Chapter V

SETTLEMENT PATTERN AND CENTROGRAPHIC ANALYSIS OF TRIBAL SETTLEMENTS IN THE TWO TRIBAL REGIONS OF ORISSA
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Proposition:

In the previous chapter the spatial distribution of the tribal settlements in the two study areas of northern tribal region and southern tribal region has been explained with help of conventional cartographic representations and it has been possible there to understand the extent to which the tribal settlements are located over the geographical space of Orissa. But, it is necessary to precisely know the nature of the pattern in which the tribal settlements are arranged so that desirable precautions could be prescribed in planning proposal so that benefits to tribal communities could be maximised through ideal judgements of locational implications. It is needless to point out that to the mind of a social scientist interested in tribal problems a significant point always strikes as regards the manner in which the tribal settlements are located in the different areas of the major tribal regions.

The distribution of settlements can initially be classified in two ways, firstly as 'regular' or 'irregular'...
and secondly as 'clustered', 'random' or 'even' (i.e.
regular). The extremes are: (i) 'regular' anti-clustered,
where the settlements are distributed as the centres of
hexagons and (ii) hyper-clustered, where all the settlements
are piled up on one single locality on the geographic surface.
The techniques to decide on the type of a distribution, are
used in situations where there is a considerable number of
settlements. But, it is well known that the number of
possible distributions of settlements on a surface is
infinite. To help to make the understanding on the description
of the pattern of distribution of settlements more viable,
it has been considered desirable, and practicable too, to
introduce the concept of a random distribution beyond which
in one direction lie distributions that are more and more
clustered and in the other direction distributions that are
more and more anti-clustered or evenly distributed.

The distribution pattern of settlements on geographic
space of any area or region controls and guides the
distribution of services and facilities needed for the
population occupying the said space. In other words, the
provision of community facilities usually adopts to the
distribution pattern of settlements. Understanding of a
settlement pattern helps further providing logically and
conveniently new facilities at appropriate places. In addition to this to take decision for the development of the basic need of minimum infrastructural and service facilities at community level the settlement pattern has to be the indicator in the process of planning prospects in any area. It is with this view that an attempt is made here for the study of settlement pattern in the two tribal regions of the state.

Spatial Units:

It has been clearly shown in the previous chapter (Ch. IV) that on the basis of the spatial distribution of different tribes, the two major tribal regions, the northern and the southern tribal regions, have been divided into 5 and 6 tribal belts respectively. The tribal belts of the northern region, as already pointed out are:

(i) The North-west Kisan-Oraon Belt (western part of Sundargarh district).

(ii) The South-west Kisan Belt (Kuchinda Area in Sambalpur district).

(iii) The North-west central Oraon-Kisan Belt (Eastern part of Sundargarh district).

(iv) The North-east central Kolha-Bhuyan Belt (Kendujhar district).

(v) The North-east Santhal Belt (Mayurbhanj district).
Similarly, the tribal belts of the southern tribal region as already indicated in the previous chapter are:

(i) The South-west Koya Belt (Malkangiri Area).

(ii) The North-west Bhottada Belt (Jeypore - Nawarangpur Tract).

(iii) The South-central Paraja-Kandha Belt (Koraput Area).

(iv) The North-central Kandha Belt (Rayagada Area).

(v) The Eastern Saura Belt (R.Udayagiri Area).

(vi) The Northern Kandha Belt (Phulbani Area).

All the settlements contained in each of the belts are taken into account for the purpose of the study of the settlement pattern in each of the said tribal belts and also in the major regions considered as a whole. The distribution of settlements in the different tribal belts and in the two major regions are presented for visual impression vide Fig. 5.1 and 5.2. It is then the task of the present study to find out the desirable methodology with its logical applicability so that necessary measure of the spatial distribution pattern could be indicated for the purpose that has been spelt out in the beginning of this chapter.
**Methodology:**

In the present study the Chi-square test is applied for the study of the settlement pattern because the chi-square test can generally be used to compare observed and theoretical frequencies, particularly when there are a large number of items under observation. In particular, it can be used to test the null hypothesis that sample data have been drawn randomly from a normal distribution. The observed frequencies are compared with those which would be expected if the distribution were actually normal, with the same mean and standard deviation as computed from the sample data.

