and

horizontal dimensions as well as materials of composition.\textsuperscript{1}

Perpillou, 1966 says that water supply is one of the most important and paramount factors in determining the location of rural settlements. Water being most necessary to men, animals and crops, man settles where it is available easily and in large quantities.\textsuperscript{2}

Dexiadis, (1969) gave a theoretical framework for the formation of settlements, uncomparing five principles. The first principle deals with maximization of man's potential contacts with natural element. The second principle is the minimization of the effort required for the achievement of man's actual and potential contact. The third principle is the optimization of man's potential space at even movement individually or in a group. The fourth principle is the optimization of the quality of man's relationship and his environment consisting of nature, society, shells and networks. The fifth principle is man's organization of his settlements in an attempt to achieve an optimum synthesis of the previous four principles.\textsuperscript{3}

\begin{enumerate}
\end{enumerate}
Mukherjee (1970) has studied the cultural geography of Jats and has succeeded in tracing stages of Jat's migration, with emphasis on the origin settlement pattern and nomenclature of their villages.¹

Singh Rana P.B. has presented hypothesis view regarding settlement pattern. He concludes that religious ritual norms of the Hindu Society lead to the maximization of socio-spatial distance among the different caste groups. While the secular norms of behaviour which are based on functional expendency, lead to the minimization of these distance.²

Nitz (1972) makes stimulating effort at evolving an outline and formulating a methodology for studying the evolution of rural settlement regions, using a comparative approach and making use of written records, archeological evidence place names and field patterns.³

Sharma (1972) says that houses and home types reflect with great exactitude and inter-relationship between

---


man and his environment and tell about man's struggle for shelter through time and space. He also emphasising religion's role in underlying form spatial arrangements and orientation of houses.¹

Sharma (1972) has attempted intervening distance analysis in an Indian desert on the basis of the formula given below (Bannerman (1902) used the same formula for calculating the distance between each new village).²

Bhala (1973) studies of patterns of settlements has led him to identify topography and social group as interacting determinants.³

Brook and Webb, (1973) have found that aggregation of population and growth of village have been closely favoured by factors like agriculture, water supply and mutual socio-economic needs. Density of settlements results mainly from the intensity of land use.⁴

2. Ibid., p. 110.
Singh (1973) has identified compact, semi-compact and hamlet types of rural settlements, and correlates the type on the basis of well-known physiographic and cultural factors.¹

Mukherji (1974) says that rural settlement studies shows for longer time great concern for types and pattern than for other attributes. He has given another attribute – spacing of rural settlements. Spacing could be calculated with the help of formula.

\[ S = 2 \times \left( \frac{A}{N} \right)^{\frac{1}{2}} \]

- \( S \) represents spacing
- \( A \) = Area of the study
- \( N \) = Number of rural settlements

Finally conclusion drawn that there is positive correlation between low productivity and low density of rural population, consequently wider spacing.²

Mann (1974) describes the structure of rural settlement by applying mean of settling processes with

---


reference to role of socio-historical forces in their formation and function.¹

According to him these are three parameters population size. Areal size and the number of occupied houses independently of spacing need for defence, cultivated area and transportation network are also related to the population size of settlements Mukharji (1974) stresses that site, situation and location are important attributes of rural settlements.²

Sen, (1974) observes that site, situation and location are important attribute of rural settlements.³

Singh R.L. and Singh R.B., (1975) have studied genesis of morphology of Indian village with a Rajput clan settlement in middle Ganga valley.⁴


Bhattacharya, (1975) correlated the settlement pattern of Deltaic West Bengal with physiography and agriculture land use. He asserted that deltaic settlements of middle ganga valley are not applicable to deltaic region.¹

Singh, Rana, (1975) suggests that varying degrees of regional and local dominance and sub-dominance in any sphere either caste numerical, economic, educational, cultural or political factors influence the settlement pattern.²

Edwards, (1975) has studied Ibasian settlement activities in America through questionnaires.³

Hassan,(1975) focusses his attention an functional analysis and found that settlements generally present a good example of human adjustment to the Geographical environment.⁴

---


Singh R.L. and Singh R.B., (1978) have found that old settlements are associated with physical features like river, because earliest settlements found in main water courses and their tributary system but this system is only find in the earliest passage of time, which got altered with time.¹

Hassan, (1980) rays that Geopolitical and National ideology have guided both pre - 1948 and post - 1967 Jewish frontier settlement in Israel. In order to comprehend the development of Jewish frontier settlements three factors must be taken into account the historical Geographic situation.²

Bercusten, (1982) says that settlement pattern in federal Republic of Germany has undergone changes along democratic lives since 1945 due change in Government. Greater impetus has been given to the rural areas, which led to establishment of small rural centres at the expanse of large urban centres, which has brought about changes both urban/rural areas affecting pattern of settlements.³


Johannes Auget, (1982) observed that politico-economic factors must be taken into consideration regarding the condition of rural settlements.¹

Singh, (1983) examined the relationship between economic development of a country/region and spatial organization of marketing system, as well as locational factors in development of market centres.²

Singh, (1983) have studied the lurarchical system and spatial patterns of central places in Baghpat tehsil on the basis of population size, central functioning and amenities available among rural settlements.³

Nag, (1984) studied the evolution of Zambian settlements and planning in order to develop the continues of settlements.⁴


Grover, (1985) discusses the evolution of Kanet villages in Siwalik hills and their landscape relations.  

Rai and Singh (1990) studied a socio-techno-economically backward segment i.e. Kopagank block.

Ishtiaq A., Mayer, (1992) have chosen Kashmir division of Jammu & Kashmir for the identification of service centres in a backward and less developed region, emphasize their full attention and put stress on sectoral planning while neglecting spatial and functional aspect of the region.

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RURAL SETTLEMENTS: SPATIAL DISTRIBUTION

Settlement is a most distinctive form of cultural landscape. It is a man made habitat on earth's surface representing an organised colony of human being including the buildings in which they live or use otherwise and the tracks and streets over which their movement take place. The distribution of settlements is defined as the frequency with which they occur in a given place. A rural settlement is relatively small and simple agglomeration of houses at a favourable site, primarily associated with agriculture and related processes. Such elements vary from region to region in types and pattern of distribution, and each one of these settlements is unique having its own personality. However in the present study general conclusion from specific facts and indices of measurement have been drawn to interpret distributional pattern and inter-relationship among the rural settlements, with the help of size (in terms of population, and area), spacing (observed, expected, index of randomness) and other characteristics. On the basis of these findings an attempt has been made to measure the degree of concentration or dispersion. General Distribution and siting of Rural Settlement. The study area, forming parts of Eastern Rajasthan, covering an area of about 14068 sq. kms. with 2990 rural settlements. District
has a mosaic of rugged mountaneous terrain, uplands, basin and dine fields, and also fertile stretches of alluvial soils having more or less uniform distribution of rural settlements. However, slight variations may be seen at micro-level due to differences in local relief, source of water supply, drainage lines, soil types, pattern of land use, transport, assessibility social attributes and population density etc. Factors like deeply cut ravines, salt marshes, ill drained soils, non-availability of drinking water etc. on the other hand hampered, a strictly uniform distribution of settlement in the study area. Different rivers and lake Sambhar has played a crucial role in the selection of sites for human habitation in historical times, 'as revealed by recent exavation in 1950's in Sambhar region, Kushana's coins of Huviska have been discovered at Sambhar. The historical evidences also available in the form of a number of relic feature belonging to buddist, Bhor, Meo and Rajput Settlers who established, their colonies in this area. Recently developed markets, roads, tracks and communication lines have made very little impact on the general distributional pattern of settlements except for the growth of a few hamlets arising out of the main village to avoid congestion or to respond to new socio-economic situations. Bichoon, Dohmi Kolan, Bhopura Kalan, Sewa, Manpura mochari, Achroi
etc. along the roads present example of aforesaid settlements.

The Jaipur district is drained by several small rivers and tributaries. These streams have influenced to the selection of sites for human habitation in study area.

**Size of Villages:**

The size (area and population) and density of rural settlements is closely related to spacing. With an inverse in distance between settlements. The density of villages tends to decrease. In the study area the average areal size of village is 5.65 km$^2$ which is less than the Rajasthan average size of villages, but more than India average 5.02 km$^2$. Figure 4.1 shows areal size of villages in the District in terms of km.$^2$ per village. On panchayat simiti level. Table 4.1 clearly indicates that the highest per village areal coverage (8.797 km$^2$) is in Dudu panchayat simiti, while the lowest areal size (2.846 km$^2$) is found in sanganer panchayat simiti. Generally, villages located in western part of district as Dudu, Phogi have large areal size, other large size villages are found in Govindgarh (7.010 km$^2$). Panchayat Simiti villages of areal size (5.01-6.00 km$^2$) are Sambhar, Viratnagar and Kotpatli, Shahpura. Majority of villages are found in (2.00-5.00 km$^2$) they are Amber, Jamwa Ramgarh,
### TABLE - 4.1

