CHAPTER - III

CENTRALITY AND HIERARCHY OF WEEKLY MARKET CENTRES

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PART - I : CENTRALITY

3.1 The concept of centrality

3.2 Methodology in measuring centrality

3.3 Choice of methods for calculating centrality

3.4 Data availability and selected parameters

3.5 New method of calculating centrality

3.6 Centrality by Davies method

3.7 Centrality by Godlund's method

3.8 Regional analysis

3.9 The centrality rank and population rank of market centres

PART - II : HIERARCHY OF MARKET CENTRES

3.10 Selection of method

3.11 Hierarchic orders of market centres

3.12 Determination of 'K' value for Hierarchy of market centres

3.13 Spatial distribution of market centres in different orders of hierarchy

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The spatial distribution and growth characteristics of weekly market centres has been discussed in the previous chapter. In this chapter, an attempt has been made to study the centrality and hierarchy of weekly market centres in the region under investigation. The present chapter is divided into two parts. Part first deals with the measurement of centrality and in the second part hierarchy of the weekly market centres has been established.

PART - I : CENTRALITY

3.1 THE CONCEPT OF CENTRALITY :

It is obvious that market centres differ from each other in many respect i.e. population size, functional composition, service capacity and area served. The present study is concerned to measure the centrality of weekly market centres in the study area. Centrality value of the market centre is the index of the total personality of market centre in question. Centrality is the measure of aggregate importance of a place in terms of its functional capacity to serve the people and area around it. Centrality of the market centres may be expressed qualitatively, such as, low and high centrality, as well as quantitatively by centrality index which are obtained by converting the functional base of a centre into index on the basis of frequency and the importance of the function. There has also been a concern among geographers to establish a precise relationship between the size of settlement in terms of population and the range of services which it offers (Johnson,1967).

Centrality, by and large, depends upon the functions (central). These central functions have a certain range beyond the limit of the place and cater to the needs of the surrounding region. Walter Christaller (1933), has define the notion of centrality. To him, " the centrality of a place is that component of its functional magnitude which is required for the population of its hinterland." He has studied the central places of Southern Germany and established a hierarchical class system as spatial model of central places.

3.2 METHODOLOGY IN MEASURING CENTRALITY :

Centrality of a place can be computed by considering either by single function or array of important functions available at a place. The single functional index has been used by large number of the geographers. The number of telephone connections was used by Christaller (1933), in his original work. Bus service frequency has been used as a measure of centrality of urban places by A.E.Smailes (1944). Dickinson (1937) has considered wholesale of cities as an indicator of centrality. Smailes (1944) has also used multifunctional index in his work, he has considered number of banks, shops, offices, schools, hospitals and cinema houses as important indicators of centrality. Berry and Garrison (1958) have considered all important functions for calculating centrality. Green (1948) has used bus service index to measure the centrality of a place. Carruther (1957) has studied the ranking of the towns based on motor-bus areas.

Godlund (1956) has worked out the centrality of Swedish settlements on the basis of capacity for service and trade in urban settlements. Davies (1967) used simple method of centrality in South Wales.

In India, studies on centrality and hierarchy of market centres have been carried out by Mukherji (1968). Sinha and Mandal (1974), Saxena (1975), Shrivastava (1976), Dixit (1988) and Jana (1978). As well as Dutta and Banarjee (1970) have used transport index as a measure of centrality. Mulik (1989) in his 'Dynamic of Urbanization in South Maharashtra plateau' has considered all central functions of the place and used surplus functional index for calculating centrality.

3.3 CHOICE OF METHODS FOR CALCULATING CENTRALITY :

In the present study author has calculated centrality of market centres of Karmala tahsil by three methods. Of these two methods have already applied by the geographers. The results of the centrality index have been calculated by using Godlund's method (1956) in which population engaged in secondary and tertiary (non agricultural workers) activities has been obtained. In the same way, the centrality index using location quotient method (Davies,1967) are obtained. The results obtained by these two methods have been compared with the results drawn by new method evolved by author in which centrality index is calculated in terms of excess population served.

3.4 DATA AVAILABILITY AND SELECTED PARAMETERS :

Taking into consideration of the socio-economic condition and the underdeveloped nature of the study area, care has been taken in the selection of central functions. The selected central functions have an effective bearing on the importance of market centre. The central functions/services have been chosen to determine the centrality of the weekly market centres within Karmala tahsil are shown in Table 3.1.

The educational, medical, economic and commercial services/functions are selected keeping in mind the regional conditions. All these twenty four (24) functions have been considered for the calculating the centrality of the weekly market centres. Of these, fourteen (14) functions have been considered for calculating the threshold population.

Fig.3.1, indicate the service capacity of a single unit of the selected functions of the study area. The minimum required population to have a telephone connection is the lowest, whereas, the senior college (higher level of educational function) has a large threshold requirement. From the Fig.3.1 one can easily grouped the lower and higher order functions and service capacity of individual functions. In the study region communicational services have minimum range and medical and educational services have maximum range.

TABLE 3.1 : List of central functions/services.