The chi-square ($\chi^2$) value is defined as follows:

$$\chi^2 = \sum \frac{(o - E)^2}{E}$$

where $o$ is the observed frequency, and $E$ is the expected frequency.

The larger the differences between observed and expected frequencies, the larger the value of chi-square. Chi-square will be zero only when all observed and expected frequencies are identical. In case of perfectly ordered distribution i.e. regular or even distribution of settlements, $\chi^2$ obtains of value of zero. The higher the value, the greater is the clustering. Otherwise, the in-between situation with $\chi^2$
values indicates a randomness of the distribution. In general case, if however, the value of chi-square turns out to be larger than that expected by chance, we shall be in a position to reject the null hypothesis under the usual procedures. In the following pages the above consideration of χ² distribution as the measure for pattern of distribution of settlements in the two tribal regions covering 11(5+6) tribal belts has been applied.

Application:

Following the principles of chi-square technique, the regions are divided into a number of grids of equal size to compare and assess the situation prevailing in different tribal belts within the region and in between the regions. The expected number of settlements per grid for a tribal belt is derived by counting the total number of settlements within each belt under consideration and then dividing by the number of grids covering the total geographical space of the said belt. The observed frequency for each grid is obtained by simply counting the number of settlements present in each grid. The χ² value is calculated on the basis of observed and expected number of settlements for all the belts and also for the two regions mentioned earlier. The details of the statistics are presented vide Table - 5.1
and 5.2 given below and in Fig. 5.1 and 5.2. The calculated value is compared with the tabulated value at desired level of significance at the appropriate places of degree of freedoms to know the spatial pattern since the data used for the analysis are not drawn as sample, but rather the total settlements are involved in the process.

Table - 5.1
Chi-square statistics and settlement pattern (Northern Tribal Region)

<table>
<thead>
<tr>
<th>Region/Belt</th>
<th>No. of grids</th>
<th>Calculated value</th>
<th>Tabulated value at 1% level of significance</th>
<th>Settlement pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGION- I</td>
<td>104 (df=103)</td>
<td>2955.95</td>
<td>147.152</td>
<td>Extremely clustered</td>
</tr>
<tr>
<td>TRIBAL BELTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) The North-west Kisan-Oraon Belt (Sundargarh west Region)</td>
<td>20 (df= 19)</td>
<td>234.89</td>
<td>36.191</td>
<td>Highly clustered</td>
</tr>
<tr>
<td>(ii) The South-west Kisan Belt(Kuchinda Region)</td>
<td>16 (df=15)</td>
<td>377.56</td>
<td>30.578</td>
<td>Highly clustered</td>
</tr>
<tr>
<td>(iii) The North-west Central Oraon-Kisan Belt(Sundargarh East Region)</td>
<td>15 (df=14)</td>
<td>147.18</td>
<td>29.141</td>
<td>Clustered.</td>
</tr>
<tr>
<td>(iv) The North-east Central Kolha-Bhuyan Belt (Kendujhar Region)</td>
<td>31 (df= 30)</td>
<td>663.43</td>
<td>50.892</td>
<td>Highly clustered</td>
</tr>
<tr>
<td>(v) The North-east Santal Belt (Mayurbhanj Region)</td>
<td>33 (df= 32)</td>
<td>1318.23</td>
<td>60.102</td>
<td>Extremely clustered</td>
</tr>
</tbody>
</table>

(df = degree of freedom i.e. n - 1)
Table - 5.2
Chi-square statistics and settlement pattern (Southern Tribal Region)

