CHAPTER VI
SIZE, SPACING AND HOUSE TYPES
OF RURAL SETTLEMENTS

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CHAPTER VI
SIZE, SPACING AND HOUSE TYPES
OF RURAL SETTLEMENTS

6.1 INTRODUCTION :-

Various geographers have recently emphasized that locational points of rural settlements have locational relationships and it is affected by the factor of distance. Locational decisions of any settlements are generally taken in order to minimize the movements and make it more accessible. Peter Hagget (1965) has pointed out that the traditional requirements of any settlement are land, water, building materials, fuel and accessibility. All these factors influences on the location of the settlements and develop a theoretical regular distribution of settlements.

The distance factor in the location of rural settlements has been discussed by Chisholm (1962), who suggested the classification of settlements and the description of the relationship between man and his physical environment. It is always essential to study the distribution of rural settlements within the particular region. Analysis of size and spacing of rural settlement of an area gives the distributional pattern. Several physical and cultural factors are responsible for the spacing between the settlements as well as their size.

For the spacing and size of the rural settlement quantitative expression of dispersion of villages has been correlated with various physio – cultural factors.

6.2 Chi –Square Test ($\chi^2$) :-

H.R. Thompson has provided a suitable procedure i.e. Chi-square test for the analysis of distribution patterns of rural settlements. This procedure has been reviewed by L.J. King. The environmental factors, which are responsible for
distribution pattern variation of settlements is tested by Chi-square analysis. The formula for Chi-square test is as follows.

\[ \chi^2 = \sum \frac{(O - E)^2}{E} \]

where \( O \) = observed number of settlements

\( E \) = expected number of settlements

**Table 6.1**

**Chi–Square Test**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsil</th>
<th>Observed no. of settlements</th>
<th>Expected no. of settlements</th>
<th>(O-E)</th>
<th>(O-E)^2</th>
<th>(O-E)^2/E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nagar</td>
<td>116</td>
<td>127</td>
<td>-11</td>
<td>121</td>
<td>0.095</td>
</tr>
<tr>
<td>2</td>
<td>Rahuri</td>
<td>94</td>
<td>127</td>
<td>-33</td>
<td>1089</td>
<td>0.0857</td>
</tr>
<tr>
<td>3</td>
<td>Shrirampur</td>
<td>81</td>
<td>127</td>
<td>-46</td>
<td>2116</td>
<td>16.66</td>
</tr>
<tr>
<td>4</td>
<td>Newasa</td>
<td>129</td>
<td>127</td>
<td>02</td>
<td>4</td>
<td>0.003</td>
</tr>
<tr>
<td>5</td>
<td>Parner</td>
<td>131</td>
<td>127</td>
<td>04</td>
<td>16</td>
<td>0.13</td>
</tr>
<tr>
<td>6</td>
<td>Akole</td>
<td>179</td>
<td>127</td>
<td>52</td>
<td>2704</td>
<td>21.30</td>
</tr>
<tr>
<td>7</td>
<td>Sangamner</td>
<td>161</td>
<td>127</td>
<td>34</td>
<td>1156</td>
<td>9.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>891</td>
<td>889</td>
<td></td>
<td>7206</td>
<td>8.10</td>
</tr>
</tbody>
</table>

Note – For calculating \( \chi^2 \), tahsil as a unit was considered.

If the calculated value of Chi-square is less than the tabulated value at the 5 percent significant level, than it gives the required analysis. In Pravara-Basin whether only physical factors are responsible or other factors are also responsible for the distributional pattern of rural settlement is tested.

Tabulated value is 12.59, at 5 and 1 percent respectively. The degree of freedom is n-1 i.e. 7-1=6. The calculated value is 8.10, which indicates that null hypothesis is accepted at both levels. It concludes that the physical elements are mostly responsible for the distributional pattern of settlements in the Pravara-Basin.

6.3 **Nearest Neighbour Technique** :-

The conventional visual assessment of the distributional pattern of rural settlements has been substituted by more reasonable scientific judgments of the precise character of such distribution with the help of nearest neighbour index.
This spacing index of map analysis technique contributes a high degree of objectivity and enables geographer to rank patterns of settlements along a scale extending from complete clustering to complete uniformity. This is a straight line measurement of the distance separating any phenomenon and its nearest neighbour in space and was first initiated and successfully used by statistical plant ecologists such as Dice, Clark and Evans, Moore and Thompson, to describe andanalyse distributions of phyto – sociological population. But over the years it has been adopted by a number of other disciplines and in geography the method was first initiated by Dacey and applied principally to urban and rural settlements pattern in the U.S.A. Recently the application of nearest neighbour analysis is used in other branches of geography.

