Nature and Characteristics of Rural Settlement in Salanpur, Paschim Bardhaman, West Bengal, India.

Sumana Nandi¹ and Tapas Mistri²

¹M.Phil. Research Scholar, Department of Geography, The University of Burdwan, Golapbag, Burdwan (Pin: 713101)
Email: sumananand93@gmail.com
PH NO: 9609738770

²Assistant Professor, The Department of Geography, The University of Burdwan, Golapbag, Burdwan (Pin: 713101)
Email: tapasam76@gmail.com
PH NO: 8967364206

ABSTRACT
India is a country where nearly two-third of the population lives in rural areas and enlightens the rural areas is the lifeline of India. Before going to achieve this goal and utilize the full potentiality of village resources it is much essential to explore rural areas in terms of their size, distribution and pattern of rural settlement. The general but overall idea of the organization of rural settlement also helps to plan the strategy of balanced rural development. In this paper, an attempt has been made to examine the nature and characteristics of rural settlement at Gram Panchayat level in Salanpur Community Development Block, the western most C.D. block of Paschim Bardhaman District Using Nearest Neighbour Analysis Technique. Settlement concentration index, Average distance between settlement(spacing) and GIS software. The result shows that in Salanpur population distributed in a very unequal manner, settlement concentrated in an unbalanced way in few areas while six mouzas are totally uninhabited, almost 53.87% area of Salanpur covered with semi-compact type of settlement structure. Therefore, thorough planning is prerequisite to come out of the latent threats for the sake of the inhabitants. Development of settlement with some proper planning has also chalked out.

Key Words: Nearest Neighbour, Gram Panchayat, Size, Pattern, Type, PR, SI Index.

1. INTRODUCTION

A village is a clustered community for societies that practice agriculture and a settlement refers to the sites where people live and work (Jin, 1988; Guo et al., 2012; Zhou et al., 2013, cited in Yang et.al., 2015). India is a country where nearly 68% of the population lives in rural areas and enlightens the rural areas is the lifeline of India. However very modest number of literature has been written on rural settlement systems in contrast with the considerable number of literature appeared on urban systems. The settlement i.e., the place of habitation is one of the important aspects of study from the standpoint of planning and development of a region (Ghosh, 1992). To utilized the full potentiality of village resources and make wealthy progress it is very much crucial to explore rural areas in terms of their size, distribution and pattern of rural settlement as it helps us to know about the organization of rural settlement and speaks about the nature of soil, topography, socio-economic background of the culture group of a particular area (Singh, 1994). The general but overall idea of the organization of rural settlement also helps to plan the strategy of balanced rural development. In this paper, an attempt has been made to examine the nature and characteristics of rural settlement in terms size, distribution, and pattern at Gram Panchayat level in Salanpur. The objectives of this study are- i. To find out the size and distribution of rural settlement in terms of population. ii. To find out the pattern of rural settlement based on nearest neighbour analysis technique. iii. To find out the type of rural settlement. At the same time it is also valuable and significant if we recommend some strategy to utilize the abandoning places, than it is very much supportive to ensuring balanced settlement distribution, minimize human pressure on an overpopulated area, proper resource management and overall sustainable rural development.

2. METHODS AND MATERIALS

Settlement data regarding the location, area of settlement is digitized from high resolution Google Earth image through online digitization method (Fig: 1).

Information like total area of settlement, distance of each settlement point is calculated in ARC GIS (10.3) software through calculate geometry tool. Area, population related data, Salanpur C.D. Block map is collected from The Census of India (2011).

Clark and Evans Nearest Neighbour technique is used to describe objectively settlement distribution pattern at Gram Panchayat Level. From the interpretation of the nearest-neighbour statistics it will be seen that all values lie along a continuous scale extending from 0(completely clustered) through 1 (random) to 2.15 (perfectly regular) [Pinder & Witherick, 1972]. (Fig: 2).
a. Nearest neighbour statistics derived from following formula=

Average distance predicted between Nearest neighbours = rE

\[ r = \frac{0.5 \sqrt{A \cdot N}}{N} \]

A = area studied (sq.km).
N = number of points.

Average distances observed between Nearest neighbours = rO

\[ r_O = \frac{\sum d_i \cdot d_i}{N} \]

d = distances between the points and its nearest neighbours (in sq.km).
N = number of points.

• Nearest Neighbour Statistics (RN) = rO/rE.