<table>
<thead>
<tr>
<th>Region/Belt.</th>
<th>No. of grids</th>
<th>Calculated value</th>
<th>Tabulated value at 1% level of significance</th>
<th>Settlement Pattern.</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGION - II</td>
<td>133 (df=132)</td>
<td>4398.87</td>
<td>195.909</td>
<td>Extremely clustered</td>
</tr>
<tr>
<td>(i) The South-west Koya Belt</td>
<td>24</td>
<td>620.69</td>
<td>41.638</td>
<td>Highly clustered</td>
</tr>
<tr>
<td>(Malkangiri Region)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) The North-west Bhottada Belt</td>
<td>26</td>
<td>330.05</td>
<td>44.314</td>
<td>Highly clustered</td>
</tr>
<tr>
<td>(Jeypore-Nabarangpur Region)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii) The South Central Paroja-Kandh Belt</td>
<td>32</td>
<td>909.46</td>
<td>57.527</td>
<td>Extremely clustered</td>
</tr>
<tr>
<td>(df= 31)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iv) The North Central Kandha Belt</td>
<td>19</td>
<td>553.99</td>
<td>34.805</td>
<td>Highly clustered</td>
</tr>
<tr>
<td>(Rayagada Region)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(v) The Eastern Saura Belt</td>
<td>27</td>
<td>887.20</td>
<td>45.642</td>
<td>Extremely clustered</td>
</tr>
<tr>
<td>(R. Udayagiri (df= 26) Region)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(vi) The Northern Kandha Belt</td>
<td>32</td>
<td>878.22</td>
<td>57.527</td>
<td>Extremely clustered</td>
</tr>
<tr>
<td>(Phulbani (df= 31) Region)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(df = degree of freedom i.e. n - 1)
Settlement Pattern:

From the above tables it is observed that for each case in each tribal belt and region there is a great difference between the calculated and tabulated $\chi^2$ values, calculated value being much higher than the tabulated value. Even at a level of 1% of significance the calculated $\chi^2$ value is far away from the normally random pattern value given in the $\chi^2$ distribution table. It is therefore an established conclusion, on the basis of this analysis, that there is not even one percent chance for the tribal settlements in Orissa for an even or anti-clustered pattern in both the tribal regions and in all the tribal belts.

Tables 5.1 and 5.2 given above clearly suggest that though in each of all the 11 tribal belts and also in the two major tribal regions the tribal settlement distribution pattern is highly clustered, there is an apparent varying degree in this clustered set up. While both the northern and the southern tribal regions in an over-all distribution pattern of the tribal settlements show an extreme tendency of clustering, the southern region seems to be much more extreme with an abnormal extreme deviation from regular or even from randomness. As is analysed in next chapter on concentration indices, it is the difference in ecological
setting of the two regions which is responsible for the
marked differences in their relative extreme clustering of
the tribal settlements.

It is further noted that three out of the six tribal
belts of the southern region agree with the general extreme
clustered pattern of the region as a whole. The extremely
clustered ones are: (i) the Eastern Saura belt (R.Udayagiri
region), (ii) the South-central Paroja-Kandha belt (Koraput
region), and (iii) the Northern Kandha belt (Phulbani region).
These three are followed by (iv) the Southwest Koya belt
(Malkangiri region), (v) the North-central Kandha belt
(Rayagada region), and (vi) the Northwest Bhottada belt
(Jeypur-Nawarangpur region).

The situation in the Northern Tribal region is
somewhat different though the region as a whole exhibits
an extremity of clustering in tribal settlement pattern
(with of course, at some degree below the situation of the
southern region). While only one out of the five tribal
belts i.e. (i) the Northeast Santal belt (Mayurbhanj region)
depicts an identical extreme clustered tendency with the
whole Northern region, the rest four belts show relatively
lower values of deviation from the general extreme clustered
pattern and therefore these four belts are attributed the
adjective of 'highly clustered' or only 'clustered' pattern
than taking them under an 'extreme clustered' pattern. These four belts in order of their higher clustered pattern are (ii) the Northeast central Kolha-Bhuyan belt (Kendujhar region), (iii) the south-west Kisan belt (Kuchinda region), (iv) the Northwest Kisan-Oraon belt (Sundargarh west region) and (v) the Northwest Central Oraon-Kisan belt (Sundargarh East region). Of these four belts, the last one i.e. the Sundargarh East region has the lowest deviation amongst all the belts of the northern and southern regions and therefore is considered to have a simply 'clustered' than 'highly clustered' pattern of tribal settlements.