The formula used for this purpose is as follows.

Nearest Neighbour Index (Rn) = \frac{d_0}{d_e}

where \( d_0 \) = the mean of the sum of the actual distance between the settlements

\( d_e = \) mean of the expected distance between the settlements

\[ d_e = \frac{1}{2\sqrt{P}} \]

where \( P = N/A \)

\( N = \) Total number of settlements

\( A = \) Total area

'\( Rn \)' values are calculated and it was observed that these values are ranging from less than 1.5 to more than 2.00. With these observations one can say that an approaching uniform distribution in some of the tahsils, and some of the tahsils are in random distributional pattern, which is affected by variation in nature of relief,
proportion of area under forest, fertility of soil, availability of irrigation facilities and accessibility (Fig. 6.1).

6.4 Size of Rural Settlement in Pravara Basin :-

While studying size of rural settlements in the region it is observed that there is direct relationship between population and the area size of settlement by population. Small area unit may support larger number of people, if fertility of the soil is more and irrigation is available. So the tahsils like Shrirampur, Rahuri, Newasa and Sangamner have small average size but more population and occupied houses. It is similarly rural population density and size of rural settlements are also linked. The range of variation is from a minimum of 114 and 137 persons per Km² in Parner and Akole tahsils respectively to a maximum of 306 persons per Km² in Shrirampur tahsil. In the basin about 90 percent of the villages have a population ranging between 0 to 3000. This means comparatively small and medium sized settlements are very common in the basin. This also shows positive relationship between irrigated area per cultivator and population size.

Average size of the village comes to 1948.3, ranging from 1241 in Akole tahsil to 3226 population in Shrirampur tahsil. Out of the total population nearly 20 percent people live in small villages (population less than 1000), while about 40 percent live in medium sized settlements (1001 to 2999). About 40 percent people live in large sized settlements with more than 3000 persons each. From these facts one may conclude that considerable part of the population in the basin
PRAVARA BASIN
AVERAGE SPACING OF SETTLEMENT
(In Sq.Km.)

PRAVARA BASIN
NATURE OF DISPERSION OF RURAL SETTLEMENT (Rn.)

Index

\(< 2\)

2 to 2.25

2.25 to 2.50

\(> 2.50\)

Index

\(< 1.50\)

1.50 to 1.75

1.75 to 2

\(> 2\)
is concentrated within few settlements. This is mainly because of agricultural prosperity in the tahsils like Shrirampur, Rahuri, Newasa and Sangamner.

Proportion of small sized settlements is more in the basin as a whole, but larger proportion of these small sized settlements is found in Akole, Parner and Nagar tahsils. This may be due to sizable area under forest (Akole), rugged relief, poor accessibility and inferior soils in these tahsils. Medium sized settlements are predominantly found in Sangamner, Rahuri and Newasa tahsils.

**Table 6.2**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsil</th>
<th>Population density (R) Km²</th>
<th>Average size of village (population)</th>
<th>Average size of the village (Area)</th>
<th>Density of villages in 100 Km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nagar</td>
<td>169</td>
<td>2248</td>
<td>13.30</td>
<td>7.52</td>
</tr>
<tr>
<td>2</td>
<td>Rahuri</td>
<td>212</td>
<td>2115</td>
<td>9.96</td>
<td>10.03</td>
</tr>
<tr>
<td>3</td>
<td>Shrirampur</td>
<td>306</td>
<td>3226</td>
<td>10.53</td>
<td>9.50</td>
</tr>
<tr>
<td>4</td>
<td>Newasa</td>
<td>212</td>
<td>2117</td>
<td>10.00</td>
<td>10.00</td>
</tr>
<tr>
<td>5</td>
<td>Parner</td>
<td>114</td>
<td>1634</td>
<td>14.34</td>
<td>6.97</td>
</tr>
<tr>
<td>6</td>
<td>Akole</td>
<td>137</td>
<td>1241</td>
<td>9.00</td>
<td>11.00</td>
</tr>
<tr>
<td>7</td>
<td>Sangamner</td>
<td>183</td>
<td>1899</td>
<td>10.38</td>
<td>9.63</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td>177</td>
<td>1948.3</td>
<td>10.99</td>
<td>9.09</td>
</tr>
</tbody>
</table>