Sr.No.	Central function / service
1	Highschools
2	Junior Colleges
3	Senior Colleges
4	Primary Health Centre
5	Dispensary
6	Doctors
7	Medical shops
8	Veterinary Dispensary
9	Milk Dairy
10	Banks
11	Post Office
12	Telephone connection
13	Cycle Marts
14	Auto repairs
15	Flour Mills
16	Oil Crushers
17	Harvesting machine
18	Kirana shops
19	Tailoring firms
20	Stationary stores
21	Cloth shops
22	Seeds and Fertilizer Dealers
23	Photo Studio
24	Hotels

KARMALA TAHSIL

SERVICE CAPACITY OF SINGLE FUNCTIONAL UNIT

FUNCTIONS

1	TELEPHONE CONNECTION	8	HIGH SCHOOL
2	POST OFFICE	9	MEDICAL SHOP
3	DOCTER	10	PHOTO STUDIO
4	DISPENSARY	11	VETERINARY DISPENSARY
5	OIL CRUSHER	12	PRIMARY HEALTH CENTRE
6	AUTO-REPAIR	13	JUNIOR COLLEGE
7	MILK COLLECTION CENTRE	14	SENIOR COLLEGE

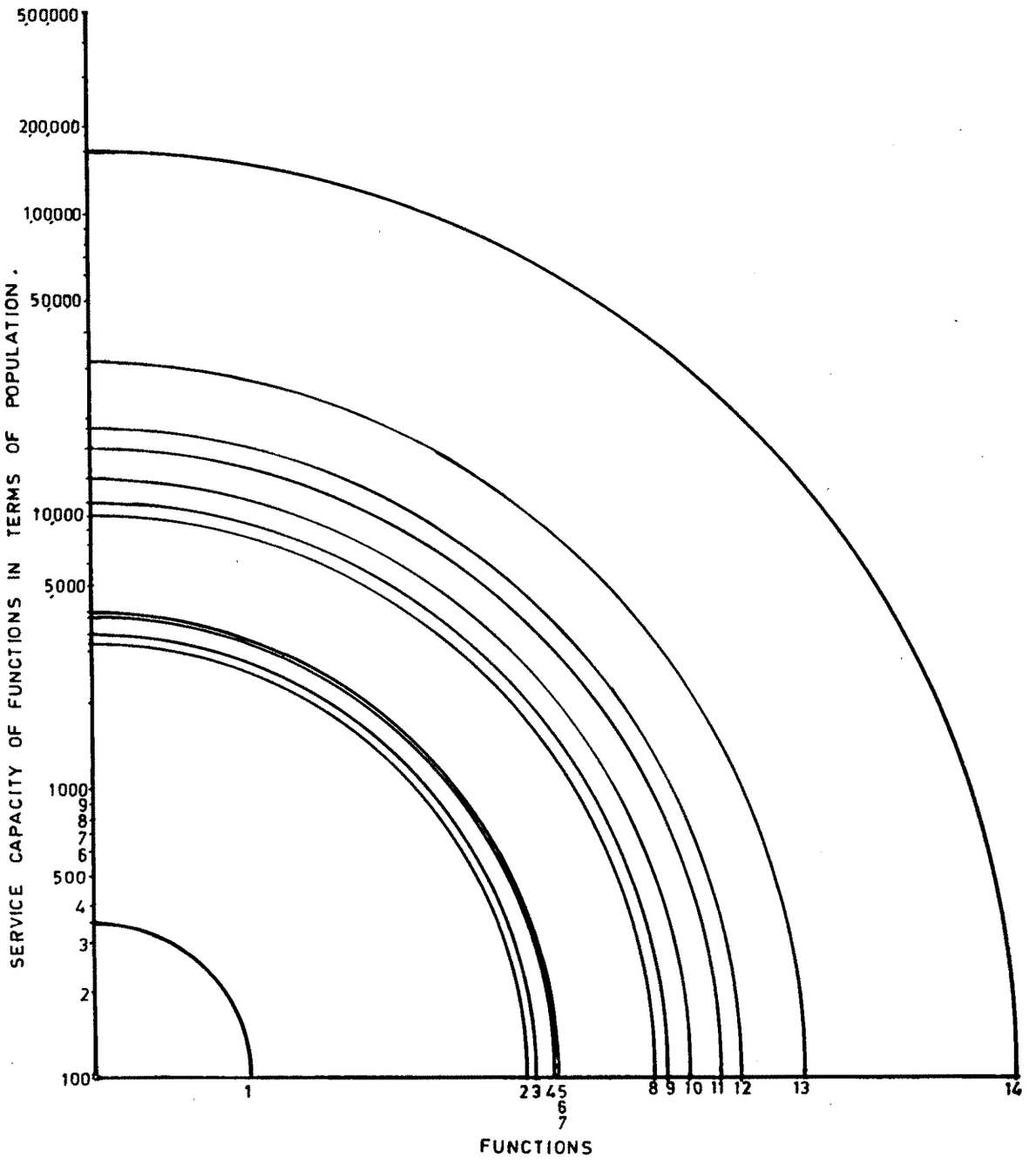

FIG 3.1

The lower order functions includes telephone connection, post office and dispensary. The medium order functions includes the commercial services like photo studio, medical shops, auto repair etc. The higher order functions includes primary health centre, junior college and senior college.

3.5 NEW METHOD OF CALCULATING CENTRALITY :

By employing the data for twenty four services, centrality of weekly market centres has been calculated by a new method. For the sake of comparison and justification of the choice of a new method, the centrality index of the market centres have been calculated by Godlund's and Davies Methods.

The newly evolved method can be designated as, " Excess population served by surplus functions." This method is very simple. However, it has its own merits, the mean population served by any single functional unit within the area under investigation is calculated and with this mean value, the total population served by the number of functional units of any function available at the market centre is calculated. The total population served by a particular function of a market centre is the total service capacity of that function. From the aggregate service capacity, the population of market centre when substracted, we get the excess population serving capacity of that function. This excess population serving capacity is calculated for selected twenty four functions. The summation of all excess population values gives the excess population served by the central functions

of a market centre. For convenience, all summation values of excess population are put under the squar root.

The following equation give the excess population index.

$$Ft = \frac{P}{Fti} \quad \ldots\ I$$

Where, Ft - is the mean functional value for the function,

t - in terms of population (mean population served by single functional unit),

P - is the total population of the study region and

Fti - is the total functional units of function 't' in the study region.

$$FP = Ct \times Ft \quad \ldots\ II$$

Where, FP = is the total functional value of function 't' at market centre (in terms of population),

Ct = is the number of units of function 't' at the market centre.

$$FP = EP - MP \quad \ldots\ III$$

Where, EP - is the excess capacity of the market place for any function 't' (in terms of population number).