It is very common to note from the field investigation at micro-level that there is a strong tendency among the tribes to cluster together at one place which is again guided by socio-cultural, topographical and environmental situations. The two tribal regions are very much superimposed over the high hills and plateaus with thin to thick forest coverage characterised by inaccessibility and this fact supports in favour of clustered development of tribal settlements. In addition to this, as the size of the settlements in terms of population and households are very small and the number of settlements are quite large irrespective of population size the psychological or behaviour tendency linked to social security and safety makes them
convinced that clustering is more suitable than the randomness or any other regular type of geographical space distribution for them. It is quite evident from the results that the settlement planning has to be done carefully giving due emphasis on the nature of their distribution which is highly clustered in general and quite different from the pattern of distribution of settlements in the other parts of the state where non-tribal settlements predominate.

It will be important to note that with the above observation that the tribal settlements in Orissa are far away from either a random distribution pattern or a regular distribution pattern as evidenced from the largely deviated $\chi^2$ values, it is not desirable to make quick decisions for taking up planning measures towards spatial re-distribution of the tribal settlements which otherwise is considered to be a necessary good for arriving at regional and communal assimilation in the light of social balance over geographical space. Redistribution measure may be good for some other tribal areas where the situation is not far away but rather closer, to random distribution pattern with already a tendency to deviate from their usual clustered habitations through influence of social changes around them as a result of technological inputs of development. In this latter observation, the case of the plains tribal settlements of Assam may be mentioned as per the analysis of Deepti Das.
in her work on tribal population and settlements in Kamrup district of Assam where the application of $\chi^2$ distribution technique has also led her to conclude that the pattern of tribal settlements is more clustered than random. Since the deviation of her calculated $\chi^2$ values was not so great as compared to the present cases of Orissa tribal regions and also in each of the 11 tribal belts, it is obvious for us to assert that the process of redistribution aspect in pursuance of tribal communities in selected tribal settlements though may be of some viable results in Assam Plains (3), such measure in Orissa would be towards negativity for a social change. We have to consider the Orissa tribal settlement concentrations on a different footing than it is in other areas at national level.

It is for this obvious fact as analysed above that there is the necessity of understanding the location of mean centres at various regional levels of the tribal belts and tribal regions of Orissa through which a slow process of social transformation tendencies could be injected by provision of conducive innovative development infrastructures for a slow but sure acceptance by tribal communities with their probable and possible accessibility to the central locations of their settlement concentrations.
Apart from the study of settlement pattern in general as mentioned above, it is equally important and necessary to identify the mean settlement centres for adoption as viable and possible attractive service centres if suited to the purpose of tribal psychological or behavioural environment. The mean centre is the position around which theoretically and also practically other settlements cluster. In effect, it is the centre of gravity of the distribution and is analogous to the arithmetic mean of descriptive statistics. The co-ordinates of the mean centre \((\bar{x}_C, \bar{y}_C)\) may be calculated from the expressions (4):

\[
\bar{x}_C = \frac{\sum (x_i \cdot f_i)}{\sum f_i} \quad \text{and} \quad \bar{y}_C = \frac{\sum (y_i \cdot f_i)}{\sum f_i}
\]

where \(x_i\) and \(y_i\) are the co-ordinates of the \(i^{th}\) point representing a tribal settlement and \(f_i\) is its number of settlements, i.e. the frequency with variable values for \(x_i\) and \(y_i\). The calculations of the mean centre of a region or of a belt that comprises of the tribal settlements within its regional fold is done considering the columns based on the x-axis, and the rows based on the y-axis. The number of units in each column \((f_i)\) is multiplied by the mid-interval
value of the base of that column \((x_i)\). The value of \(x_c\) is found out by summing up the products \(x_i f_i\) and then dividing by the total number of points (i.e. tribal settlements) as has been given in the above expression. Similarly, \(y_c\) is also calculated as given in the above mentioned expression.

In the present study for quantitative measure and spatial assessment the mean centres for each of the 11 tribal belts of the two regions have been identified and presented in the same Fig. 5.1. and 5.2. It was necessary to present a visual picture of these theoretically obtained mean centres on the indication of their calculated co-ordinates because only after plotting their locations we can make an impression on the viability of their elevation to the status of spatial leadership at micro-regional level for taking measures of diffusion of ideas and innovations on planning and development. The co-ordinate values and names of each mean centres are given in table 5.3 and 5.4. In all, we thus obtain 13 sets of coordinates for the 13 regional units (i.e. for the two major tribal regions at higher order and the 11 tribal belts covering the two regions at lower level).
### Table - 5.3