(Fig. 6.2, 6.3, 6.4 & 6.5)

**6.5 Spacing of Rural Settlements in Pravara Basin:**

The basin is varied in its spatial character. It has, therefore, equally striking variation in spacing of rural settlements. This revealed in range of variation from a minimum of 3.22 Km in Akole tahsil to maximum of 4.07 Km in Parner tahsil for the basin as a whole the spacing of rural settlements comes to 3.56 Km.

The spacing between the rural settlements in the basin is influenced by several factors, such as proportion of area under forest, availability of water, intensity of land use and accessibility.
PRAVARA BASIN

POPULATION DENSITY
(Per Sq. Km.)
PRAVRA BASIN -

RURAL POPULATION DENSITY (1991)
(PER Sq. Kms.)

INDEX

\[ \begin{align*}
\text{\vdots} & \leq 150 \\
150 - 200 \\
200 - 250 \\
> 250
\end{align*} \]

FIG. 6-2 B

AVERAGE SIZE OF VILLAGE (1991)
(BY POPULATION)

INDEX

\[ \begin{align*}
\text{\vdots} & \leq 1500 \\
1500 - 2000 \\
2000 - 2500 \\
> 2500
\end{align*} \]

FIG. 6-3
Table 6.3
Spacing of Rural Settlements

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Tahsil</th>
<th>Density of villages in 100 Km2</th>
<th>Average size of village (Area)</th>
<th>Average Distance between villages (Spacing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nagar</td>
<td>7.52</td>
<td>13.30</td>
<td>3.91</td>
</tr>
<tr>
<td>2</td>
<td>Rahuri</td>
<td>10.03</td>
<td>9.96</td>
<td>3.49</td>
</tr>
<tr>
<td>3</td>
<td>Shrirampur</td>
<td>9.50</td>
<td>10.53</td>
<td>3.48</td>
</tr>
<tr>
<td>4</td>
<td>Newasa</td>
<td>10.00</td>
<td>10.00</td>
<td>3.40</td>
</tr>
<tr>
<td>5</td>
<td>Parner</td>
<td>6.97</td>
<td>14.34</td>
<td>4.07</td>
</tr>
<tr>
<td>6</td>
<td>Akole</td>
<td>11.00</td>
<td>9.00</td>
<td>3.22</td>
</tr>
<tr>
<td>7</td>
<td>Sangamner</td>
<td>9.63</td>
<td>10.38</td>
<td>3.46</td>
</tr>
<tr>
<td></td>
<td>Region</td>
<td>9.09</td>
<td>10.99</td>
<td>3.56</td>
</tr>
</tbody>
</table>

By using the different indices computed, there are three categories of spacing were identified.

1. **Areas of High Spacing (4.00 Km or more) :-** Parner tahsil comes under this category. This tahsil forms a part of the rain shadow area with scarcity of water for both drinking as well as irrigation purposes. So the land under irrigation per cultivator is also low. Hence there is high spacing between the settlements.

2. **Areas of Moderate Spacing (3.5 to 4 Km) :-** Rahuri and Nagar tahsils come under this category. This may be due to comparatively higher irrigated land per cultivator in the tahsils.

3. **Areas of Low Spacing (Less than 3.5 Km) :-** Shrirampur, Newasa, Akole and Sangamner tahsils come under this category. Former two tahsils have sizable proportion of area under irrigation and consequent economic development hence spacing is low. But latter two tahsils have the topographical influence on low spacing, particularly in Akole tahsil, hilly areas are responsible for dispersion in settlements and hence low spacing is observed.

It may be concluded that large population size and high rural population density with low spacing in the north, north east and eastern part of the basin is
related with well developed transportation network, availability of fertile soil and irrigation facilities. The high spacing and small size of the villages in the south part are related to undulating areas, poor soil and low rainfall (Fig. 6.6).