MP - is population of market centre.

$$EPi = EP1 + EP2 + EP3 + EP4 + ... EPn \quad .... IV$$

Where, EPi - is the total centrality of a market place (measured in terms of population).

Thus, the calculated centrality indices for all weekly market centres within the study area are shown in Table 3.2 and represented in Fig.3.2. This table also incorporates the centrality indices calculated by location quotient method and Godlund's method too.

3.6 CENTRALITY BY DAVIES METHOD :

Davies (1967), in his simple method applied for South Wales, has used the following formula to calculate a index for single unit of function.

$$C = \frac{t}{T} \times 100$$

Where, C - is score for any function 't',
t - is one unit of function 't' and
T - is the total number of functional units of function 't' within the study region.

With the help of above method, centrality score for selected functions have been calculated and the sum of individual centrality score of all functions at any weekly market place has been computed as the composite locational index and

TABLE 3.2 : Centrality scores of weekly market centres - calculated by excess population index (new method), location quotient index (Davies method) and Godlund's method and their ranks.

Sr. No.	Name of the Market Centre	Rank by population	Centrality by New Method	Rank	Centrality values by location Quotient method	Rank	Centrality values by Godlund's method	Rank
1	Karmala	1	917.88	1	746.47	1	20.75	1
2	Jeur	4	537.80	2	236.92	2	18.87	2
3	Jinti	9	401.68	3	90.52	5	5.00	9
4	Kem	2	342.03	4	173.75	3	6.60	5
5	Ketur	8	291.63	5	78.18	6	10.95	3
6	Sade	3	259.21	6	98.81	4	2.23	17
7	Pomalwadi	17	216.58	7	30.45	9	3.74	14
8	Korti	5	203.21	8	55.23	7	3.93	12
9	Manjargaon	16	162.25	9	21.97	12	3.73	15
10	Dahigaon	18	153.98	10	18.57	14	1.40	18
11	Divegavhan	14	142.84	11	17.69	15	2.71	16
12	Sogaon	12	132.97	12	15.34	17	5.07	8
13	Kugaon	15	132.08	13	15.66	16	5.83	7
14	Kumbhargaon	11	127.12	14	19.41	13	4.64	10
15	Kedgaon	10	117.43	15	22.17	11	4.28	11
16	Chikhalthan	6	88.12	16	30.70	8	7.18	4
17	Savadi	7	84.74	17	24.54	10	6.00	6
18	Hingani	13	74.29	18	6.77	18	3.79	13

SOURCE : Compiled by Author.

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CENTRALITY OF WEEKLY MARKET CENTRES

(BASED ON NEW METHOD)

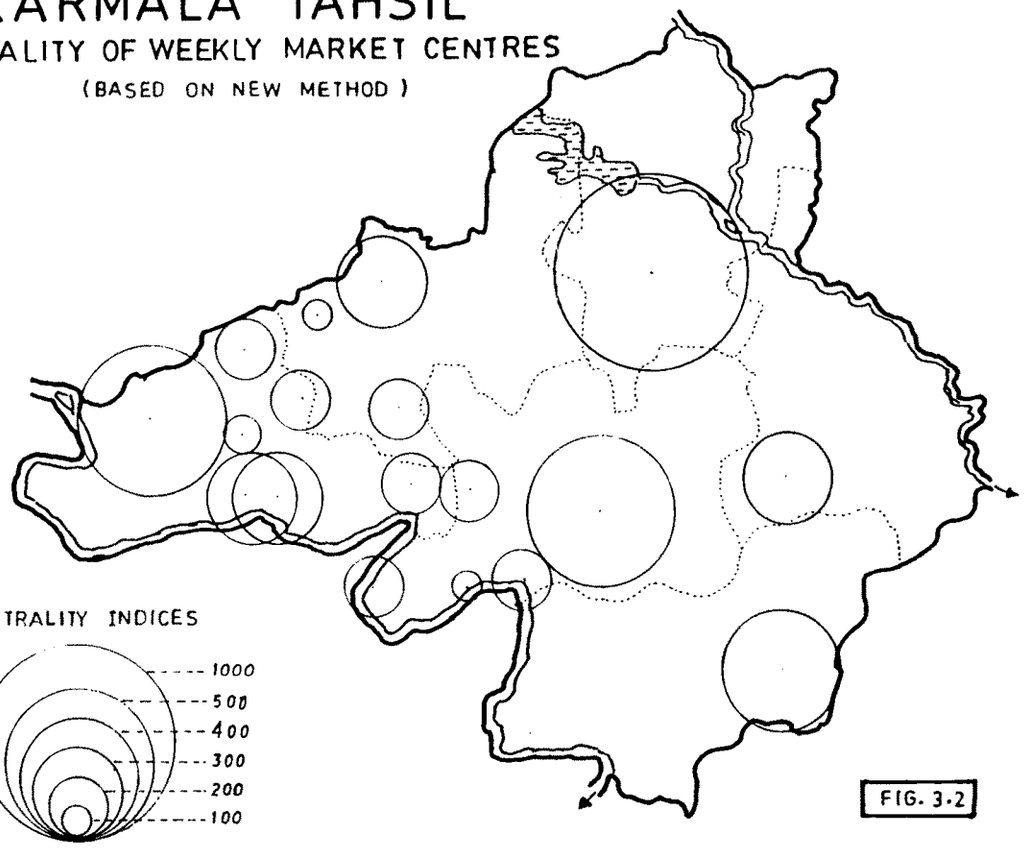

FIG. 3·2

CENTRALITY OF WEEKLY MARKET CENTRES

(BASED ON DAVIS METHOD)