Figure: 1

Figure: 2
b. Settlement concentration index =
   \[ \text{PR} = \frac{\text{RL}}{\text{TL}} \times 100. \] [Tian, 2007]
   Where,
   \( \text{PR} \) = Rural residential land percentage of a Gram Panchayat.
   \( \text{RL} \) = Rural residential land area of a Gram Panchayat in sq.km.
   \( \text{TL} \) = Total residential land area of a Gram Panchayat in sq.km.

c. Average distance between settlement (Spacing)
   \[ 1.0746\sqrt{\frac{A}{N}} \]
   Where,
   \( A \) = area of the unit.
   \( N \) = number of settlement.
   Settlement Density = \[ \frac{N}{A} \]
   Where, \( A \) = area of the unit.
   \( N \) = number of settlement.

3. ABOUT THE STUDY AREA

Salanpur is the western most land of Paschim Bardhaman District, sharing the state boundary with Jharkhand. It is surrounded by Dhanbad district of Jharkhand on the west, Jamtara district of Jharkhand on the north, Barabani C.D. Block of Paschim Bardhaman district on the east, and Asansol Municipal Corporation on the south. Salanpur C.D. block encompasses total area of 135.05km² (Fig: 3).

It has 1 Panchayat Samity, 11 Gram Panchayats, 75 mouzas, 69 inhabited villages and 2 urban units (Source: Salanpur Block Development Office). The shape of this block resembles like a triangle (Hagget Shape Index=0.49).

4. DISTRIBUTION OF RURAL SETTLEMENT ACCORDING TO POPULATION SIZE

The basic decisive factor for the size typology of the rural settlement is the number of population (Ismael, 2013). Distribution of rural settlement according to population size is also a display of socio-economic improvement of the concerned area. Big size villages usually nurture in those areas where facilities are available to maintain people’s livelihood. There are all sizes of villages in Salanpur ranging from 20 people to those several thousand inhabitants. The villages have been classified into 5...
categories based on the size of their population. The five categories are-

i. **Very small size villages** (population of less than 200),

ii. **Small size villages** (population of 200-499),

iii. **Medium size villages** (population of 500-999),

iv. **Large size villages** (population of 1000-1999),

v. **Very large size villages** (population of 2000-4999).

As the census 2011, indicates medium to very high size villages represents the wide-ranging of the settlements in the area. On the other side the number of small villages declining. According to population size the distribution of settlement are presented at Gram Panchayat level in following manner (Fig: 4)-

**i. Very Small Size Villages (< 200):**

Only three villages belong to this group, representing only 4.35% villages and distributed in Alladi, Phulberya, and Dendua Gram Panchayat. Population density of this region is also low ranging from 519 to 907 per sq.km.

**ii. Small Size villages (200-499):**

Six villages representing this group, covers 8.70% of total villages. Dendua, Kallya, Phulberya, Rupnarayanpur Gram Panchayat have this type of villages and population density of this region is ranging from very low to high.

**iii. Medium Size Villages (500-999):**

These size types of villages dominating the area represent 33% villages, and distributed in all Gram Panchayat. All types of population density range available in this group.

**iv. Large Size Villages (1000-1999):**

27.53% villages belong to this group and distributed in Alladi, Basuebpur-jemari, Dendua, Jitpur-Uttar-Rampur, Kallya, Phulberya and Salanpur Gram Panchayat. Population density ranges from medium to high.

**v. Very Large Size Villages (2000-4999):**

26.09% villages belong to this group and distributed in all Gram Panchayats except Phulberya. Population density is low to very high in this region because the number of villages and its population in each Gram Panchayat is a major factor in variation of population density.

**5. SETTLEMENT CONCENTRATION**

Concentration of settlement indicates the total area under settlement or build up area or the residential land percentage is calculated for every gram Panchayat. The larger rural residential land percentages have the higher the grade (Tian, 2007). According to the calculation result (Table: 1) of PR in every gram Panchayat the concentration of rural settlement is mapped in fig: 5.
### Table: 1 Calculation table of rural residential land percentage.