6.6 Rural House Types and Building Material :-

The house is a shelter, a means of regulating the climate to meet the basic physiological requirements of the body. It may perform this function well or indifferently. The house then becomes a universal feature of regions permanently occupied by human beings. The rural houses of rural landscape is one of the aspect, which provides the clues regarding the complex relations between man and his environment, represent the cultural heritage of the past and the survival of tradition and reflection of the social state. In other words, human dwellings are governed by physical factors as well as tradition and cultural landscape. House as a geographic unit, includes the dwelling ranging from the small thatched hut to the most elaborate massive mansion and other human structure, where people agglomerate, used as store for material goods and where social and cultural needs are satisfied. Rural dwellings are adopted to environment of the region, which determines the nature of building material form of roof and layout of houses. As pointed out by Blache, man has always tended to build his house with the nearest material at the hand.

Rural houses of a particular region, present diversity in form, size and functions, as well as balanced adaptation to the physical and cultural environment of the area. When needs are dire, 'necessity becomes the mother of invention' and it is therefore, not to be wondered at that the 'influence of environmental features is reflected in man's works in a similar way in different localities. The natural environment determined mostly the building materials and the form of the roof.
PRAVARA BASIN
AVERAGE DISTANCE BETWEEN VILLAGES
(SPACING IN KMS.)

INDEX

---

< 3.25
3.25 - 3.5
3.5 - 4.0
> 4.0

FIG. 6.6
The houses are constructed out of local materials, available or easily imported. On the basis of field observations, the impact of buildings genius is visualized with their general and particular aspects. So the dwellings, the most universal elements of cultural landscape, having a highly significant place in the geographical hierarchy of phenomena, depict in any region, the symbol of its regionalism, expressive of both its physical milieu, as well as socio-economic structure.

Several geographers in India have worked on house types in different parts of the country. U. Singh (1955) attempted to analyse and correlate the number of plots, population, land owners and area under different crops and their relationship with the house types. His ideology was followed by Roy (1961). He studied the nature of soil, changes in land use and occupational characteristic influencing house types in area. R.L. Singh (1957), Singh (1965), Bose (1967) worked on tribal village, Singh (1968), Kayastha (1972), Tamaskar (1972), Sharma and Singh (1974), Sinha (1976), Mandal (1979) are the important persons who have worked on various aspects of rural house types in India. Even though there is more need to study the house types in regional context. Attempt has been made to find out the impact of various physical and cultural factors on the house types in the Pravara Basin.

6.7 Impact of Physical Factors :-

Topography of the area, drainage system, soil types and climate are the important factors, which determine the types of rural houses. Climate is more predominant and influences building material, shape of roof and ultimately the types of houses. Amount of rainfall, direction of wind, sunny sides are the important factors, which control the architecture and plan of rural dwellings. In the study area, Akole tahsil and large portion of Sangamner and some part of Rahuri
tahsil experiences heavy rainfall. Houses in these parts are made of branches of
trees, bamboo, grass, mud and stone. In the Parner tahsil, house walls are built up
of stone, mud and sun dried bricks. Rest of the region also characterized with
using stone and mud as a major building material for the houses.

It is observed that houses in western part of the basin have sloping roofs
because of heavy rainfall. The roof material used in these parts is mud tiles, grass
and straw. Areas which experience the low rainfall have flat roofs constructed
from mud, wood or corrugated iron or metal sheets.

Physiography and drainage also play an important role in determining the
plan and layout of the house types. In Akole and Sangamner tahsils where
proportion of undulating and hilly terrain is more the houses are built in a
scattered manner. On the other hand houses in the plain, fertile part of the Pravara
and Mula valley are closely spaced, most of the houses have common wall. Each
house has a limited open space in the front. The front court yard of the house is
walled with a single door at the center. Since last three decades the development
of irrigation particularly in Mula valley has changed the rural house pattern in
these areas.

Development of ‘Vastis’ and ‘Wadi’ settlements have created new form of
house type in the area. Houses in the wadi settlements are built from stone or burnt
bricks. These houses have separate arrangement for cattle, residence and storing
agricultural implements and goods. This form of house types belongs to a rich or
‘Bagayatdars’ where at the road side of the farm beautiful mansion like building is
constructed, nearby the main house separate arrangement is made to keep the
agricultural implements, small quarters are also constructed for the agricultural
labourers. One part is fully devoted to dairy development, where cows, buffalos
are kept. This form is particularly developed in Shrirampur, Rahuri and Newasa
tahsil and it is because of introduction of canal irrigation in the area.
6.8 Impact of Cultural Factors :-

The socio - economic situation of the region determines the regional pattern of house types. It influences the shape, size, plan and style of construction of houses. Economic condition of the people, traditions and social customs are the important factors. The houses of one community differ widely from those of the other, the reason being the difference in economic condition and cultural outlook. The houses also represent the cultural heritage of the past and the survival of the tradition may be seen not only in the general aspect of the house but in the style of construction and architectural features (Singh R.L., 1957).