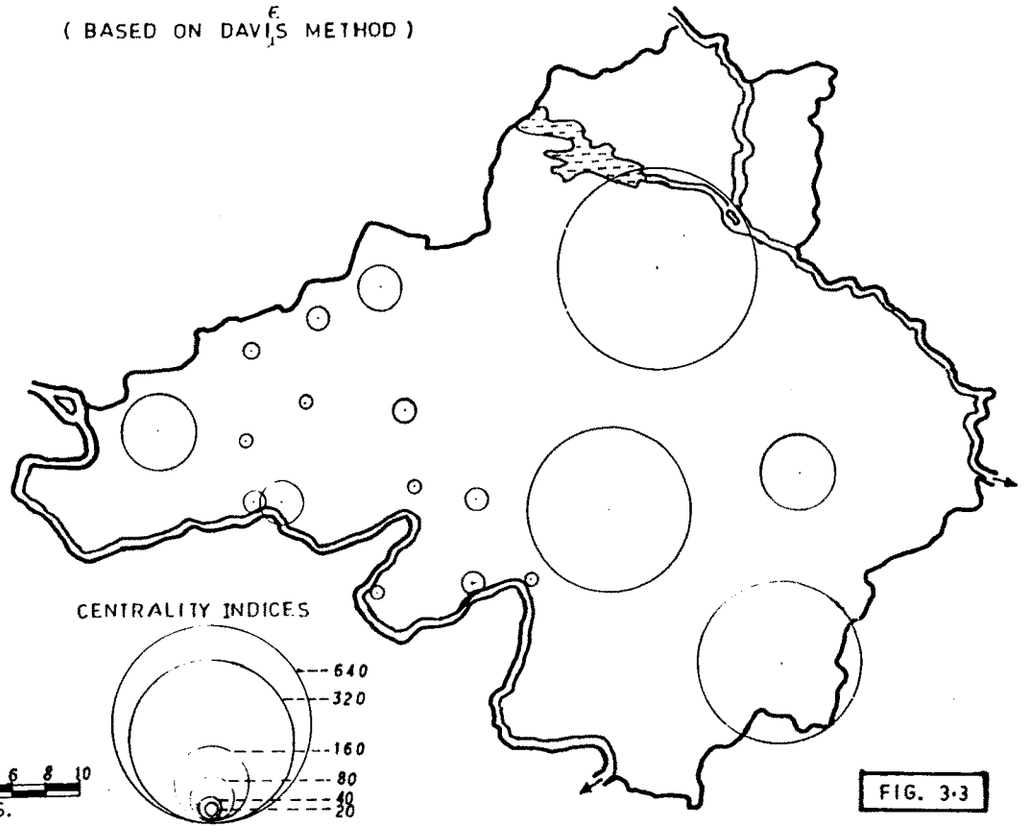

FIG. 3·3

incorporated in Table 3.2 and shown in Fig.3.3. This method gives sometimes misleading results for the market centres which are well connected to adjoining settlements. As the number of people who are actually employed at a market centre are residents of near by villages, and the census enamurated them as a employees or tradesmen of the place of the residents.

3.7 CENTRALITY BY GODLUND'S METHOD :

The non-availability of functional data, sometimes pose a serious problem in the process of investigation and it becomes very difficult to calculate the centrality. Under this circumstances, the method used by Godlund (1956), can be used to calculate the regional mean index of centrality. He established the relationship between number of persons employed in retail trade and commerce to the total population, with the help of following equation :-

$$C = \frac{TC}{P} \times 100$$

Where, C - is the regional mean index of centrality,
TC - is the number of persons employed in retail trade, commerce and other services in study region and
P - is total population of the study region.

This formula is slightly modified due to the paucity of data and has been applied in a new formate as under :-

$$C = \frac{NAW}{P} \times 100$$

Where, C - is the regional mean index of centrality,

NAW - is non-agricultural workers partly engaged either in secondary or tertiary activities,

P - is the total population of the study region.

With this modified technique the centrality scores of the weekly market centres have been determined. The market centres whose index exceeds the regional mean are supposed to have a service area. Higher indices are being naturally associated with important market centres. The centrality scores calculated by this method are incorporated in Table 3.2 and depicted in the Fig.3.4.

3.8 REGIONAL ANALYSIS OF CENTRALITY :

A comparative analysis of the three methods proves the suitability and superiority of the new method. The centrality scores based on Godlund's method (Fig.3.4) gives a some what deceptive picture of an area. A small market centre like Chikhalthan scores high centrality value by this method, at the other end of the scale, a comparatively large market centre like a Jinti scores lower value. In fact the reality is different.

The results computed by locational index method suggest the aggregate importance of a market centre. However, this method does not throw any light on the excess service capacity of the market centre. It gives only nodal importance. In the