Mean Centres of Tribal Settlements  
(Northern Tribal Region)

<table>
<thead>
<tr>
<th>Region/Belt</th>
<th>No. of Tribal Settlements</th>
<th>Co-ordinates</th>
<th>Name of the mean tribal settlement centre with police station &amp; District.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIBAL REGION - I</td>
<td>4944</td>
<td>$\bar{x}_c = 44.52$ $\bar{y}_c = 18.66$</td>
<td>Bhand (Baria Police station of Kendujhar District).</td>
</tr>
</tbody>
</table>

**TRIBAL BELTS**

(i) The North West Kisan- Oraon Belt (Sundargarh west Region).

(ii) The Southwest Kisan Belt (Kuchinda Region).

(iii) The Northwest Central Oraon-Kisan Belt (Sundargarh East Region).

(iv) The East Central Kolha Bhuyn Belt (Kendujhar Region).

(v) The Northeast Santal Belt (Mayurbhanj Region).

<table>
<thead>
<tr>
<th>Region/Belt</th>
<th>No. of Tribal Settlements</th>
<th>Co-ordinates</th>
<th>Name of the mean tribal settlement centre with police station &amp; District.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIBAL REGION - I</td>
<td>4944</td>
<td>$\bar{x}_c = 13.09$ $\bar{y}_c = 9.84$</td>
<td>Panchmahala (Sundargarh Police station of Sundargarh District).</td>
</tr>
<tr>
<td>(i) The North West Kisan-Oraon Belt (Sundargarh west Region).</td>
<td>599</td>
<td>$\bar{x}_c = 6.37$ $\bar{y}_c = 7.47$</td>
<td>Tainsar (Mahulpali Police station of Sambalpur District).</td>
</tr>
<tr>
<td>(ii) The Southwest Kisan Belt (Kuchinda Region)</td>
<td>433</td>
<td>$\bar{x}_c = 10.14$ $\bar{y}_c = 9.87$</td>
<td>Turiberana (Raghunathpali Police station of Sundargarh District).</td>
</tr>
<tr>
<td>(iii) The Northwest Central Oraon-Kisan Belt (Sundargarh East Region)</td>
<td>648</td>
<td>$\bar{x}_c = 10.16$ $\bar{y}_c = 14.32$</td>
<td>Ukhunda (Baria Police station of Kendujhar District).</td>
</tr>
<tr>
<td>(iv) The East Central Kolha Bhuyn Belt (Kendujhar Region)</td>
<td>1098</td>
<td>$\bar{x}_c = 11.27$ $\bar{y}_c = 14.32$</td>
<td>Godipokhari (Baripada Police station of Mayurbhanj District).</td>
</tr>
</tbody>
</table>
Table - 5.4
Mean Centres for Tribal Settlements (Southern Tribal Region)

<table>
<thead>
<tr>
<th>Region/Belt</th>
<th>No. of Tribal Settlements</th>
<th>Co-ordinates</th>
<th>Name of the mean tribal settlement with police station &amp; District.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIBAL REGION - II</td>
<td>8063</td>
<td>$\bar{x}c = 39.43$, $\bar{yc} = 36.39$</td>
<td>Chatikona (Bissamkatak Police station of Koraput District).</td>
</tr>
<tr>
<td>TRIBAL BELTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) The Southwest Koya Belt (Malkangiri Region)</td>
<td>586</td>
<td>$\bar{x}c = 14.42$, $\bar{yc} = 16.52$</td>
<td>Duraguda (Mathili Police station of Koraput District).</td>
</tr>
<tr>
<td>(ii) The Northwest Bhottada Belt (Jeypur-Nawarangpur Region)</td>
<td>848</td>
<td>$\bar{x}c = 12.56$, $\bar{yc} = 13.76$</td>
<td>Dabugaon (Dabugaon Police station of Koraput District).</td>
</tr>
<tr>
<td>(iii) The South Central Paroja-Kandha Belt (Koraput Region)</td>
<td>1250</td>
<td>$\bar{x}c = 17.98$, $\bar{yc} = 15.72$</td>
<td>Kundali (Pottangi Police station of Koraput District).</td>
</tr>
<tr>
<td>(iv) The North Central Kandha Belt (Rayagada Region)</td>
<td>1115</td>
<td>$\bar{x}c = 10.21$, $\bar{yc} = 9.27$</td>
<td>Petligura (Kalyansingpur Police station of Koraput District).</td>
</tr>
<tr>
<td>(v) The Eastern Saura Belt (R.Udayagiri Region)</td>
<td>2164</td>
<td>$\bar{x}c = 13.26$, $\bar{yc} = 9.47$</td>
<td>Anuguro (R.Udayagiri Police station of Ganjam District)</td>
</tr>
<tr>
<td>(vi) The Northern Kandha Belt (Phulbani Region)</td>
<td>2103</td>
<td>$\bar{x}c = 12.88$, $\bar{yc} = 12.59$</td>
<td>Digipada (Baliguda Police station of Phulbani District).</td>
</tr>
</tbody>
</table>
Mean Centre of tribal settlements for Northern Tribal Region:

As mentioned in previous chapter, the tribal settlements in Northern tribal region is characterised by a mixed concentration of tribal groups where the eastern belt is dominated by either single or double dominated tribe types i.e. Santal, Bhuayan and Kolha while the western sector is dominated by Kisan and Oraon types. The mean centre, interestingly, falls in between these two sections indicated by the coordinates:

$$\bar{x}_c = 44.52 \quad \text{and} \quad \bar{y}_c = 18.86$$

The position of this regional mean centre has been plotted in the map vide Fig. 5.1. Interestingly this centre is neither in Sundargarh region of Kisan-Oraon dominating belt with highest concentration of tribal settlements, nor in Mayurbhanj region of Santal dominating belt with similar concentration of tribal settlements. The location falls in Bhanda area in Baria police station of Kendujhar district located at only 30 km. away from Kendujhar town where there is least tribal settlement concentration nearby. But this point is economically backward due to lack of infrastructure for development and also for poor transport system. If this theoretical mean centre point is shifted to Kendujhar town or nearby, it would
have an ideal spatial location from operational point of view. It will provide a compromising location for the region as a whole and also for easier development operations for tribal settlements without any hindrance. Moreover, this suggested operational regional mean centre is already well connected with intra- and inter-state bus services where Tribal Development Agencies are already functioning with their headquarters. At present, two important integrated tribal development projects the Bhuyanpirn and the Juangpirn Projects, are carrying in development activities particularly for the two important tribal communities i.e. the Bhuyan and Juang tribes.

Mean Centres of Tribal Settlements for the tribal belts of Northern Region:

It is logically true that the above operational mean centre represents a good location in the process of compromise between the two areas of major concentrations, but it cannot alone do the job of representing all the tribal settlements of the region when an approach to development plans for the tribal settlements are taken into consideration at micro-regional scale. It is needless to say that diffusion of innovations for regional development would not be effectively done if the above regional mean centre alone is considered to act as the control point for all the tribal settlements of the northern tribal region.
This research scholar was, therefore, concerned about better representatives for arrangement of tribal settlements at micro-level. For this purpose, the northern tribal region is divided into five subregions based on desirable attention for preserving the homogeneous characteristics and inter-regional and intra-regional harmony in both tribal and non-tribal settlements of the region.

Tribal settlements were plotted in each of these 5 micro-regions taking into consideration their respective locations. The mean centres of each of the five tribal belts of the northern region have been obtained and these theoretical mean centres have been noted in Table - 5.3 above by coordinates and the locations have been plotted in Fig. 5.1.

(i) The mean centre for the North-west Kisan-Oraon Belt of Sundargarh west region falls at Panchamahal in Sundargarh police station on the MDR. This centre is only 8 km from Sundargarh district headquarters and it is conveniently located to represent all the functionally important tribal concentrated areas nearby, such as Talasara, Subdega, Balisankara, and Bargaon through M.D.R. and S.H. 10. It is suggested that a micro-regional centre should be set up for tribal development schemes in the above suggested mean centre of settlements for this region so that maximum number of tribal settlements would get the benefits of trickling down effect.
of the integrated tribal development plans.