In the study area most of the settlements are located on highly elevated ground. Where the village site (Gaonthan area) is sufficiently large to hold the growing population, the hamlets, vastis or wadi settlements develop nearby. These wadi settlements are treated as a part of the main village in respect of administration, social, cultural, economic and religious and other matters.

The availability of local building material is of great importance in the construction of houses. The use of mud, clay, bamboo, grass, reeds, timber, sand and stone is usually used for the construction of wall and roofs of the houses.

6.9 Types of Houses :-

Houses are classified according to their size, building material used for wall and roof, and the structure.

According to Size :-

According to size, rural houses are classified as large, medium and small houses. Large houses in size, which are observed in the study area are generally known as 'Wadas'. These houses are constructed from stone or bricks with flat roofs and are found in valley region. The percentage of these houses is very less,
two or three houses of large size are found in a village and they are belong to rich farmers. Medium size houses have stone or mud walls with tiled flat roof or sloppy roofs with local tiles, Mangalore tiles or corrugated iron sheets. These houses have front varandah, Majghar, Deoghars and kitchen. Such houses are built from stone and mud. They have thatched or tiled roofs. These houses are more commonly built by small farmers or agricultural labourers.

**According to Wall Material (Mud, Stone, Brick, Timber) :-**

It is observed that, stone is the predominant building material used for walls with mud. Brick is the second important material used in agriculturally prosperous areas and grass, reeds or branches of trees are used as a wall material by poor people as well as by tribals in the western part of the region.

**According to Roof Material (Mud + other material, Tin, Tile, Thatch, Wood) :-**

The roofs of the houses in this area are predominantly constructed from wood and mud, tiles, corrugated sheets, grass and in recent time by cement slab. In western hilly part grass, reeds, leaves and local tiles are used as a roofing material, whereas in central and eastern part mixture of wood and mud (Dhaba) is a common roofing material apart from this corrugated iron sheet and cement sheets are also used. The slope of roofs goes on decreasing with the decrease in amount of rainfall particularly from west to east.

**According to Structure :-**

From the architectural point of view houses are classified, but in this region old houses have little consideration of architectural style. Wada houses have front wall with little elevation of main door, wadas are built on a raised plinth (Jote) and have open veranda. Some of the wooden carving may observed inside the houses where ceilings are made of small closely fitted wooden beams. Some houses are
two storied with walls constructed on stone and bricks, they may have different parts of various functional use. Such houses have separate cattle shade either in the front of or side by the houses.

**Occupancy Rate :-**

Occupancy means the number of persons per house. The study of occupancy rate of rural houses in the basin shows that Nagar and Newasa tahsils have an occupancy of less than 5.5 (5.03 and 5.16, respectively) persons. Rest of the tahsils have more than 5.5 occupancy rate, Sangamner tahsil have higher occupancy rate i.e. 5.93 persons per house. The average occupancy rate of the basin is 5.52. It is very remarkable that occupancy rate does not show any relationship with the physiography or any cultural, social or economical condition of the area.

Summarizing the salient features building material and house types in the basin, one may observe that apart from physical and cultural factors, economic factors also play an important role in determining the type, structure and material to be used for the construction of houses.

Rural house types are far from ideal for living houses are very compact, there is no space between the houses, common wall is used for the differentiation between the houses, windows are not kept at any side, so houses are poorly ventilated and congested, especially in the valley areas. There is no proper drainage, and hence used water stagnates. There is a lack of civic sense. The lack of privy – places lead to the use of nearby areas of houses or outer parts of the gaon than. The quality of the houses particularly low class people very low, inadequate space, poor quality of building material and so on, hence the poor man’s houses are just an apology for shelter.
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3. Mather, C.E. (1944), A Linear Distance Map of Farm Population in the U.S. AAAG. 34, pp. 173-180
4. Dacey, M.F. (1962), ‘Analysis of Central Place and Point Patterns by a Nearest Neighbour Method Lund Series in Geography, pp.54-76