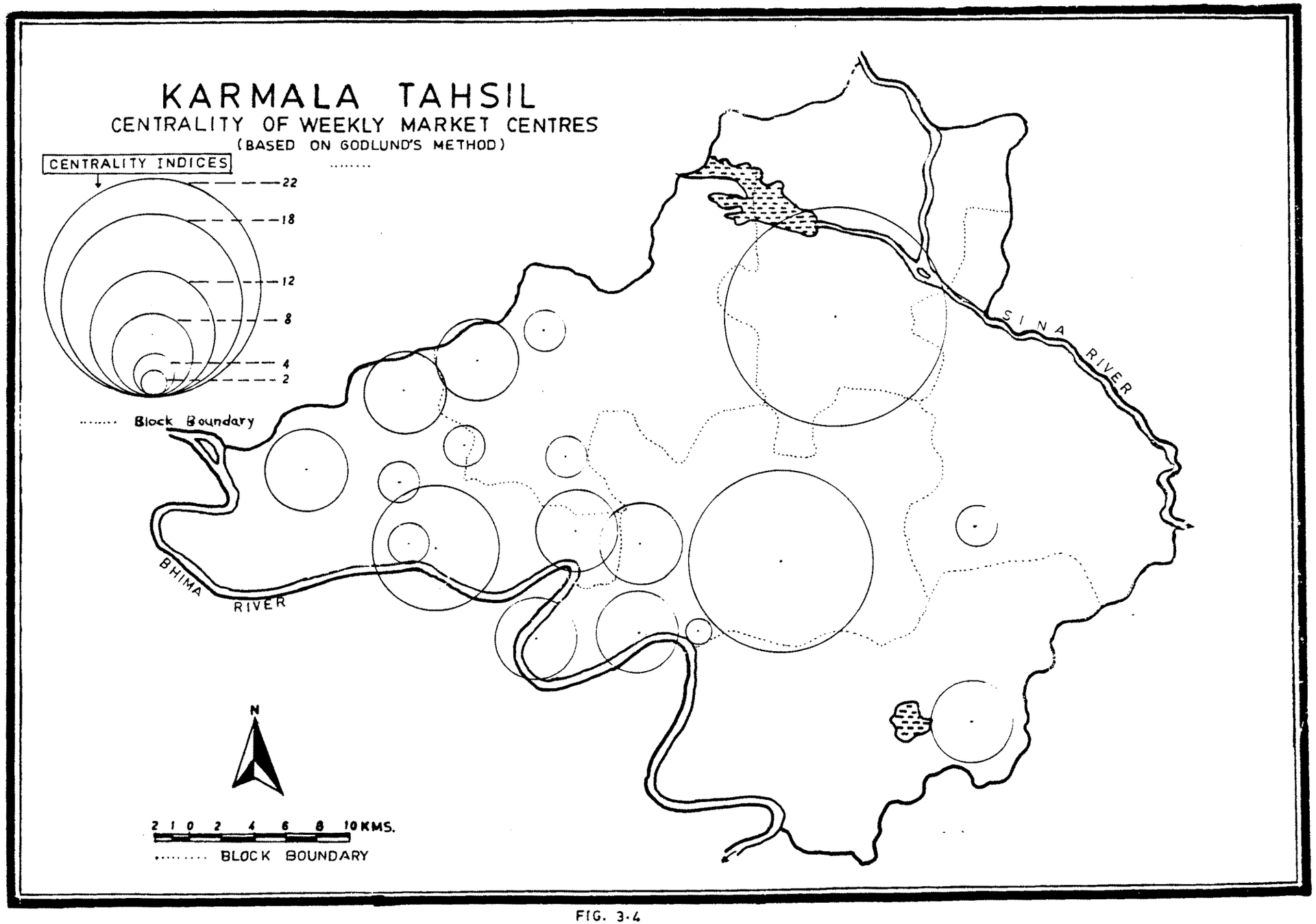
KARMALA TAHSIL
CENTRALITY OF WEEKLY MARKET CENTRES
(BASED ON GODLUND'S METHOD)
CENTRALITY INDICES
22
18
12
8
4
2
Block Boundary
BHIMA RIVER
SINA RIVER
N
2 1 0 2 4 6 8 10 KMS.
BLOCK BOUNDARY

FIG. 3·4

study region, Chikhalthan rank 16th according to the new method, whereas, by location quotient method, it ranks 8th. The same is the case with Kedgaon and Savadi market centre.

The centrality indices obtained by new method indicate the correct values of the weekly market centres because they are directly related to the excess population serving capacity of the respective weekly market centres. The regional analysis of weekly market centres and their respective centrality values calculated by new method and other associated methods shows that Karmala is the first ranking weekly market centre in respect of population and the centrality score. Jeur weekly market centre stands at the second position inspite of its fourth ranks in population size. Further, the market centres like Jinti, Kem and Ketur ranks 3rd, 4th and 5th in the order. The last ranking weekly market centre scores the lowest centrality values (Table 3.2).

From the analysis of the population size and centrality values by new method and associated methods, one can make the generalization and come to the conclusion that the importance of a place is not simply measured in terms of its population size but the functional magnitude of a place has great bearing on its regional personality. And therefore, the centrality score calculated by functional base seems the most suitable, superior and significant in showing the reality of the weekly market centres and their spatial organization.

3.9 THE CENTRALITY RANK AND POPULATION RANK OF WEEKLY MARKET CENTRES :

The relation between centrality rank and population rank of weekly market centres is depicted by a scatter diagram (Fig. 3.5). On the graph, the weekly market centres like Karmala and Sogaon indicate a perfect relationship between the centrality ranks and population ranks. The correlation between centrality rank and population rank calculated by Spearmans Rank Correlation Method is R = 0.42 which is significant at 5 percent level.

A cursory glance at the graph reveals that the higher order weekly market centres have lower degree of deviations and lower order weekly market centres shows the higher degree of deviation (Fig.3.5).

PART - II : HIERARCHY OF WEEKLY MARKET CENTRES

The concept of hierarchy of market centres denotes ranking of market centres into successive groups on the basis of population size, the functions performed by centres or the facilities and services offered by centres, and on the basis of either the trade turnover or the trade area of centres. The hierarchical ranking is one, that deals with different orders or levels of weekly market centres.