(ii) The second region is identified as the Southwest Kisan belt of Kuchinda region in Sambalpur district lying east of Ib river, and its mean centre is found out to be at Tainsar in Mahulpali police station close to Kuchinda Tahsil headquarters on one side and Govindpur railway station on the other side lying on the south-eastern railway line connecting Jharsuguda and Rourkela. It is about 35 km east of Sundargarh on the road joining Kuchinda and Bargaon which runs via this location. But this theoretical mean centre can hardly help as the subregional centre for exposing the single dominated tribe like Kisan to the innovations of tribal development schemes of the government. If the theoretical mean centre would be shifted to the nearby important location Kuchinda, where already there are developmental activities under ITDP (Integrated Tribal Development Project) to uplift of the tribal society, then it will be more meaningfully operational for this belt.

(iii) The third region which is identified as the Northwest central Oraon-Kisan belt of Sundargarh East region has 648 tribal settlements and the theoretical mean centre is calculated to be Turiberana in Raghunathpali P.S. which is only 8 km east of Latnikata. But this point is very poorly connected as only a narrow unmetalled road serves this. So,
for better development of the tribal society the theoretical mean centre may be shifted to the nearby point Lathikata which can be the operational mean centre. The new point is connected both through railways and road ways, NH-23 connecting this functionally operative point with the major district road. Moreover, Lathikata is having a Development Block Office where government or any development agencies can introduce certain new ways for tribal development.

(iv) The next micro-region is a vast one i.e. Northeast central Kolha-Bumyan belt of Kendujhar region whose theoretical mean centre is calculated to be at a point nearer to northeast of Kendujhar district headquarters, 4 km. away from it. As the point is not properly connected with roads, it may be shifted to an operational centre like Kendujhar police station headquarters which treated as an operational centre by the government authority or any other development agency so that maximum induction effect can be materialised.

(v) The North-eastern Sental belt of Mayurbhanj region is an agricultural region. This micro subregion is a single dominated tribal region. The mean centre falls near Gohipokhali in Baripada police station on the NH-5 at a distance of about 9 km. west of Baripada proper. This tribal belt has as many as 2166 tribal settlements and therefore needs special attention.
It is suggested that a micro-regional centre should be set up at this point for tribal development schemes in view of its mean location of tribal settlements for this subregion as it is well connected with Baripada which is the district headquarters of the Mayurbhanj district. Majority of the tribal settlements of this tribal belt lie within a distance of least effort from the said theoretical as well as operational mean centre. It may further be noted here that this micro-regional operational mean centre is situated at a reasonable and well accessible distance from practically all settlements of this tribal belt as a whole and it is a vulnerable point for diffusion of innovations of tribal welfare from here so that maximum induction effect can be materialised.

**Mean Centre of Tribal settlements for Southern Tribal Region:**

The same technique has also been applied to the southern tribal region where the tribal settlements are more unevenly distributed throughout the region. The entire region is divided into different pockets and is mostly occupied by single dominated tribes. So their distribution type also differs from one another. The mean centre value for this region is plotted in the map vide Fig. 5.2 as per data in table 5.4. It can be seen from the map that the theoretical
mean centre for the region as a whole is located at Chatikona in Bissamkatak police station and lies only 4 km. away southwest of Bissamkatak which is the headquarters of the police station and is coincidently also a permanent collective centre for forest goods. The mean centre falls on the State Highway No. 5 which connects Rayagada with Bhawanipatna and also with the south-eastern Railway line running from Vizianagaram to Raipur. Through this railway line all important forest goods are transported from Bissamkatak, Rayagada, Gunupur, Kalyansingpur and surrounding areas to Andhra Pradesh. So this point is definitely the best spatial location from where co-ordinated effort for regional and economic development of tribal areas of the surroundings can be materialised. Thus, Chatikona would act as an operational centre for the southern tribal settlements, without any territorial bias.

The southern tribal region is divided into 6 micro-sub-regions based on homogeneous characteristics and inter- and intra-regional harmony in both tribal and non-tribal settlements of the region. The tribal settlements were plotted in each of these 6 micro-subregions for obtaining individual micro-regional mean centres. Table No. 5.4 gives the sub-regional mean centres of tribal settlements in southern tribal region and the locations have been plotted in Fig. 5.2.
Mean Centres of Tribal Settlements for the tribal belts of Southern Region:

(i) The Southwest Koya belt of Malkangiri region is with very few tribal settlements, numbering only 586 most of which have each a population less than 500. The theoretical mean centre lies north of Mathili police station headquarters at a distance of about 3 km from it. It is observed that this theoretical location of mean centre is not ideal for balance regional development for the tribal society. It would be better to shift this theoretical mean centre to Mathili for available infrastructural facilities and this location should be given a status of micro-regional centre for diffusion of innovations of tribal development.