**DISTRIBUTION OF AREA AVERAGE PER VILLAGE SQ. KMS AT PANCHAYAT SIMITI LEVEL (1991)**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Panchayat Simiti</th>
<th>Area (Sq.kms.)</th>
<th>No. of village</th>
<th>Average per village</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kotputli</td>
<td>663.2</td>
<td>119</td>
<td>5.573</td>
</tr>
<tr>
<td>2.</td>
<td>Viratnagar</td>
<td>643.8</td>
<td>118</td>
<td>5.456</td>
</tr>
<tr>
<td>3.</td>
<td>Shahpura</td>
<td>407.9</td>
<td>79</td>
<td>5.164</td>
</tr>
<tr>
<td>4.</td>
<td>Govindagarh</td>
<td>666.0</td>
<td>95</td>
<td>7.010</td>
</tr>
<tr>
<td>5.</td>
<td>Sambhar</td>
<td>832.3</td>
<td>143</td>
<td>5.820</td>
</tr>
<tr>
<td>6.</td>
<td>Dudu</td>
<td>1847.5</td>
<td>210</td>
<td>8.797</td>
</tr>
<tr>
<td>7.</td>
<td>Phagi</td>
<td>1111.1</td>
<td>168</td>
<td>6.613</td>
</tr>
<tr>
<td>8.</td>
<td>Sanganer</td>
<td>583.4</td>
<td>205</td>
<td>2.846</td>
</tr>
<tr>
<td>9.</td>
<td>Jhotwara</td>
<td>384.9</td>
<td>102</td>
<td>3.774</td>
</tr>
<tr>
<td>10.</td>
<td>Amber</td>
<td>830.7</td>
<td>194</td>
<td>4.282</td>
</tr>
<tr>
<td>11.</td>
<td>Jamwa Ramgarh</td>
<td>1000.0</td>
<td>231</td>
<td>4.329</td>
</tr>
<tr>
<td>12.</td>
<td>Bassi</td>
<td>630.0</td>
<td>209</td>
<td>3.014</td>
</tr>
<tr>
<td>13.</td>
<td>Chaksu</td>
<td>749.7</td>
<td>258</td>
<td>2.906</td>
</tr>
<tr>
<td>14.</td>
<td>Lalsot</td>
<td>847.4</td>
<td>293</td>
<td>2.892</td>
</tr>
<tr>
<td>15.</td>
<td>Dausa</td>
<td>894.8</td>
<td>221</td>
<td>4.049</td>
</tr>
<tr>
<td>16.</td>
<td>Bandikui</td>
<td>600.0</td>
<td>207</td>
<td>2.898</td>
</tr>
<tr>
<td>17.</td>
<td>Sikrai</td>
<td>502.7</td>
<td>138</td>
<td>3.642</td>
</tr>
</tbody>
</table>

*Source: Compiled from District Primary Census Hand Book of Jaipur District, Rajasthan - 1991*
JAIPUR DISTRICT
SIZE OF VILLAGES
(Based on area 1991)

State Boundary
District Boundary
Tehsil Boundary
P.S. Boundary

2 -3.50
3.51-500
5.01-6.00
6.01-8.50
>8.51

FIG. 4.1
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Panchayat Simiti</th>
<th>Population</th>
<th>Number of villages</th>
<th>Average per village population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kotputli</td>
<td>177608</td>
<td>119</td>
<td>1492.50</td>
</tr>
<tr>
<td>2.</td>
<td>Viratnagar</td>
<td>155270</td>
<td>118</td>
<td>1315.87</td>
</tr>
<tr>
<td>3.</td>
<td>Shahpura</td>
<td>128177</td>
<td>79</td>
<td>1622.49</td>
</tr>
<tr>
<td>4.</td>
<td>Govindagahr</td>
<td>210430</td>
<td>95</td>
<td>2215.05</td>
</tr>
<tr>
<td>5.</td>
<td>Sambhar</td>
<td>162221</td>
<td>143</td>
<td>1134.41</td>
</tr>
<tr>
<td>6.</td>
<td>Dudu</td>
<td>210655</td>
<td>210</td>
<td>1003.11</td>
</tr>
<tr>
<td>7.</td>
<td>Phagi</td>
<td>130453</td>
<td>168</td>
<td>776.50</td>
</tr>
<tr>
<td>8.</td>
<td>Sanganer</td>
<td>153893</td>
<td>205</td>
<td>750.69</td>
</tr>
<tr>
<td>9.</td>
<td>Jhotwara</td>
<td>103076</td>
<td>102</td>
<td>1010.54</td>
</tr>
<tr>
<td>10.</td>
<td>Amber</td>
<td>205355</td>
<td>194</td>
<td>1058.53</td>
</tr>
<tr>
<td>11.</td>
<td>Jamwa Ramgarh</td>
<td>190822</td>
<td>231</td>
<td>826.06</td>
</tr>
<tr>
<td>12.</td>
<td>Bassi</td>
<td>159749</td>
<td>209</td>
<td>764.34</td>
</tr>
<tr>
<td>13.</td>
<td>Chaksu</td>
<td>125703</td>
<td>258</td>
<td>787.22</td>
</tr>
<tr>
<td>14.</td>
<td>Lalsot</td>
<td>187439</td>
<td>293</td>
<td>639.72</td>
</tr>
<tr>
<td>15.</td>
<td>Dausa</td>
<td>207958</td>
<td>221</td>
<td>900.86</td>
</tr>
<tr>
<td>16.</td>
<td>Bandikui</td>
<td>186479</td>
<td>207</td>
<td>886.37</td>
</tr>
<tr>
<td>17.</td>
<td>Sikrai</td>
<td>160624</td>
<td>138</td>
<td>1163.94</td>
</tr>
</tbody>
</table>

Source: Compiled from District Primary Census Handbook of Jaipur District, Rajasthan.
Jhotwara, Dausa Sikrai, Bandikui, Lalsot, Chaksu, Bassi.

The average population of a village in the study area is 1079. Table 4.2 shows the average population of a village at panchayat simiti level. Table 4.3 shows that only 1.69 per cent of villages of district have population of above 5000, 48.82 per cent of villages are in range of 500-1999 range. Table 4.2 shows the average population per village in different panchayat simities of Jaipur district. The highest per village population (2215 persons) is found in Govindgarh followed by Shahpura (1622 person) and Kotputli (1492 person), while lowest per

<table>
<thead>
<tr>
<th>TABLE - 4.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of Population</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>Less than 200</td>
</tr>
<tr>
<td>200 - 499</td>
</tr>
<tr>
<td>500 - 1999</td>
</tr>
<tr>
<td>2000 - 4999</td>
</tr>
<tr>
<td>5000 - 9999</td>
</tr>
<tr>
<td>10,000 above</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Source: District Primary Census Handbook (1991)
### TABLE - 4.4

CLASSIFICATION OF VILLAGES ACCORDING TO THE SIZE OF POPULATION

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Panchayat Simiti of Village</th>
<th>Total No. %age of Village below 200-499 500-1999 2000-4999 5000-9999 and above</th>
<th>200 penson pensons pensons pensons pensons population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kotputli</td>
<td>119 3.97 1 0.84 11 9.21 83 69.25 22 18.49 2 1.68</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Virat Nagar</td>
<td>118 3.94 7 5.93 23 19.49 71 60.17 12 10.17 5 4.24</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Shahpura</td>
<td>79 2.54 4 5.06 8 10.13 48 60.76 16 20.25 3 3.80</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Govindgarh</td>
<td>95 3.17 8 8.42 7 7.37 41 43.16 30 31.58 8 6.42</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Sainthar</td>
<td>143 4.78 10 6.99 31 21.68 82 57.37 17 11.83 3 2.10 1 1.05</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Duddu</td>
<td>210 7.02 19 9.045 63 30.00 104 49.52 19 9.05 5 2.38</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Phagi</td>
<td>158 5.61 17 10.12 68 40.47 72 42.86 9 5.36 2 1.19</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Sanganer</td>
<td>205 6.85 36 17.56 66 32.20 90 43.90 10 4.68 3 1.46</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Jhotwara</td>
<td>102 3.41 12 11.77 29 28.43 43 46.08 12 11.76 2 1.96</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Amber</td>
<td>194 6.48 17 8.76 47 24.23 105 54.12 22 11.34 3 1.55</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Janwa Ramgarh</td>
<td>231 7.72 25 10.82 68 29.44 120 51.95 17 7.36 1 0.43</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Bassi</td>
<td>209 6.98 22 10.53 77 36.84 99 47.37 9 4.30 2 0.36</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Chaksa</td>
<td>258 8.62 64 24.81 116 44.96 74 28.68 3 1.16 1 0.39</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Lalsot</td>
<td>293 9.79 84 28.67 80 27.30 115 39.25 12 4.10 2 0.58</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Dausa</td>
<td>221 7.39 33 14.39 59 27.70 111 50.23 14 6.33 3 1.36 1 0.45</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Bandikui</td>
<td>207 6.92 23 11.11 57 27.54 108 52.17 18 8.70 1 0.48 1 0.48</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Dikraii</td>
<td>138 4.61 11 7.97 23 16.67 90 65.22 11 7.97 3 2.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jaipur</td>
<td>2990 393 13.14 833 27.86 1460 46.83 253 8.46 49 1.64 2 0.07</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**

A - Number of Villages  
B - Percentage in each range
FIG. 4.3

JAIPUR DISTRICT

Villages According to Size of Population

Above 10000
5000 - 9999
2000 - 4999
500 - 1999
200 - 499
Below 200

Legend:

- 
- 
- 
- 
- 

5 0 10 15 Km
village population (639 person) in Lalsot followed by (764 person) Bassi and (776 person) in Phagi panchayat simiti.