3.10 SELECTION OF METHOD :

In the present study the hierarchical grouping of weekly market centre is obtained from the array of centrality scores

RELATIONSHIP BETWEEN POPULATION SIZE RANK AND CENTRALITY RANK OF MARKET CENTRES

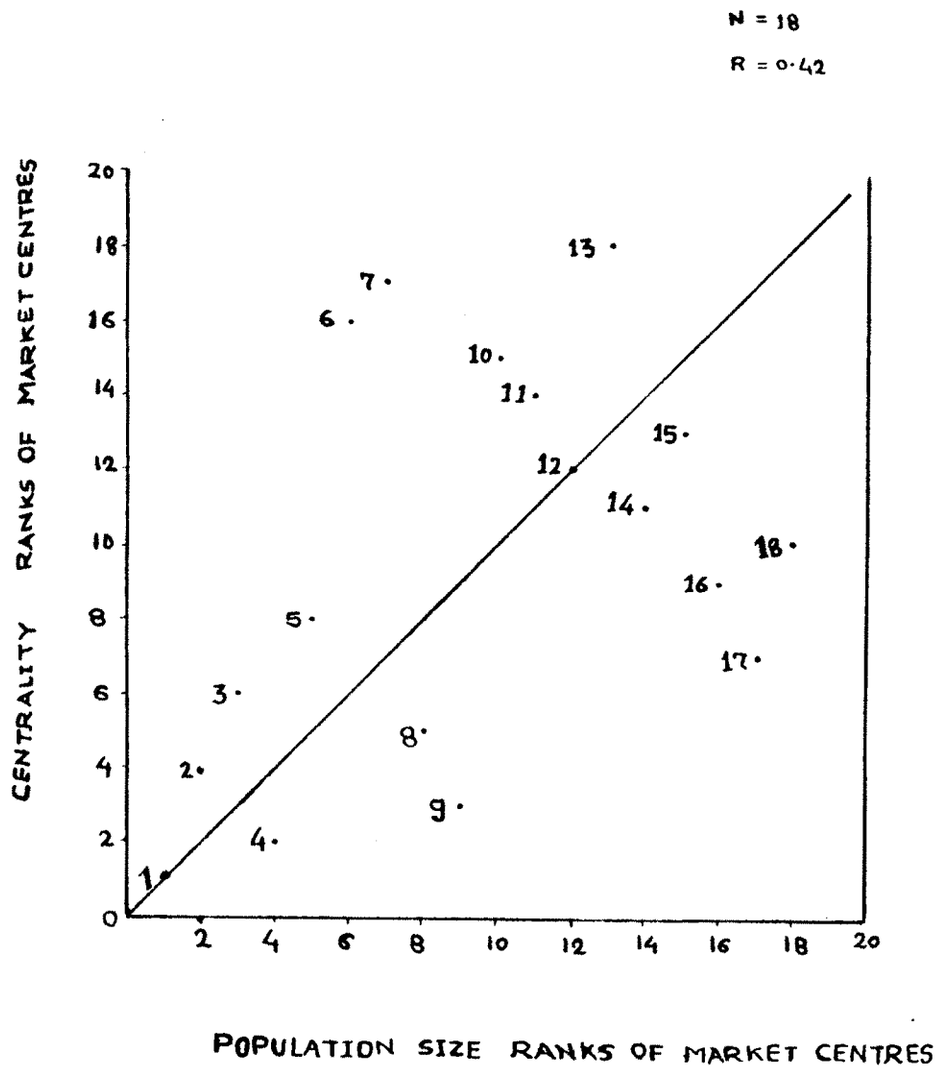

FIG 3·5

estimated by newly evolved method, i.e. excess population served by surplus function. For classifying weekly market centres into different orders of hierarchy, market centres have been ranked in order to their centrality scores and ranks are plotted on a log-log scale. The plotting of weekly market centres on the graph (Fig.3.6) clearly indicates different slopes, grouping the weekly market centres of a different order, having a different levels of functions and services. Karmala weekly market centre has the highest centrality and it stands high above all the weekly market centres in the study region. The second order includes two weekly market centres, namely, Jeur and Jinti, in respect of population, Jeur stands at 4th and Jinti at 9th rank. The third order in hierarchy includes Kem, Ketur, Sade, Pomalwadi and Korti weekly market centres of the study region. The fourth order of hierarchy incorporates the remaining ten weekly market centres in the study region. The clear cut breaks in the slope are found on the graph (Fig.3.6) which differentiate the functional magnitude and centrality values of the weekly market centres.

3.11 HIERARCHIC ORDERS OF WEEKLY MARKET CENTRES :

Having classified the weekly market centres into different orders, it seems desirable to examine the characteristics of market centres of different orders.

3.11.1 First order weekly market centre :

At the apex of the hierarchical class system, stands the tahsil headquarter of Karmala, which is the only recognized town