(ii) The Northwest Bhottada Belt of Jeypur-Nawarangpur region is situated in a plateau and mountainous terrain and is sparsely populated, more specially with the predominance of Bhottada tribe where the size of the tribal settlements is very small in comparison to other areas. The theoretical mean centre of tribal settlements of this belt is calculated to be at Dabugaon which is the police station headquarters. Umarkote to the north, Kotpad to the southwest and Nawarangpur to the southeast lie not very far off from here. It is further noted that this micro-regional centre is situated at a reasonable distance from the tribal settlements of this micro-region. So it can be treated as an operational centre for diffusion of innovating plan benefits of tribal welfare.
(iii) The South-central Paroja Kandha Belt of Koraput region with 1250 tribal settlements is occupied by vast areas of Kashipur police station in northeast up to Chitrakonda in extreme southwest. This micro-region has maximum concentration of tribes because the area is highly congenial for the tribal people. The theoretical mean centre falls near Kundali in Pottangi police station of Koraput district on the NH-23. It is also not far from Sunabeda since Sunabeda lies to the northwest of the location at a distance of about 10 km. Unlike the other micro-regions, the operational mean centre at Kundali has a suitable location with more concentration of tribals in its surrounding. Majority of police stations of this micro-region also come under the core areas of the southern tribal region. It is suggested that the above theoretical mean centre should be treated as operational.

(iv) The North Central Kondha Belt of Rayagada region is a multifunctional economic region, mainly situated along the river valley of Nagavalli river system on the east and Tel river on the west and has high concentration of tribal settlements with 1115 tribal settlements most of which are small in size. The mean centre of settlements is calculated to be at Petligura of Kalyansingpur P.S. connected by MDR 48A. This location has all advantages from transport point of view. Besides this, it is situated at convenient distance from all
the important tribal settlements of this micro region. Hence, it is suggested that this should be the operational mean centre for this belt.

(v) The Eastern Saura Belt of R. Udayagiri region has 2164 tribal settlements and the mean centre is at a distance of about 10 km. to the northwest of R. Udayagiri. It is northeast of Gunupur. The density of tribal settlements is the highest in this region and the size of the tribal settlement is small with a population of less than 200 each. The theoretical mean centre is calculated to be at Anuguro. The whole micro-region is under single dominating tribal type, i.e. Saura tribe, and the percentage of tribal population is more than 70% to that of total population. So it is suggested that the theoretical mean centre should be shifted to R. Udayagiri tahsil headquarters which is well linked with the other micro-regions of the tribal region. So R. Udayagiri is the best position considered from the point of spatial location and is suggested as the co-ordinating centre for tribal development as the centre is already having some tribal development projects such as the Lanjia Saura project existing for the exclusive benefit of Saura tribal people.

(vi) The North Kandha belt of Phulbani region has 2103 tribal settlements, each of them being small in size and there is not even one settlement which has a population of 1000.
The theoretical mean centre of the micro-region is north-east of Baliguda police station close to the M.D.R. connecting Baliguda and Phulbani. The location has a commanding position with better interaction with the majority of the tribal settlements of the micro-region. Therefore, the mean centre for tribal settlements, thus theoretically obtained at Digipada is logically the best location considered from spatial point of view which can be a coordinating centre so far as tribal development programmes are concerned.

The above finding is based on spatial location of mean centres of settlements for the individual micro-regions of the tribal communities. It provides suggestions for operational points based on arrangement of tribal settlements around these mean centres in their respective belts and as such these centres would help the authorities in taking care through development activities diffused from here to the respective areas. Again, if the overall regional mean centre is assisted by the said micro-subregion mean centres then it will be easier to infuse the trickling down effect of development benefits for tribal settlements in tribal belts of Orissa.
Reference


(3) Ibid.