The classification of villages of the district based on the size of population has also been taken into consideration, while studying the spatial distribution of rural settlements in it. The villages of district has been divided into six population groups containing less than 200 to more than 10,000 persons. Table 4.3 shows distribution of population of villages in district. There are 393 villages i.e. 13.14 per cent of villages in District inhabited by less than 200 person, where as 833 villages comprising 27.85 per cent of villages contain between 200 and 499 person. The table 4.3 further 76.67 per cent of villages are in population range of 200-1999 person villages above 2000 person are only 10.15 per cent of total number of villages in the District. Figure 4.3 display the distribution of population size of villages at panchayat simiti level. It is clear from the table 4.4 and the figure 4.3 that there is uneven distribution of the population of villages between different categories and between different panchayat simities of the District. The proportion of villages of very small size varies from 0.84 per cent in Kotputli to 28.67 per cent in Lalsot, where as district average is 13.14 per cent. Similar variation between different categories is also seen between different panchayat simities of the district.
**TABLE - 4.5**

**DENSITY OF VILLAGES PER 100 km\(^2\) IN JAIPUR DISTRICT AT PANCHAYAT SIMITI LEVEL 1991**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Panchayat Simiti</th>
<th>Area (Sq. kms.)</th>
<th>No. of Village</th>
<th>No. of Village / 100 km(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kotputli</td>
<td>663.2</td>
<td>119</td>
<td>17.9</td>
</tr>
<tr>
<td>2.</td>
<td>Virat Nagar</td>
<td>643.8</td>
<td>118</td>
<td>18.3</td>
</tr>
<tr>
<td>3.</td>
<td>Shahpura</td>
<td>407.9</td>
<td>79</td>
<td>19.3</td>
</tr>
<tr>
<td>4.</td>
<td>Govindgarh</td>
<td>666.0</td>
<td>95</td>
<td>14.2</td>
</tr>
<tr>
<td>5.</td>
<td>Sambhar</td>
<td>832.3</td>
<td>143</td>
<td>17.1</td>
</tr>
<tr>
<td>6.</td>
<td>Dudu</td>
<td>1847.5</td>
<td>210</td>
<td>11.4</td>
</tr>
<tr>
<td>7.</td>
<td>Phayi</td>
<td>1111.1</td>
<td>168</td>
<td>15.1</td>
</tr>
<tr>
<td>8.</td>
<td>Sanganer</td>
<td>583.4</td>
<td>205</td>
<td>35.1</td>
</tr>
<tr>
<td>9.</td>
<td>Jhotwara</td>
<td>384.9</td>
<td>102</td>
<td>26.5</td>
</tr>
<tr>
<td>10.</td>
<td>Amber</td>
<td>830.7</td>
<td>194</td>
<td>23.3</td>
</tr>
<tr>
<td>11.</td>
<td>Jamwa Ramgarh</td>
<td>1000.0</td>
<td>231</td>
<td>23.1</td>
</tr>
<tr>
<td>12.</td>
<td>Bawri</td>
<td>630.0</td>
<td>209</td>
<td>33.1</td>
</tr>
<tr>
<td>13.</td>
<td>Chaksu</td>
<td>749.7</td>
<td>258</td>
<td>34.4</td>
</tr>
<tr>
<td>14.</td>
<td>Lalsot</td>
<td>847.4</td>
<td>293</td>
<td>34.5</td>
</tr>
<tr>
<td>15.</td>
<td>Dausa</td>
<td>984.8</td>
<td>221</td>
<td>24.7</td>
</tr>
<tr>
<td>16.</td>
<td>Bhundikui</td>
<td>600.02</td>
<td>17</td>
<td>34.5</td>
</tr>
<tr>
<td>17.</td>
<td>Sikrai</td>
<td>502.7</td>
<td>138</td>
<td>27.4</td>
</tr>
</tbody>
</table>

**Source:** Primary District Census Handbook of Jaipur - 1991
The village density (Figure 4.4) has been arrived at by counting the number of villages per 100 km$^2$ of area. The average density of villages in the study area comes to 24-villages/100 km$^2$. The highest value is found in 35 villages/100 km$^2$ in Sanganer Panchayat Simiti, followed by Bandikui, Lalsot, Chaksu Panchayat Simities (34 villages/100 km$^2$), while lowest value is noticed in Dudu (11 village/100 km$^2$) followed by Govingarh (14 village / 100 km$^2$), Phagi (15 village / 100 km$^2$). The village density per 100 km$^2$ in District varies between 11 and 35 villages per 100 km$^2$.

**Spatial Analysis:**

The spacing of rural settlements denotes the locational arrangement of the villages with respect to one another. To analyse this dimension, classical geographers have considered spacing as a basis for classification of rural settlements into different types. In Sweden, Switzerland, Poland and France, geographers used fixed spacing as a unit for measurement of concentration and dispersion. However, no statistical tool provices a perfect vision of distributional pattern because every unit

---

has its own trend and identity as regards socio-cultural and spatial characteristics. So none of these methodologies can have universal application. The theoretical basis of the relationships between settlements density and spacing was first provided by Robinson and Barnes for the analysis of dispersed rural population of mid West, U.S.A. and Ontario. Their formula is based on the concept of uniform distribution formerly devised by Christaller. This was latter modified by Mather in following manner:

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TABLE - 4.6

AREA AND INTER VILLAGE SPACING PANCHAYAT SIMITI LEVEL - 1991

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Panchayat Simiti</th>
<th>Area (Sq. kms)</th>
<th>No. of Village</th>
<th>D-Inter Village village spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kotputli</td>
<td>663.2</td>
<td>119</td>
<td>2.536</td>
</tr>
<tr>
<td>2.</td>
<td>Virat Nagar</td>
<td>643.8</td>
<td>118</td>
<td>2.510</td>
</tr>
<tr>
<td>3.</td>
<td>Shahpura</td>
<td>407.9</td>
<td>79</td>
<td>2.441</td>
</tr>
<tr>
<td>4.</td>
<td>Govindgarh</td>
<td>666.0</td>
<td>95</td>
<td>2.845</td>
</tr>
<tr>
<td>5.</td>
<td>Sambhar</td>
<td>832.3</td>
<td>143</td>
<td>2.592</td>
</tr>
<tr>
<td>6.</td>
<td>Dudu</td>
<td>1847.5</td>
<td>210</td>
<td>3.187</td>
</tr>
<tr>
<td>7.</td>
<td>Phagi</td>
<td>1111.1</td>
<td>168</td>
<td>2.763</td>
</tr>
<tr>
<td>8.</td>
<td>Sanganer</td>
<td>583.4</td>
<td>205</td>
<td>1.812</td>
</tr>
<tr>
<td>9.</td>
<td>Jhotwara</td>
<td>384.9</td>
<td>102</td>
<td>2.087</td>
</tr>
<tr>
<td>10.</td>
<td>Amber</td>
<td>830.7</td>
<td>194</td>
<td>2.223</td>
</tr>
<tr>
<td>11.</td>
<td>Jamwa Ramgarh</td>
<td>1000.0</td>
<td>231</td>
<td>2.235</td>
</tr>
<tr>
<td>12.</td>
<td>Bassi</td>
<td>630.0</td>
<td>209</td>
<td>1.865</td>
</tr>
<tr>
<td>13.</td>
<td>Chaksu</td>
<td>749.7</td>
<td>258</td>
<td>1.831</td>
</tr>
<tr>
<td>14.</td>
<td>Lalsot</td>
<td>847.4</td>
<td>293</td>
<td>1.827</td>
</tr>
<tr>
<td>15.</td>
<td>Dausa</td>
<td>894.8</td>
<td>221</td>
<td>2.162</td>
</tr>
<tr>
<td>16.</td>
<td>Bandikui</td>
<td>600.02</td>
<td>207</td>
<td>1.829</td>
</tr>
<tr>
<td>17.</td>
<td>Sikrai</td>
<td>502.7</td>
<td>138</td>
<td>2.050</td>
</tr>
</tbody>
</table>

Source: Primary District Census Handbook of Jaipur - 1991
JAIPUR DISTRICT
SPACING OF VILLAGES

Kilometer
< 2.00
2.01-2.25
2.26-2.50
2.51-2.75
> 2.76

FIG. 4.5
\[ D = \frac{1.0746}{A/N} \]

Where, \( D \) = Theoretical distance between points or Settlements in hexagonal arrangement.

\( A \) = Area, and

\( N \) = Number of Settlements per unit area.

The composition of theoretical inter-settlement distances at panchayat simiti level clearly indicates the pattern of spacing in the District (Figure 4.5), which according to the range of spacing varies between 1.812 kilometre in Sanganer Panchayat Simiti and 3.187 kilometre in Dudu Panchayat Simiti. District average spacing is 2.282 kilometre. As many as 7 panchayat simities show above than District average spacing. Table 4.6 shows the inter-village spacing at panchayat simiti level. Inter village spacing can be grouped into five categories as, very low, low, moderate, high and very high spacing.

**Very Low Spacing (< 2.00 km):**

This group consists of five panchayat simities i.e. Sanganer, Bassi, Chaksu, Lalsot and Bandikui the value of spacing is 1.812, 1.865, 1.831, 1.827 and 1.829 respectively. It covers 39.16 per cent of total district area, generally
lying in south-eastern of the District. The average village
density of these blocks are (32 village per 100 km²). These
panchayat simities have well drained land, drained by
R. Dhand River Morel and River Ratnaganga in fertile and
high productive land. These panchayat simities are good
example of an agricultural economy characterised by small
and medium size villages in large number. This is result
of the availability of fertile land, high water table,
assessibility to means of transport and communication.

Low Spacing (2.01 - 2.25 km.):

This group covers an area 3365.8 square kilo metre,
while is 28.71 per cent of total area of the District
including five panchayat simities, viz. Amber, Jhotwara,
Jamwa Ramgarh, Dausa and Sikrai. The lowest spacing in this
group Sikrai (2.05) while highest spacing of Jamwa Ramgarh
(2.23). It contains 887835 person of District and 29.6 per
cent (886) of inhabited villages. Here average area per
village ranges (Sikrai) 3.64 km² to 4.32 km² (Jamwa
Ramgarh), while village density shows variation between 23
(Amber and jamwa Ramgarh) and 27 village per 100 km² of
area in Sikrai panchayat simiti. The development of
transport, communication irrigational facilities like tank
irrigation and fertile soils are responsible for the growth
of semi compact settlement in those areas.
**Moderate Spacing (2.26 - 2.50):**

This group comprise of only one panchayat simiti namely, Shahpura the value of spacing in this simiti is 2.44 km. covering 643.8 sq. kms. area of the District which is 2.64 per cent of total District area. Total population of this panchayat simiti is 128177 person while average population per village is 1622 per village. Village density is 19 village per 100 km², large number of villages (60.76 per cent villages) one in 500-1999 population range.