<table>
<thead>
<tr>
<th>Sl.NO</th>
<th>G.P.</th>
<th>Area (sq.km)</th>
<th>rural settlement area2018(sq.km)</th>
<th>PR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Achhra</td>
<td>3.99</td>
<td>0.36969</td>
<td>9.26541</td>
</tr>
<tr>
<td>2</td>
<td>Alladi</td>
<td>13.302</td>
<td>1.05569</td>
<td>7.93633</td>
</tr>
<tr>
<td>3</td>
<td>Basudebpur-jemari</td>
<td>6.633</td>
<td>0.46959</td>
<td>7.0796</td>
</tr>
<tr>
<td>4</td>
<td>Dendua</td>
<td>22.912</td>
<td>1.09301</td>
<td>4.77047</td>
</tr>
<tr>
<td>5</td>
<td>Ethora</td>
<td>9.539</td>
<td>0.3552</td>
<td>3.72366</td>
</tr>
<tr>
<td>6</td>
<td>Jitpur-uttar Rampur</td>
<td>9.64</td>
<td>1.15583</td>
<td>11.9899</td>
</tr>
<tr>
<td>7</td>
<td>Kallyya</td>
<td>12.453</td>
<td>0.54178</td>
<td>4.3506</td>
</tr>
<tr>
<td>8</td>
<td>Phulberya</td>
<td>10.763</td>
<td>0.46933</td>
<td>4.36059</td>
</tr>
<tr>
<td>9</td>
<td>Rupnarayanpur</td>
<td>5.618</td>
<td>1.23323</td>
<td>21.9514</td>
</tr>
<tr>
<td>10</td>
<td>Salanpur</td>
<td>11.89</td>
<td>0.80765</td>
<td>6.79268</td>
</tr>
<tr>
<td>11</td>
<td>Shyamdi</td>
<td>4.76</td>
<td>0.34386</td>
<td>7.22395</td>
</tr>
</tbody>
</table>

### Figure: 5

From this map we categorize settlement concentration zone in four categories. Dendua, Kallya, Phulberya, Ethora represent very low (3.72-4.77% PR value) settlement concentration zone. Alladi, Achhra, Shyamdi, Basudebpur-Jemari, Salanpur represent medium (4.77-9.26% PR value) settlement concentration zone. Jitpur-Uttar Rampur represent high (9.26-11.98% PR value) settlement concentration zone and Rupnarayanpur represent very high (11.98-21.95% PR value) settlement concentration zone. Rupnarayanpur and Jitpur-Uttar rampur represent very high settlement concentration zone because, these parts are very much close to the urban centre (Chittaranjan, Hindustan Cables), major transport line traversed these area, major administrative, financial, health centres etc. are available in these areas. While other areas expressive of low to medium settlement concentration zone as those areas are lack of appropriate transport facility, socio-economic amenities, some areas also have physical hindrances.
6. SETTLEMENT PATTERN AND TYPE

According to Bunge “any closed curve has a shape and non-closed collection of points has a pattern. So, a region may be it is a mouza, block, district, state, country has a shape but a settlement unit does not have these criteria. Shape is two dimensional, pattern is zero dimensional and pattern is delineated by the relative distances or spacing of points with respect to one another.” Applying the nearest neighbour point pattern analysis technique, it will be seen that all RN values lie along a scale ranging from 0.31 to 0.90 (Cluster to Random pattern), based on this scale we made an appropriate interpretation of the settlement pattern of Salanpur C.D. block. Based on RN value we prepare a settlement pattern map of Salanpur and classified this area into following categories:

Table: 2 Calculation table for Nearest Neighbour Statistics, Hypothetical Spacing and Settlement Density.

<table>
<thead>
<tr>
<th>Gram Panchayat</th>
<th>Area (sq.km)</th>
<th>N</th>
<th>rO=ΣD/N</th>
<th>rE=0.5√A/N</th>
<th>RN</th>
<th>HD (km)</th>
<th>Settlement Density/sq.km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achhra</td>
<td>3.99</td>
<td>22</td>
<td>0.075868</td>
<td>0.212934</td>
<td>0.356299</td>
<td>0.457</td>
<td>5.513</td>
</tr>
<tr>
<td>Alladi</td>
<td>13.302</td>
<td>153</td>
<td>0.061961</td>
<td>0.1474179</td>
<td>0.420307</td>
<td>0.316</td>
<td>11.502</td>
</tr>
<tr>
<td>Basudebup-jemari</td>
<td>6.633</td>
<td>45</td>
<td>0.087207</td>
<td>0.1919201</td>
<td>0.45439</td>
<td>0.412</td>
<td>6.784</td>
</tr>
<tr>
<td>Dendua</td>
<td>22.912</td>
<td>139</td>
<td>0.069496</td>
<td>0.2029902</td>
<td>0.342363</td>
<td>0.436</td>
<td>6.066</td>
</tr>
<tr>
<td>Ethora</td>
<td>9.539</td>
<td>18</td>
<td>0.200533</td>
<td>0.2217356</td>
<td>0.904381</td>
<td>0.782</td>
<td>1.886</td>
</tr>
<tr>
<td>Jitpur-uttar Rampur</td>
<td>9.64</td>
<td>69</td>
<td>0.081254</td>
<td>0.1148408</td>
<td>0.707533</td>
<td>0.401</td>
<td>7.157</td>
</tr>
<tr>
<td>Kallya</td>
<td>12.453</td>
<td>141</td>
<td>0.069464</td>
<td>0.1485748</td>
<td>0.467534</td>
<td>0.319</td>
<td>11.322</td>
</tr>
<tr>
<td>Phulberyap</td>
<td>10.763</td>
<td>35</td>
<td>0.089494</td>
<td>0.2772312</td>
<td>0.322814</td>
<td>0.595</td>
<td>3.251</td>
</tr>
<tr>
<td>Rupnarayanpur</td>
<td>5.618</td>
<td>55</td>
<td>0.090402</td>
<td>0.1598295</td>
<td>0.565614</td>
<td>0.343</td>
<td>9.789</td>
</tr>
<tr>
<td>Salanpur</td>
<td>11.89</td>
<td>64</td>
<td>0.068885</td>
<td>0.2155117</td>
<td>0.319635</td>
<td>0.463</td>
<td>5.382</td>
</tr>
<tr>
<td>Shyamdi</td>
<td>4.76</td>
<td>25</td>
<td>0.084596</td>
<td>0.2181742</td>
<td>0.387745</td>
<td>0.468</td>
<td>5.252</td>
</tr>
</tbody>
</table>