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HIERARCHIC ORDERS OF WEEKLY MARKET CENTRES

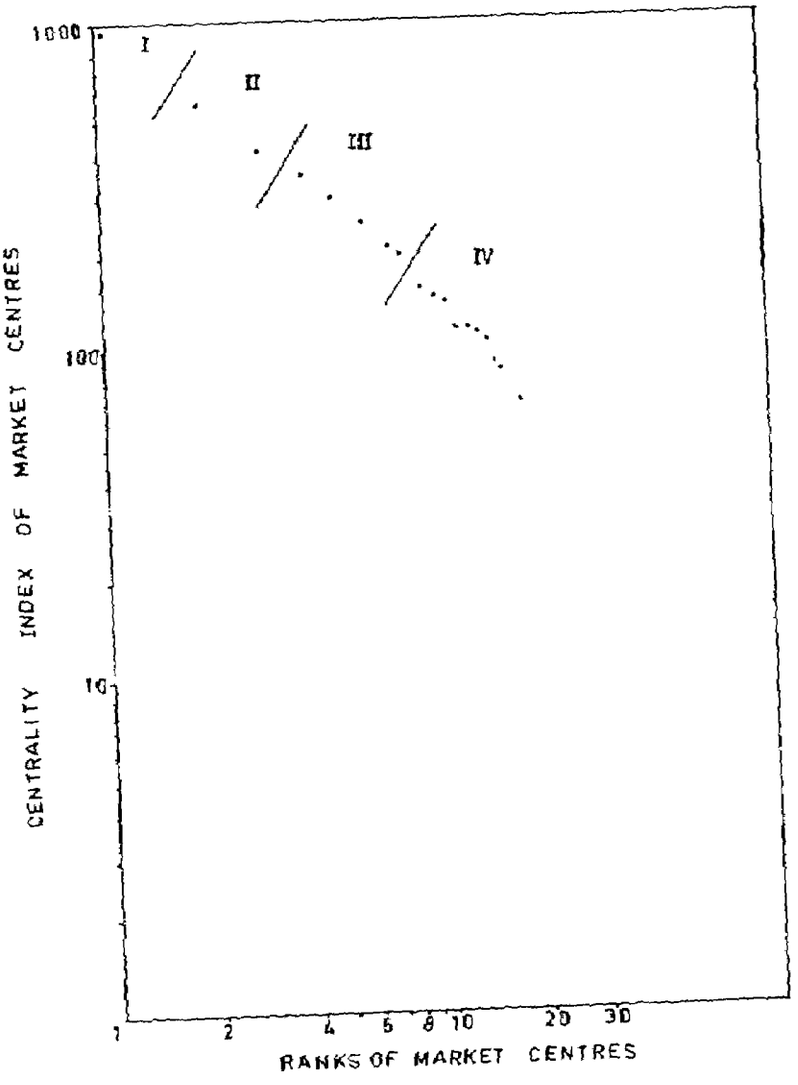


FIG 3.6

in the tahsil. It has attended the highest centrality scores of 917.88. The varieties of the functions included higher education, specialized medical facilities, administrative/ revenue and judicial facilities, developmental services, banks, auto repairs, cloth shops, photo studios and other higher order commercial establishments. The centre is, predominently a commercial one, where wholesale and retailshops have concentrated. As it is a administrative site of a Karmala tahsil, it has a multifacet development. Economically, socially and politically it has greater influence over the study region. From demographic point of view, it's population size increased by 2678 during the ten years. Karmala is known as most important regional market centre.

3.11.2 Second order weekly market centres :

The second order is occupied by Jeur and Jinti market centres. They are important places and serve region as a sub-regional centres. They have attended the centrality scores of 537.80 and 401.68 respectively. These centres have predominently dominated by secondary educational services, medium level of medical facilities, veterinary dispensaries, banks and financial institutions and relatively higher numbers of retail commercial establishments; such as, Kirana shops, cloth shops, tailoring firms, stationary stores, and seeds and fertilizer dealers shops which are significant from view point of peasant society. It is worthy to note that Jeur is located at a nodal point and also

railway station on Kurduwadi - Dound broadgauge, where Jinti is connected by an important mattled roads with the adjoining settlements.

TABLE 3.3 : Hierarchic orders and number of weekly market centres.

Order	I	II	III	IV	Total
Number of weekly market centres	1	2	5	10	18

SOURCE : Compiled by the Author.

3.11.3 Third order weekly market centres :

Within the third order, five weekly market centres are included (Table 3.3). These weekly market centres have the range of centrality index from 200 to 350 (Table 3.1). This group of order consists Kem, Ketur, Sade, Pomalwadi and Korti weekly market centres of the study region. Characteristically higher order central functions are not observed in these centres. However, the milk dairies, cycle marts, flour mills, oil crushers and readymade shops are important services available at these centres.

3.11.4 Fourth order weekly market centres :

Out of the, eighteen weekly market centres of the study region, ten weekly market centres are classified into the fourth hierarchic order, where the medium and lower orders of functions are available. So far as the centrality scores of these centres are concerns the scores ranges from 70 to 170. The weekly market centre, namely Hingani is the lowest in the hierarchic order in the study region. Table 3.3 shows hierarchic order and number of weekly market centres in the study region.

3.12 DETERMINATION OF 'K' VALUE FOR HIERARCHY OF WEEKLY MARKET CENTRES :

According to Christaller (1933), and Losch (1954), in a perfect geometrical pattern, there is a definate numerical relation between the number of central places of two successive orders. The total number of settlements of certain order served by a central place of the next higher order is obtained by multiplying higher order with a fixed multiplier. This multiplier is designated as 'K' value. Further Christaller suggested that 'K' value once determined for the region would apply in all levels of hierarchy. It is expected to develop K = 3 system when the supply of goods from the places as near the dependent places as possible. Whereas, K = 4, system develops where the cost of construction of transport network

is important. Most of the central places in such cases are located on important traffic routes. The administratively controlled region has a fixed 'K' system where, K = 7 value would develop. This perfect geometrical patterns and their fixed values are rarely found in reality. The physical conditions, localization of resources and levels of economic development distort the spatial arrangement.

For determining the 'K' value in the study region, the method of bifurcation ratio used by geomorphologists is used.

$$K = \frac{K1 + K2 + K3 + \ldots + Kn}{n}$$

Here, K stands for composite value for all orders of weekly market centres.

$$\text{Therefore, } K = \frac{1}{1} + \frac{2}{1} + \frac{5}{2} + \frac{10}{5} = \frac{18}{9} = 2.00$$

The result of above said equation clearly indicates that within the study region, the weekly market centres and their hierarchic class orders are governed by 'K' value of 2.00 which is approaching to marketing principle.