**High Spacing (2.51 - 2.75):**

Relatively high spacing prevails in three panchayat simities of the District, viz., Govindpur, Viratnagar and Kotputli, they comprising of 11.10 per cent (1973.2 km²) area of Jaipur District. The areal size of the villages in these panchayat simities ranges 5.45 km² (Viratnagar) to 7.01 km² (Govindagarh), these panchayat simities having 11.10 per cent (332) of its inhabited villages. The number of inhabited villages per 100 km² of rural area in these panchayat simities ranges 14 villages per 100 km (Govindagarh) to 18 in (Viratnagar), which results in large inter-village spacing and big villages, unproductive rugged lands, high lands marshy land, lack of irrigational facilities and
inadequate means of transport and communication are basic course for high inter-village spacing.

**Very High Spacing - (Above 2.76):**

Very high spacing is found in two panchayat simities in the District, viz., Dudu and Phagi. These areas are characterised by numerous salty lakes as Sambhar, Phulera and Various other smaller Jhils and tals and contain salinelands, particularly as well as various extention of Aravallis hillocks and ruggedness of area, so that most of its areas are rendered uninhabited. Besides, lack of fertile, soil, irrigational facilities, transport and communication, desert, clinate etc. one responsible for very high spacing (Inter-village) in these two panchayat simities. They cover 12.63 per cent (2958.6 km$^2$) of the total area of district and 378 villages of total inhabited villages. The density of villages per 100 km$^2$ in Dudu and Phagi are 11 and 15 respectively. The average size per village is 8.79 km$^2$ (Dudu), 6.61 km$^2$ (Phagi).

The foregoing discussion reveals a direct relationship between spacing and settlement density per 100 km$^2$ in different panchayat simities of Jaipur district. It is obvious that where spacing is high villages are of larger size, with a small number of hamlets having high density of population, which results in compact structure of
settlement. On contrary in areas of low spacing, settlements are generally smaller in size with low pressure of population and scattered distributional pattern, viz. hamleted type settlements. A Radial distribution of rural settlement can be interpreted with the help of theoretical spacing and settlement density per 100 km². Figure shows that, as spacing decreases village density increases and vice versa. According to relationship between these two factors rural settlement may be classified into different types. Very low spacing (< 1.50 km) with high settlement density (> 40 settlement per 100 km²) may be taken as an index of hamleted type, such type of settlements does not exist in study region. Low spacing (< 1.95 km) with medium settlement density (30-40 village per 100 km²) is an indicator of semi-compact structure, in this type of settlement type five panchayat simities comes under semi-compact type. Medium spacing (<2.7 km) with moderate settlement density (15-30 villages per 100 km²) may be taken as index of compact structure nine panchayat simities coming in this category. High spacing (> 2.7 km.) and very low village density (< 15 village per 100 km²) giving rise very compact type of settlements since these indices are not sufficient for classification of rural settlements. Other may also be considered to classify the rural settlement.
Nature of Dispersion:

Dispersion of Rural Settlement is a function of several factors, including the process of evolution, the time lag, and everchanging socio-economic conditions under the influence of scientific and technological progress. Several statistical techniques of measuring degree of dispersion and concentration have been evolved by Stone and Hudson but these two have no precise connotations and their significance levels vary from region to region, due to physio-cultural variation. An attempt has been made here to measure the degree of dispersion, taking on the basis of the observed mean of nearest inter-village straight line distance ($o$), village density ($d$) and expected distance ($E$). This method is known as nearest neighbour approximation analysis. In this analysis it is assumed that points are distributed randomly in accordance with a poisson probability function, which assumes that each location has an equal chance of containing a point, while, in the real world settlements are neither always evenly spaced, nor are they spaced in a strictly random pattern. Thus dispersion may be defined as degree of deviation of set of points from random relative to some delimited areas.


It is true that the actual establishment pattern can hardly be predicted through any statistical analysis because every unit has its own trend and identity. It is more so in an ancient settled area where the settling process has seldom been in accordance with any geometrical pattern.

The first suitable approach towards dispersion analysis has been initiated by plant ecologists Clark and Evans in their analysis of distributional pattern of various species over a given space. According to them the index of randomness (RN) can be completed by using the following formula

\[ RN = \frac{o}{E} \quad \text{Where} \quad E = \frac{1}{2} \left( \frac{1}{d} \right) \]

\[ = 2 \times o / d \]

For the present analysis, panchayat simiti has been taken as standard areal unit for measurement of RN values, and all the inhabited settlements in the Panchayat simities of Jaipur district have been taken into consideration in the present study.

The index of randomness (RN) has been calculated by applying above mentioned formula. This provides a measure of the degree to which the distributional pattern of the observed inter-village distance deviates from random expectation. The value of this index ranges from 0.0 (complete confrontation) through 1.0 (random) to 2.149 (ideal or normative hexagonal lattice). This index of RN value can be correlated with variance (V) for further testing, which can be computed by mathematical formula.¹

\[ V = \frac{4-N}{4} \text{dn} = 0.0683086/d \]

When the value of \( E \) is greater than \( V_1 \), the distribution is termed regular, when the value of \( V \) is greater than \( E \), it is termed clustered, and term random is applied to a case when \( V \) and \( E \) are equal, i.e. variance-mean ratio is one. In the present study, the value of \( E \) is always more than \( V \), thus representing a regular rather than random pattern.

Table 4.7 shows the result of RN values and different indices calculated with reference to the nearest neighbour analysis for each panchayat simiti of the District while figure 4.7 gives the measurement of spatial pattern of rural settlement in study area. The RN values

¹ Dacey, M.F., "Order Distance in an Inhomogenous Random Point Patterns", Canadian Geographer, Vol.9, 1965, pp. 144-152.
JAIPUR DISTRICT
Nearest Neighbour Distances of
Rural Settlements 1991

FIG. 4.6
TABLE 4.7

SPACING AND NATURE OF DISPERSION OF RURAL SETTLEMENT

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Panchayat Simiti</th>
<th>d/km²</th>
<th>D</th>
<th>o</th>
<th>E</th>
<th>RN</th>
<th>V</th>
<th>Di</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kotputli</td>
<td>0.179</td>
<td>2.536</td>
<td>1.822</td>
<td>1.182</td>
<td>1.541</td>
<td>0.381</td>
<td>0.740</td>
</tr>
<tr>
<td>2.</td>
<td>Virat Nayar</td>
<td>0.183</td>
<td>2.510</td>
<td>1.485</td>
<td>1.169</td>
<td>1.270</td>
<td>0.373</td>
<td>0.631</td>
</tr>
<tr>
<td>3.</td>
<td>Shahpura</td>
<td>0.193</td>
<td>2.441</td>
<td>1.565</td>
<td>1.138</td>
<td>1.375</td>
<td>0.353</td>
<td>0.641</td>
</tr>
<tr>
<td>4.</td>
<td>Govindgarh</td>
<td>0.142</td>
<td>2.845</td>
<td>1.815</td>
<td>1.328</td>
<td>1.366</td>
<td>0.480</td>
<td>0.636</td>
</tr>
<tr>
<td>5.</td>
<td>Sambhar</td>
<td>0.171</td>
<td>2.592</td>
<td>1.798</td>
<td>1.209</td>
<td>1.487</td>
<td>0.399</td>
<td>0.691</td>
</tr>
<tr>
<td>6.</td>
<td>Dudu</td>
<td>0.131</td>
<td>3.187</td>
<td>2.138</td>
<td>1.383</td>
<td>1.545</td>
<td>0.521</td>
<td>0.719</td>
</tr>
<tr>
<td>7.</td>
<td>Phagi</td>
<td>0.151</td>
<td>2.763</td>
<td>1.742</td>
<td>1.287</td>
<td>1.353</td>
<td>0.452</td>
<td>0.628</td>
</tr>
<tr>
<td>8.</td>
<td>Sanganer</td>
<td>0.351</td>
<td>1.812</td>
<td>1.464</td>
<td>0.844</td>
<td>1.734</td>
<td>0.194</td>
<td>0.810</td>
</tr>
<tr>
<td>9.</td>
<td>Jhotwara</td>
<td>0.264</td>
<td>2.087</td>
<td>1.217</td>
<td>0.973</td>
<td>1.250</td>
<td>0.258</td>
<td>0.756</td>
</tr>
<tr>
<td>10.</td>
<td>Amber</td>
<td>0.233</td>
<td>2.223</td>
<td>1.641</td>
<td>1.036</td>
<td>1.583</td>
<td>0.293</td>
<td>0.735</td>
</tr>
<tr>
<td>11.</td>
<td>Jamwa Ramgarh</td>
<td>0.231</td>
<td>2.235</td>
<td>1.547</td>
<td>1.040</td>
<td>1.487</td>
<td>0.295</td>
<td>0.693</td>
</tr>
<tr>
<td>12.</td>
<td>Bassi</td>
<td>0.331</td>
<td>1.865</td>
<td>1.175</td>
<td>0.869</td>
<td>1.352</td>
<td>0.206</td>
<td>0.631</td>
</tr>
<tr>
<td>13.</td>
<td>Chaksu</td>
<td>0.344</td>
<td>1.831</td>
<td>1.634</td>
<td>0.852</td>
<td>1.917</td>
<td>0.198</td>
<td>0.892</td>
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<tr>
<td>14.</td>
<td>Lalsot</td>
<td>0.345</td>
<td>1.827</td>
<td>1.210</td>
<td>0.851</td>
<td>1.421</td>
<td>0.197</td>
<td>0.661</td>
</tr>
<tr>
<td>15.</td>
<td>Dausa</td>
<td>0.246</td>
<td>2.162</td>
<td>1.432</td>
<td>1.009</td>
<td>1.419</td>
<td>0.277</td>
<td>0.659</td>
</tr>
<tr>
<td>16.</td>
<td>Bandikui</td>
<td>0.345</td>
<td>1.829</td>
<td>1.147</td>
<td>0.851</td>
<td>1.347</td>
<td>0.197</td>
<td>0.626</td>
</tr>
<tr>
<td>17.</td>
<td>Dikrai</td>
<td>0.274</td>
<td>2.050</td>
<td>1.112</td>
<td>0.956</td>
<td>1.163</td>
<td>0.249</td>
<td>0.542</td>
</tr>
</tbody>
</table>