i. **High Clustering (0.31-0.35):**
Dendua, Achhra, Salanpur, Phulberyap G.P. belong to this group and the hypothetical spacing ranging from 0.43 to 0.59 km and the no of settlement unit is greater comparing to another region.

ii. **Medium Clustering (0.38-0.46):**
Alladi, Basudebup-jemari, Shyamdi, and Kallya G.P. belong to this group and the hypothetical distance of these G.P. is medium ranging from 0.31
to 0.46 km respectively and the no of settlement is also medium.

iii. **Near to Random (0.56-0.70):**
Rupnarayapur and Jipur-Uttargram P.G. belong to this group and the hypothetical distance is 0.34 and 0.40 km, the no of settlement is 55 and 141 respectively.

iv. **Taking the pattern of Random (0.90):**
Only Ethora G.P. show the very near appearance of random pattern, the hypothetical distance is also highest, 0.78 km and very smallest no of settlement present here.

The analysis reveals that except Ethora Gram Panchayat all Gram Panchayat deviating towards uniformity, only Ethora indicates near random situation. Various type of factors area controlled RN value. According to Pinder (1972), more extensive the area taken around a given distribution the lower will be the RN value. In the present case Pinder’s conclusion in some extent true, showing a negative linear relationship between RN value and areal extension (r=-0.18).

With the basis of theoretical spacing and settlement density we may classify rural settlement in different types. Figure: 7 show that, there is an inverse relationship between spacing and settlement density, as the spacing increase the village density will decrease and vice-versa.
Where the spacing is high the villages are of larger size with low number of hamlets with high population pressure, rendering in general compact structure of settlement. While in areas of low spacing the settlements are generally smaller in size with low pressure of population and scattered distributional pattern (Singh, Singh, Singh, 1975).

With the basis of theoretical spacing and settlement density we may classify rural settlement in different types:

i. **Hamleted type of settlement:**
   Low spacing (0.31-0.34 km) and high settlement density (1.88 -3.25/sq.km) is an indicator of hamleted type of settlement distribution structure. Alladi, Rupnarayanpur, and Kallya Gram Panchayat belong to this group covering 28.13% of area.

ii. **Semi compact type of settlement:**
   Medium spacing (0.34-0.47 km) and moderate settlement density (3.25-7.15/sq.km) is an indicator of semi compact type of settlement structure. Dendua, Basudebpur-jemari, Salanpur, Achhra, Shyamlidi, Jitpur-uttarrampur belong to this group and cover large portion of Salanpur (53.87%) block.

iii. **Compact type of settlement:**
   Compact type of settlement covers an area of 18.28% and spread over Ethora and Phulberya Gram Panchayat with very high hypothetical spacing (0.47-0.78km) and low settlement density (1.89-3.25/sq.km).

7. **CONCLUSION**

Forgoing analysis reveals that there is an uneven distribution of settlement pattern and population. The settlement pattern is very much clustered to random, but not properly got random pattern. Various parts of this area is not similar in terms of physical environment and socio-economic facilities. So, people are more concentrated in few areas while 6 villages are totally uninhabited. Peoples are more attracted to settle near towns, headquarters, most accessed places where amenities are available to maintain their livelihood. Based on this study we may say that it is very much important to resurvey this area and make some planning strategy for proper utilization of those depopulated parts by providing basic facilities, accessibility and investment on employment generation activities so, the people are attracted to settle there. Proper and balanced distribution of settlement is very essential part for a sustainable rural development. It is found that in some parts of the study area diversification of settlement has already been stated to cope with the changing socio-economic forces.

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