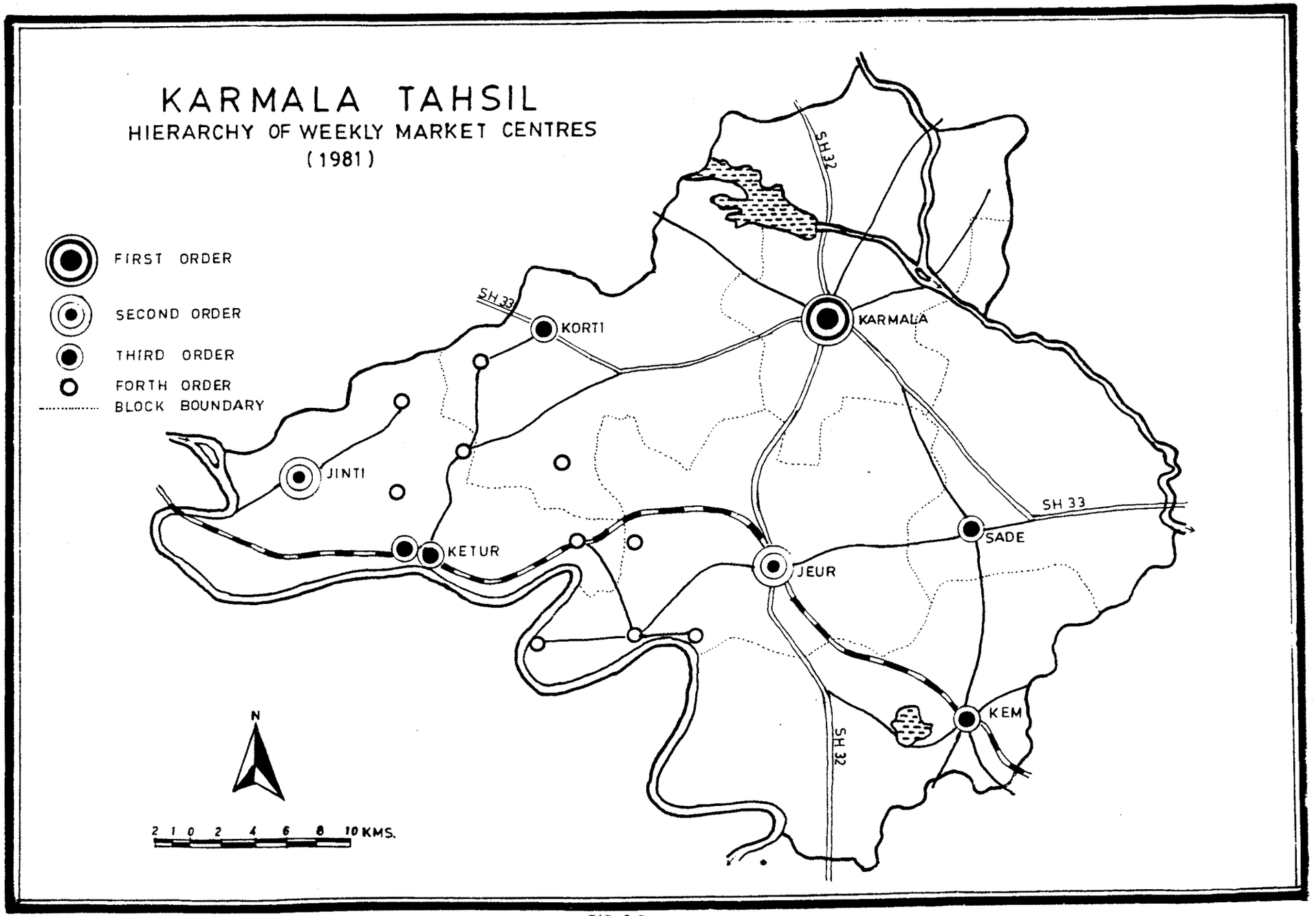
The comparative analysis of four fold hierarchic order indicates that the departure of existing pattern from the theoretical K value. As per the K = 3 principle, the progression of weekly market centes is 1 : 2 : 6 : 18 ..... etc.

The departure of K = 3 model in the study region reads 1:2:5: 10 etc. The result shows a noticeable difference in progression. Perhaps, this is because of the fact that the region under study has wider spatial differences and entire progression of central places (market centres) to the lowest order is not considered while establishing hierarchic orders of weekly market centres, since the study is only confined to the market centres of the region.

3.12 SPATIAL DISTRIBUTION OF WEEKLY MARKET CENTRES IN DIFFERENT ORDERS OF HIERARCHY :

The spatial distribution of weekly market centres in different hierarchic order in the study region displays the pattern in which the higher order weekly market centres are located in central upland (Fig.3.7). In this part, one first order, one second order and two third order weekly market centres are located. Karmala is first, Jeur is second and Sade and Kem are the third order centres. By and large, weekly market centres are unevenly distributed within the study region. The western half of the study region comprises larger number of the weekly market centres of lower orders, at the other end of the scale, the eastern half of the region possess few number of weekly market centres of higher order.

Regional analysis indicates that Bhima river and its adjoining track is densely dotted with medium sized and lower order weekly market centres.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HIERARCHY OF WEEKLY MARKET CENTRES
(1981)
FIRST ORDER
SECOND ORDER
THIRD ORDER
FORTH ORDER
BLOCK BOUNDARY
SH 32
SH 33
KORTI
KARMALA
JINTI
KETUR
JEUR
SADE
KEM
N
2 1 0 2 4 6 8 10 KMS.

FIG 3.7

TABLE 3.4 : Distribution of weekly market centres in different orders of hierarchy.

Sr. No.	Blocks	Ist order	IInd order	IIIrd order	IVth order	Total
1	Karmala	1	-	-	-	1
2	Arjunnagar	-	-	1	-	1
3	Kem	-	-	1	-	1
4	Jeur	-	1	-	4	5
5	Pomalwadi	-	1	2	4	7
6	Korti	-	-	1	2	3
	Total	1	2	5	10	18

SOURCE : Compiled by the Author.

The blocks and study of weekly market centres hierarchy shows a typical pattern. Karmala block (Table 3.4) is dominated by a single market centre of first order. Arjunnagar and Kem blocks consist of single weekly market centre of third order in each. There are four 4th order and one 2nd order weekly market centres located in Jeur block. The spatial pattern is characterrised with high concentration of seven weekly market centres in Pomalwadi block, in which, four 4th order, two 3rd order and one 2nd order are located. The block Korti includes only three weekly market centres of which two are 4th order and one is 3rd

order. Fig.3.7 and Table 3.4 represents the spatial distribution of weekly market centres with their hierarchic orders. Thus, the four tier hierarchy of weekly market centres is observed in the study region, in which the distinct socio-economic conditions are well reflected.

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