Source: Primary District Census Handbook of Jaipur - 1991
ranging from 0.844 (Sanganer) to 1.383 (Dudu) panchayat simities, reveals clear tendency towards regularly. On the basis of RN value, the dispersion in different panchayat simities of Jaipur district may be classified under five categories as indicated in Figure

**Least Regularity (<1.300):**

This group include three panchayat simities namely virat nagar, Jhotwara and Sikrai, having RN value 1.270, 1.250 and 1.163 respectively. Covering 11.96 per cent (358) villages of the District and 1531.4 km$^2$ of area. Average area per village being 5.573 sq. km (Virat Nagar) 3.774 sq. km. (Jhotwara) and 3.642 sq. km. (Sikrai). The observed inter-village distance (o) is 1.485 km (Virat Nagar), 1.217 km (Jhotwara) and 1.112 km (Sikari) while expected inter village distance (E) in the panchayat simities are 1.169 km. in (Virat Nagar), 0.973 km. (Jhotwara) and 0.956 km. in (Sikrai), which is lower than the observed value distance. The intensity of villages per 100 km$^2$ is 18,26 and 27 respectively which lies in medium range. These panchayat simities are located in three different locations in the district.
Low Regularity (1.301 - 1.475):

Low regularity found in seven panchayat simities of the District covering an area of 5657.9 sq. km. and containing 1272 villages which is 42.54 per cent of total villages. These seven panchayat simities shahpura, Govindgarh Phagi, Barsi, Lalsot, Dausa and bandikui have average village density in between 14 (Govindgarh 34 in (Lalsot, Bandikui). The area is inhabited by small to large villages, the value varying from 7.01 sq. km. (Govindgarh) to 2.89 sq. km. (Lalsot). The observed inter-village distance ranges from 1.815 km (Govindgarh) 1.147 km. (Bandikui). The inter village spacing (D) is 2.845 km. (Govindgarh) to 1.827 km. (Lalsot). The expected inter-village distance (E) shows lower value ranging from 1.328 km. to 0.851 km. so the RN value is always above 1.

Moderate Regularity (1.476 - 1.500):

Areas of moderate regularity comprise of two panchayat simities in Jaipur District are Sambhar and Jamwa Ramgarh. This group covers 1832.3 sq. km. area and 374 villages which is 12.5 per cent of the total villages of the district Inter-village spacing is 2.592 km. and 2.235 km. respectively. Average area in these panchayat simities are 5.82 sq. km. and 4.32 sq. The village density per 100 km$^2$
RADIAl DISTRIBUTION
FUNCTION OF RURAL SETTLEMENT

VERY LOW SPACING

HAMLETED

LOW SPACING

MODERATE SPACING

COMPACT

HIGH SPACING

NO. OF VILLAGE PER 100 KM²

1.0746 \sqrt{A/N}

FIG. 4.8
is 17 and 23, observed distances (o) in these panchayat simities, i.e. Sambhar and Jammu Ramgarh is 1.798 km., and 1.547 km. respectively, while expected distances (E) is 1.209 km. 1.040 km., which is lower than the observed distances. So RN values above one which are 1.487, and 1.487 of both.

**Moderately High Regularity (1.501 - 1.675):**

Moderately high regularity has been found in three panchayat simities namely Kotputli, Amber and Dudu. They cover 3341.4 sq. km. area of district and 17.49 per cent (523) villages of the District. They are in rugged and bad land areas of Jaipur district. The inter-village spacing of these panchayat simities varies from 3.187 (Dudu) to 2.223 km (Amber). These panchayat simities have average village area between 8.79 km. (Dudu) 5.57 sq. km. (Kolputli), 4.28 sq. km. (Amber) observed distances (o) are 2.138 km. in Dadu to 1.641 km. Amber, while the expected distance of Dudu, Kolpulti and Amber are 1.383, 1.182 and 1.036 km. respectively. The Rn value of these panchayat simities are 1.545 (Dudu), 1.541 (Kotputli) and 1.583 (Amber).

**High Regularity (> 1.676):**

This area include only the two panchayat simities (Sanganer and Chaksu) with RN value 1.734 and 1.917,
incorporating 1334 sq. km. area and 483 villages (915.48%) of total villages of Jaipur district. The observed inter-village distance (o) in these panchayat simities are 1.464 (Sanganer), and 1.634 (Chaksu) while expected inter-village distance (E) is 0.844 (Sanganer), 0.852 (Chaksu). These two panchayat simities are located in south-central parts of the district having high regular distributional pattern of settlement in it.

On the basis of the for going discussion it may be concluded that trend of dispersion has in every case been found towards regularity. So Dacey's Regular Poisson probability law\(^1\) is quite applicable in this case, because the empirical variance mean ratio here is always less than 1. The deviation index of nearest neighbour has also been tested with use of normalizing index of random disturbances whose intensity has been measured by using following mathematical formula:\(^2\)

\[
Di = \frac{o}{(1.0750 / \bar{d})}
\]

Table 4.7 shows that the normalizing index (Di) values, in various panchayat simities of the district ranges from 0.542 (Sikrai) 0.810 (Sanganer) indicating clear tendency towards regularity.

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CHAPTER - V

PATTERN OF SETTLEMENT : A CLASSICAL APPROACH

Settlements are the organised habitation of the people as a physical landscape including the buildings in which they live or work and the streets over which their movement take place. The shape of the settlements are influenced by physico-cultural, socio-economic and religious rituals of the region. The patterns are subject to change depending upon the ecological setting of the area, therefore, it exhibit considerable variations from one area to other area.

The word 'pattern' is often equated with the word 'shape'. However, these are geometrical dissimilarities between these two terms. According to West Bengal, A closed curve has a shape where as a non-closed collection of points has a pattern. Therefore, a settlement has shape become its boundaries are close curve which circumscribe an area or a space in two dimensions. The pattern of points are zero dimensional objects whose patterns are operationally determined via relative distances or spacing of points with respect to one another. According to basic properties, patterns can be categorised into three classes:

(i) Settlements that have the pattern of Euclidean Geometry
(ii) Those that are independent of scale and density and
(iii) Those which may be expressed through the relative
spacing of individuals in the distribution, but in thus case it should be noted that a single distribution will have different pattern at different quadrant sizes.

Settlement pattern and determined in relation to natural or man made features such as streams, ridges, canals and roads. It is also determined on the basis of location of houses and high ways. It shows the shape of settlements and relationship between one dwelling and other some time irrespective of the site of settlement. In the same way site may have no bearing an pattern. In the analysis of patterns of settlements two basic things have to taken into consideration. First, the pattern should be abstracted from habitat. Secondly, the pattern should also depend upon houses, people wish to construct. It may consist of socio-cultural need of the people, as cattle sheds, granaries out houses. In Urban areas a store, garage, post-office, school and large gathering halls may also determine a pattern of settlement.

Villages in the region greatly differ from one another in shape and pattern by reason of differences in the arrangement of streets of houses. Street system is most crucial element because houses are generally built according to street or a road. However cultural elements such as location of places of worship, giving a distinct character to the pattern of settlement. The study of
settlement pattern comprises two aspects i.e. (i) The external layout and (ii) the internal plan, both these aspects are closely related, various geographical conditions such as location, configuration of land, surface water (rivers, canals, tanks, ponds and wells etc.), the nature of soil, vegetational cover, shape of cultivated fields, besides these physical conditions, historical events, cultural conditions, patterns of roads and streets and other features such as Temples, Mosques, Churches, garrison etc. also influence the settlement pattern. In the past state of insecurity and the present social taboos and ethos of the society are another significant factors in the development of settlement pattern. Grouping of houses due to certain reasons assumes different forms as a result of which many distinct patterns emerge. These may be some settlements where no pattern is recognizable, such patternlessness becomes a pattern in itself and its consequences as cross working of various causes and functions of a settlement. Arrangement of houses is conditioned factors like roads, cent-tracks, water facility while lanes and streets from the skeleton of the lay out of a village. Buildings located in the space with in the skeleton determined the shape and form of the village as does the flesh in the body.
However, ancient literature throws light on the Aryan village pattern. This pattern was based on the Swastika marking the cross road of an Aryan village which ran north and south, and east-west. They were terminated at the four gates dedicated to four position of Sun. Another example of settlement pattern is found in Manasara Shilpshastra. According to this plan, there were eight types of Aryan villages: Dandaka, Sarvatobhodra, Nandyavavta, Padmaka, Swastika, Prastara, Karmuka and Chatusmuka.

It is obvious from this that most of plans were rectangular or square and did not appear to differ in essentials. Each village was surrounded by wall with a ditch for defence purposes. There were generally a gate in the middle of each of the four quarters. The outer of village was usually occupied by temple, a tank or a public hall. The town quarters were further sub-divided by straight streets. Each block was inhabited by member of a peculiar caste or profession, the best quarter being generally reserved for Brahmins and people of other high caste. The axis of general plan and intersection by streets were made in relation with the climatic condition.


This type of plan of rural settlement does not occur at present day in their true form hence study of present village pattern is of vital interest.

**Shape Analysis: Classical Approach:**

The emerging methodologies since late nineteenth century indicate the traditional or classical view of shape analysis, mostly followed by Meitzan (1895) in dealing with the classification of rural settlement of Germany on the basis of their form and patterns. Demogeon has added to this morphological structure of village and their plans in describing village shape.¹ In his study of Yamoto basin, Hall used the external forms of selected areas as a basis for the classification of village pattern.² His method have been followed by other European Geographers. In India this approach has been initiated by Singh, in describing the layout of village in middle Ganga Valley. According to it, the entire village is divided into is number of squares or rectangles, each forming separate strip of forms, pasture of gardens with definite field boundaries like fixed village limits.³

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In a settlement pattern, two elements are common, i.e. the main inhabited site and the hamleted site while the structural arrangement of inhabited sites vary in their shapes.

The present analysis of village pattern is primarily concerned with clustered settlements, as such settlements, on account of the congregation of a number of dwellings and arrangements of association lanes give rise to different village patterns. So analysis is confined to only those villages which are compact or semi-compact settlement, for this analysis villages of varying shapes have been selected from survey of India's topographical sheets, on the scale of 1 cm = 500 metres or R:F 1:50,000. On the basis of observation a number of settlement patterns have been identified, which are as follows.

**Hollow Square Pattern:**

The hollow square pattern is similar to the square pattern with hollow or unbuilt space in the centre of village, as in the course of hollow rectangular settlement, the unbuilt space is caused by the presence of tank or a temple or mosque or a garden or by any such features etc.

**Elongated or Linear Pattern:**

Elongated or linear arrangement is another common settlement pattern found in the region. It is easily
recognised by a simple arrangement of houses along a road, lake shore or river bank, etc. This is mostly due to the effect of the site, physical or cultural factors in the site which either restrict the growth of some settlements in particular direction or foster its extension in others. The advantage of proximity of a river or drainage for obtaining drinking water, in flood free areas are some of the physical factors which cause elongation of settlements. Among cultural factors, metalled or unmetalled road and railway lines also exert result in the elongation of villages. Road and Camel tracks attracts the people to settle along them. In the past the danger of troops or organised robbers attacking the villagers, prevented the growth of settlement along the roads, but now a days considerable number of villages are growing along the roads. In study area large number of villages are in this category i.e. Sewa, Bhandarej etc. show in figure 5.1.

Circular Pattern:

Circular settlements, which may have several variation, result from an attempt to built a maximum number of houses at one site. Such houses are generally built around the maxion of local zamindar or clan chief or around the village well this pattern is the heritage of the past particularly of eighteenth and nineteenth century, when the
security of villages were uncertain. A considerable number of such type of semi-fortified settlements have circular pattern. "The circular form is a natural result of maximum aggregation for the purpose of defence, around the mansion of local zamindar, who use to protect the peasants against neighbouring chief. In some cases natural barrier like shallow marshes or lakes etc. or religious buildings like temple or mosques, ponds, wells or market places also produce such a circular pattern. Due to the presence of these cultural features in the centre hollow circular pattern is developed. Digo and Watica are best example of such pattern in the distinct

**Radial Pattern:**

This sort of village pattern is similar to the circular pattern with slight variation in internal as well as external structure of lay out. The Radial pattern of settlement is conditioned by radiating character of count-tracks or lanes which coverage at central point the house of Zamindar, place of worship, water well etc. i.e. as Kananta

**Chess Board Pattern:**

The chess board pattern or guid pattern denotes right angled mesh of streets with or without a central
FIG. 5.1
PATTERNS OF SETTLEMENTS IN JAIPUR DISTRICT

SOURCE: SURVEY OF INDIA TOPOGRAPHICA SHEET NO. 45N, N., N., M.
T 12 13 2
rectangular market place. Such plan is typical feature of some large rectangular and square villages. In these villages two or more streets meet each other at right angles and few others subsidiary lanes runs parallel to the main steel, which gives rise to such a pattern generally the village is divided into words or tolas, each inhabited by different castes as Harsoli village in the district.

**Double Nucleation:**

This is characterised by two villages so near to each other that it one of them must have grown up by colonization upon the edge of other. Among the physical and cultural feature small 'valas', ponds, canal road, railway line etc. are important factors producing such a pattern. From revenue and administrative point of view, each village may have a separate entity, but geographically these two are one. Such pattern may also be developed as result of market attraction, such village is Kaladera.

**Triangular Pattern:**

This pattern occur on site when the growth of settlement is restricted on three sides by certain physical or cultural factors. Cart-tracts, roads, rivers, railway line etc. may restrict the growth of settlement. This settlement pattern may come into existence at the junction
of three roads. Best example of such settlement pattern is Kolpulli Jajeer as in Fig.5.2.

**L-Shaped Pattern:**

L-shaped pattern is subsidiary to the rectangular or square pattern. It came into existence when two roads, cant tracts meet at right angle and attracts people to settle along them such type of settlement pattern is rare in Jaipur district, Hastera village show some of the characteristics.

**Rectangular Pattern:**

The most common village shape of the nucleated settlements is rectangular one this is not true only for the area under study, but also for the other parts of India, China, Japan and Italy. The main consative factors for this pattern is rectangular divisions of land prevalent in ancient times known as the 'bigha' system, comparable with the 'Jori' system of Japan, handen of China and Juferium of Italy. In fact rectangular pattern is heritage of the ancient part, as it has been in Mansara. Our land measurement system - bigha, based on square units, has been responsible for the emergence of this pattern of villages,

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people did not want to disturb the shape of fertile arable fields adjoining their dwellings as these fields were the chief assets and source of livelihood of the formers.

An aggregation of rectangular or square dwellings results in rectangular plans for villages. The rectangular alignment of dwelling with their main axis from north to south and from east to west is also designed to get maximum sunlight and fresh air. Another advantage of rectangular shape lies in maximum accommodation of dwellings in a number of rows parallel to each other. In brief, when ever human habitation are agglomerated the plan of village conforms broadly to rectangular shape and when it did not have natural growth. The pattern is generally irregular or roughly rectangular or square. Rectangular pattern is the chief characteristics of study area. Muntoda, Rahlana and Nangol are some example of this pattern, which are show in (figure 5.1).

**Hollow Rectangular Pattern:**

Hollow rectangular pattern is marked by an unbuilt open space in middle of a settlement. It is found in areas of frequent strige, where the central vacant space was formerly occupied by an old fort or place of local chief tain, around which the villagers congregated in course of time the fam ily of the chief tain was ruined or shifted with result that the fort or the palace disappeared and
space is now marked by mound of ruins at the centre of the settlement. Superstition does not allow people to build houses on the ruined sites. Hence the neglected space remains unoccupied and results in a hollow rectangular pattern. Some other typical feature like a temple, a church, a mosque, a pond, chaddy tree etc. in middle of village may also lead the formation of such a pattern. In summer season, peasants gather under the tree for relaxation and in winter evenings a bonfire may lit around which the village folk exchange gossips. In some instances, weekly or bi-weekly markets are held in vacant places and even sometime such open spaces are used for the processing and cleansing of agricultural produce. In the District of Jaipur such settlement patterns are much but few are located in Figure 5.1 i.e. Dudu, Goner etc.

Square Pattern:

The square and rectangular patterns are complementary to one another. Due to attractive but restrictive physical forces in a village site a square settlement may turn into rectangle one, vice-versa. The crossing of carttracks or roads leads to the formation of this pattern villages lying at the intersection of two cant-track give rise to four district blocks, all in generally square shape. Existence of thick grooves, tanks
or ponds, road etc. restrict the growth of houses outside the squares. These four squares are sometimes occupied by different castes, according to hierarchy, villages of perfect square pattern did not seen on the topo-sheet, generally rectangular and square shape were resembling as in the case of Nongol and Dudu etc.

**Amorphos Pattern:**

The amorphos pattern of rural settlement are found in an area where several settlements and formsteads are found scattered, connected by footpath and cant-tracts having no definite shape. Such villages are dotted with numerous hamlets and individual form steads, all being very small and are linked by central function such irregular distribution of settlements with no definite settlement pattern is called amorphous pattern. This pattern may seen in parsoli, phulera, and Amer etc.
CHAPTER - VI

SYSTEM - DEFINITION AND EXPLANATION

A system is "a set of objects together with relationships between the objects and their attributes", further a system can be defined logically as a set of elements so closely inter-connected that change in any one of them result in changes in all the others. Schumm is of the opinion that a system is a meaningful arrangement of things. A spatial system is one in which one or more functionally interdependent variables are found. Beer stated that "a system is one of the names of order, the Antonym of chaos". The World that is perceived is to a great extent orderly and consists of a series of objects linked by flows of energy and mass constituting a system. Berry explained that a system may be characterised as "a group of inter-dependent elements, which function together for a purpose". As per meaning given in Webster's new Collegiate Dictionary, "A system is a regularly interacting or inter-dependent group of items forming a unified whole, a group of inter-acting bodies under the influence of

related forces, or an assemblage of substances, that is, in or tends to equilibrium or a form of social, economic political organization or ideas or principles usually intended to explains the arrangement of working of a systematic whole" e.g. system of philosophy, classificatory system, solar system, eco system, political system, settlement system, human system, circulatory system etc. An organization amenable to treatment of 'wholes' is called a system. Chorley and Kennedy suggested that "a system is a gestalt concept (concept of wholes) in which the relationship between the elements makes it greater in sum than more addition of the constituents of which is comprised." Angyal noted that the difference between a system and an aggregate is that in the former the parts are arranged, while in the latter they are merely added. System approach attempts to see facts in wholes rather than in pieces, and stresses the relationships rather than information per

Hall and Fagen stated that a system is "a set of objects together with relationships between the objects and between their attributes". The objects are classified in the first order, second order and third order objects. A system is not a real thing but a convenient obstruction. The obstruction and closure of a system are necessary for analysis, process and experimental design because any
system, in reality is infinitely complex. There are three fundamental aspects of all systems namely structure, function and evolution.

**Structure and Elements System:**

A system is composed essentially of elements and the links between the elements. An element is a primitive term that has no definition, like that of concept of point in geometry. Nevertheless the structure of a system is the sum of elements and connection between them. Function concerns the flows (Exchange of relationships) which occupy the connections. Development presents the exchange in both structure and function which may take place over time.

The definition of an element depends upon scale at which we concine of the system, for example, a department may be viewed as a system made up of individual people, each person may be regarded as a biological system and so on. Similarly a car may be an elements in traffic system, but may also be regarded as constituting a system.

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Figure 6.1. Two difference views of inter system interaction. The upper shows system A and B interaction as units, with smaller system interaction going on with in each system. The lower diagram shows system A and B interacting at lower level (after Blalock and Blalock 1959).
Figure 6.2. Shows the kind of relation that may exist between elements within the system.
So it is clear from these examples that definition of an element depends upon the scale at which we conceive of the system the concept of elements as a component unit of system has been plotted by Blalock and Blalock which has been shown in Figure 6.1 which shows two different views of interaction. First shows system A and system B interacting as sub-units with smaller system interaction going on within each system. Second Figure 6.2 shows system A and B interacting at lower levels.¹

Another problem is system building is how to identify the elements. Identification is particularly difficult when we are dealing with phenomenon which are continuously distributed e.g. when precipitation forms an element in system. Identification is easiest with elements which are clearly separated, such as farms. But from the point of view of mathematical systems theory an element is variable. It follows, therefore, that in seeking for a translation of mathematical elements in geographical context. We must construct the element as an attribute of some defined individual rather than as individual itself.²

The second component of system is links (Relationships). The link of the system which connects the


different element of a system have been shown in the figure, three basic forms of relationships may be defined as follows:

(i) Series relationship
(ii) Parallel relationship
(iii) Feedback relationship

The other two compound relationships are as follows:

(i) Simple compound relation
(ii) Complex compound relation

(i) **Series Relationship**: This is the simplest characteristics of elements connected by an irreversible link $C_i - C_j$ forms a series relation and it may be observed that this characteristic possess a cause and effect relationship with which traditional science has dealt. Thus relationship can be explained by an example, the productivity of wheat in Ganga Nagar depends upon the irrigation available.

(ii) **Parallel Relationship**: This relationship occurs when two or more elements affects a third or inversely when one element affect two or more others as in figure 6.2, for example, the precipitation and temperature variables
influence the vegetation and vegetation in turn influences the amount of rainfall received and general temperature conditions.

(iii) **Feedback Relationship:** A feedback relationship is a kind of link that has been newly introduced into analytic structures. It describes a situation in which one element influences itself.\(^1\) For example, the leguminous crops sown in the field enrich the nitrogen in soil and thus themselves affected.

It is possible to combine these relationships in a number of ways, so that two elements may be connected in various different ways simultaneously. The link thus form a kind of wiring system connecting elements in various ways.

**Closed System and Open Systems:**

The classification of system according to the exchange of energy and matter through the boundary between the system and its surrounding environment i.e. the larger system of which it is part. **Foster,\(^2\) (M)** and other developed the following framework:

(a) **Isolated Systems:** Where neither matter nor energy is exchanged with environment.

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(b) Non-Isolated Systems:

(I) Closed system - where energy, but not matter is exchanged with environment.

(II) Open System - Where both matter and energy are exchanged with the environment.

Matter and energy are the two important ingredients of a system. Matter has mass and occupy space and participates in the constitution of physical objects. Energy is capacity and ability to do work and work refer to some force accelerating mass. These term matter, mass energy and work have been drawn from physics but it is equally applicable to other sciences as well.

Closed system has no interchange of energy or matter across their boundaries and posses clearly defined boundaries. They initially have an energy supply and the end result is determined by thus initial energy input. When no energy is available to do work entropy increases to a maximum. True equilibrium is attained with maximum entropy. Thus an increase in entropy implies a decrease in the organization of system.

Open system has a ranked difference with closed system. In open system energy and matter may flow across the boundaries of system and there is a continuous flow of
energy and material through the system. They are thus characterised by varying amount of entropy but never maximum entropy. However entropy may decrease remain constant, or increase because the direction of change depends upon reaction of the system component to the imports. Since there is balance between export and import of energy between the system and the environment. An open system may maintain a state of equilibrium "Dynamic equilibrium" or "Steady State". The static equilibrium of a closed system differs from the dynamic equilibrium of an open system. It is thus important to specify the relationship of the system to the environment in which it operates.

Other aspect of system are Entropy and Negentropy. Entropy is the ultimate state of inert uniformity, which describes the tendency inherent in a system organization. It is qualitatively measure the randomness and disorder of a system as entropy of system increases, greater disorder and more disorganised the system. Negentropy measures the organization of a system the more complex organization of a system. The greater is the negentropy because energy is more efficiently used.


Third aspect of system analysis which is great importance is notion of stability and instability in systems. Stability in a system implies continuance of structure overtime. Structure refers to locational pattern of a variety of objects both as they exist at one specific point in time and also they change over in spatial or temporal aspect. "It only demands that change occur in such a way that the system structure continues to be recognisable overtime".

Margalof noted there are two type of stability, the stability that survives changes, and the stability that remains the same but never tested.

Instability in a system is a particular kind of dynamics in the system in which growth and evolution are prominent features. Of vital significance in study of urban systems, is question of instability of evolutionary process this kind of system is characterized by discontinuous growth where one kind of evolution can become arrested and exchanged for another kind this happens because an urban system evolves in an environment which forms part of urban system itself with monitoring and changing interaction


between various parts of system. This dynamic system shows either the oscillatory behaviour showing cyclic fluctuations resulting from the interaction of sub-system or unstable behaviour reflecting unfixed and changing state of system, i.e. the circular and cumulative causation model, controlled by feedback process.

**System Equilibrium:**

Energy system maintains equilibrium. A system cannot be a system unless the totality of the interactions and inter-dependencies between the parts is in some kind of equilibrium. The equilibrium signifies a state in which some kind of balance is maintained over a long period of time. The two words state and balance in equilibrium and significant. The term state denotes the value at which the variables take on at any particular point of time within the system. A system may have a large number of values for the variables and may refer to any well-defined condition. The term balance signifies steady position. But equilibrium does not imply absolute sameness of balance rather it implies action and counter action within the bounded limits.¹

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The concept of equilibrium varies in both the closed and the open system. Chorley and Kennedy\(^1\) have identified eight equilibrium conditions. Three equilibrium on a level course, three keeping the system on given trajectory and two moving to a new equilibrium on a different level but not a trajectory the equilibrium conditions on a level course are (a) static equilibrium (b) stable equilibrium and (c) steady state equilibrium. Equilibrium associated with a system on a trajectory (a) Thermodynamic equilibrium, a tendency towards a condition of maximum entropy in an isolated system (b) Dynamic equilibrium which consists of balanced fluctuation about a constantly changing trajectory (c) Dynamic meta stable equilibrium which implies threshold jump to a new trajectory. The two other type of equilibrium, unstable equilibrium and meta stable equilibrium refer to a system which move to a new equilibrium on a different level but not a trajectory.

It become necessary to determine the type of equilibrium applicable to the urban system. Under consideration. An urban system on level trajectory would probably be found where urban system is mainly a market center serving and being served by an agricultural hinterland. It is unlikely to grow dramatically since it is

neither near a large metropolitan centre nor area resource centre. An equilibrium on an upward trajectory would doubtedly be that of a large metropoliton centre which is likely to continue to grow. An equilibrium on a downward trajectory would be found in a duliming region which has relied on exploitation of natural resources. An equilibrium moving to a new equilibrium level would be found in a region with respect to new conditions. The new condition for example could be the introduction of transport routes or establishment of manufacturing plants in the region which can cause a change in the system. Such change occur almost continuously and do not cross range of stability that each sub system contains sometime they cross threshold level and transform the structure of the system (threshold concept developed by chorley and others, hinted at three equilibrium types identified by them are unstable, Meta-stable and dynamic meta stable equilibrium).

**Models of System Approach:**

Harvey recognised three models of system approach.

(1) System analysis in which concept of system developed in biology, electrical sciences, acts as a tool of analysis to find out relationship of complex bodies.
(2) Theory of general systems developed by Mesar Voic to explore the syntax of system.

(3) General system theory, which was first developed by a biologist named Von Bertalanffy who visualised that every part of the organism is linked with whole organism. Both Von Bentalonffy and Boulding attempted to demonstrate the universality of explanatory structure by tracing out the isomorphism between system comprised of every different phenomena.

The distinction between the writings of Mesarvoic and Von Bertalanffy is not clear cut. There is considerable amount of confusion in the use of terminology even in such fundamental concept like entropy. The very fact that there are varying interpretation to what they said confirm the existence of ambiguity and confusion. As Wilbank and Symanski said that the interpretation of system analysis is semantic exercise. Obviously, the difference in three models of system approach are rather subtle and not much apparent.

**Basic Characteristics of System:**

From preceding explanation, it is obvious that a system has certain basic characteristics:

(i) A system is a combination of elements
(ii) It is self regulatory in nature

(iii) The independent interacting variables of a system are held together by linkage mechanism

(iv) It constitutes a complex of systems

(v) It links up human activities and physical process within it.

Properties of System:

A system concept has four main properties:

(i) It is monistic

(ii) It is structural

(iii) It is functional

(iv) It is self regulatory similar to homeostasis in living organisms, feedback principles in cybernacies and servo-mechanism in system engineering.

Application of System Theory in Geography:

The concept of system is quite old. Newton wrote the solar system, economist an economic system and biologist on living system. Ackermann was one of the first geographers to point to rise of system research. Earlier the system thinking was at periphery of geographic thought
instead of being at its very core. System analysis provides with a convenient calculus for examination of geographical problem. The same analytical framework provided by calculus, probability theory, geometry and mathematics, which deal with many natural systems can be applied in geography also. System analysis has yielded insights in structural characteristics and behaviour of complex interacting spatial phenomenon. Therefore, system concepts provide an appropriate conceptual framework for handling substantive geographical problems themselves to being formulated in terms of system theory. Methodologically and empirically, concept of system is essential to our understanding of geography. When Geography tending to move to words adoption of new system based paradigm, it is important to attempt some evaluation of system concept from geographic point of view. Geographers are concerned essentially with the systems that involve spatial elements such as location, distance, direction extent, density, succession or derivates of them. The system analysis can have a versatile application in geography. In view of multivariate nature of most of Geographical problems, it is natural that system analysis provides an appealing framework for studying these complex problems. Fundamental to study systems in geography is the use of probability theory. As long as a system is self perpetuating because at least
one element remains in steady state, the various component of system can be treated in terms of functions. Scholastic models of such systems provide new ranges of understanding. In a mathematical concept of a system, an element is a variable but in geographic concept it is an attribute of the individual rather than individual itself.

In recent years system theory has been put forward as a framework linking the wide range of social and environmental phenomena. It provides the geographer with the logical method of organization. A system approach appears to offer a framework for bringing spatial order, means of integration of knowledge providing an effective mode of inquiry. System thinking is the habit of concentrating on how collections of things act and interact, and is at want of geographical inquiry. The notion of system is a device built in mind of geographer whereby he identifies inputs, studies the interaction of the elements and recognises the resultant output.

**Studies of urban Systems:**

The application of system concept in urban geography is slow. The emphasis is on the theories of the system rather than on system itself. In parts thus must be attributed to the complexity of system analysis itself, which, if it is to be fully employed involves mathematical
techniques beyond reach of the most of the Geographers.\(^1\) It is only recently that growing interest in thus field among urban geographers has become apparent. Two type of application may be noticed in relevant literature:\(^2\) (a) a recourse of technology of systems and the use of this concept to provide from works within which the data are organised or parallelism between phenomena suggested, and (b) the precise use of certain measures of systems to urban problems.

The credit may be given to Berry\(^3\) for introducing systems concept in urban geography demonstrate utility of system concept to study of urban systems and argues that lessellations of size and spacing and regularity of density gradient provide systems within systems. The concept deal primarily with the organization of system and the process that operate. Asset of structural equations is devised for embodying the relationship between attributes of objects. Curry\(^4\) attempted to present a comprehensive formulation of organizational features of systems of cities and related

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1. Harvey, p. 469.
well known rank-size or 'Zipf' rule with the notion of entropy. Similarly Olsson\(^1\) also suggests that if a system of cities obeys the rank size rule, it is in a state of equilibrium in which entropy has been maximised.

The more rigorous application of system ideas are on the growth characteristics of urban system, urban places in United States and Canada have shown considerable stability as a system. A number recent works have explored the nature of the system change in a structures-process-response format. Canter's\(^2\) work on the growth of Welsh city system emphasizes the effect of industrialization on the organizational goal of central place system. He postulates industrialization as a major constraint making the system interrupted. The system of central places has constantly fluctuated around a steady state condition altering the size, spacing and functional structure of the centre. Sumple and Golledge\(^3\) by utilizing quadrat analysis, measured


the degree of entropy of central place location in the central prairies of Canada and revealed the distribution of central places had a more uniform (organised) pattern over-time. Wang\(^1\) analysed urban settlement patterns in Malaysia and concluded that they did not move towards uniformity. The studies of the relationships an rank size role and hexagonal hierarchies as steady state are coming up.

A geographic process considering both time and space may be the result of numerous interacting and interdependent factors within a spatial system. Until recently, studies of the process of change were less common. However, some of the current researches have established that a variety of non-economic factors play significant part in spatial process of urban system development. The process studies should not be limited to non-economic factors but should be brought to economic factors also to understand the complex urban system.

**Urban Systems and Spatial Order:**

Urbanization is aggregation of people into large-dense and heterogenous settlements, also connotes changes in the demographic, economic and social structure of the

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society. Since one of the basic purpose of geographic research is to analyse the spatial aspect of urbanization, so geographers should regard the analysis of location of urban places as major focus of investigation. The pioneering work in this field was devoted to the analysis of the factors affecting the location and growth of individual urban place and approach was primarily historical. Analysis was in terms of uniqueness in relation to its site or hinterland little or no regard was given to the importance of urban location in relation to the location of other urban places, i.e., their position relative to urban system. The traditional approach is evident in Smaile's attempt. Although he recognizes that situation is often more important than site, yet he considers factors like nodality as significant. The basic approach is one of analysing urban places as individuals having unique relationship with these situation factors Harris and Ullman analyse patterns of location rather than individual locations. They suggest that any settlement patterns can be broken down into three sub-patterns:

(1) A linear pattern of transport routes,


A clustered pattern of places performing specialized services.

A uniform pattern of places providing a wide variety of services for their surrounding areas.

A set of basic premises, outlined by Garner\textsuperscript{1} provides a basic for analysis of settlement patterns. They include notion of agglomeration, hierarchy friction of distance, economies of scale and the ordered adjustment of the spatial distribution of human activity. However, these notions are not entirely new in explaining settlement patterns because some of these were adopted by Christaller and Losch. The very nature of these notions demands that inter-relationships among urban place be considered as an important location factor. In the words of Davis and Golden,\textsuperscript{2} the city is efficient mode of settlement because it minimises the function in space. In the writings of Christaller and Losch concerned with spatial distribution of urban places, terms such as 'equilibrium', 'space economy', and 'distance' often appear. This word suggest that such concept are widely accepted as being a fundamental research value. By this we can suggest that to analyse the


distributional pattern of urban places we must consider their location in relation to space and in particular we must regard these spatial patterns as being attempted adjustment to the concept of economic space-economy, and distance often appear. From this we can suggest that to analyse the distributional pattern of urban places we must consider their location in relation to space and in particular we must regard these spatial patterns as being attempted adjustments to abstracts concept of economic space. In such a way some works have appeared emphasizing if a settlement pattern attaines a perfect adjustment to the space economy, urban places will be uniformly spaced and remain in equilibrium.

**Modifications in Central Place Theory:**

Many of the implication in classical central place theory have been modified and certain obscurities of original theoretical statement have been classified since its first publication in 1933. The modern central place theory based on nodality indices, such studies have now existed more than two decades and have been accepted by researchers throughout the world.

In modern central place theory, the central place includes all urban centres. *Berry and Garrison*¹ have stated

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that "the term central place has meant 'Urban Centre'. In the past the theory sought to account for these urban centres". The importance of central place is measured in absolute sense "as a cluster of retail and service establishments that provides a convenient point of focus for consumers who visit to purchase the goods and services they need", and centrality is defined as the "the essence of the point of focus".  

In reformulating the central place theory, Berry and Garrison have relaxed one of the assumption of isotropic plain. Using the concept of the range of good and threshold purchasing power. They demonstrated that a hierarchical class system of central places can exist no matter whatsoever the distribution of purchasing power be. The reformulated central place model allows excess profit to be earned in the system. Thus, Berry and Garrison brought marketing principle closer to reality. The application of modern central place theory have produced some of the most advanced works in geography, for example, the identification of hierarchical structuring, the determination of hierarchical structuring, the determination of


market areas and geometric pattern of central places. The uniform (hexagonal) distribution of settlements as postulated by Christaller's central place theory has stimulated considerable interest in pattern analysis. Out of this interest, there has evolved a growing awareness among geographers of the direct link between laws and theories of location and their two-dimensional expression via patterns. The general conclusion is that central places in the real world are not uniformly spaced nor are they spaced in a strictly random pattern. This problem has been remedied during the 1960s through the use of techniques borrowed from plant ecology to measure quantitatively the extent of uniformity in point distribution. Brush and Bracey\(^1\) studied distribution of central places in southern western Wisconsin and tested the hypothesis that the central places are arranged in a hexagonal pattern in accordance with central place theory. He explored a new nearest neighbour method of map analysis.

Dacey\(^2\) analyzed the spatial aspect of central places and uses regional method to compare the observed

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pattern with three expected distribution: (a) hexagonal
distribution (b) random distribution and (c) the
clustered distribution. The nearest neighbour method is
employed to detect randomness among central places (points)
by measuring distances to the nearest neighbours Dacey
utilized thus approach in his studies and showed the
relationship between observed and expected patterns. The
composition shows that the pattern of central places in
this area approximates a random rather than uniform or
clustered distribution. It suggest that even in the area of
planned land division the dominant pattern of central places
appear to be random.

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