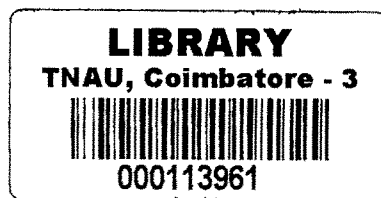


AN APPROACH FOR SPATIAL INTEGRATION THROUGH AREA PLANNING

THESIS SUBMITTED IN PART FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY IN AGRICULTURAL EXTENSION TO THE
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COIMBATORE



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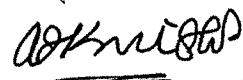
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Certificate

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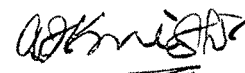
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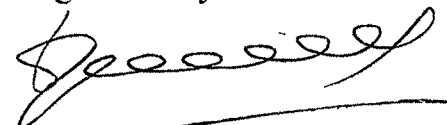
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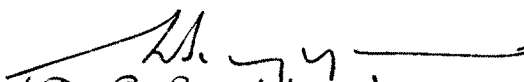
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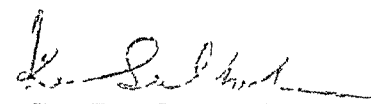
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CONTENTS

CHAPTER		PAGE NO.
I	INTRODUCTION	1
II	THEORETICAL FRAMEWORK	13
III	RESEARCH METHODOLOGY	44
IV	FINDINGS AND DISCUSSION	71
V	SUMMARY AND CONCLUSION	138
	REFERENCES	145
	APPENDIX	152

LIST OF TABLES

TABLE	PAGE NO.
1. Work force in Kadayanallur block	46
2. Infrastructural facilities existing at the block level	49
3. Rank of cropped area over years	60
4. North West corner rule	69
5. Existing infrastructural facilities	74
6. Space matrix	77
7. Scalogram - Ranking of the settlements	81
8. Identified settlements for raising their present level	107
9. Coefficient of concordance and the Chi-square values among the sixteen villages in different years	109
10. Coefficient of concordance-W-and the Chi-square values for each villages over five years of time	111
11. Estimation of mean yield and percentages of marketable surplus for major crops	125
12. Matrix of basic data for transportation model	126
13. Final plan of transportation model	127

LIST OF FIGURES

FIGURE		PAGE NO.
1.	Von Thunen's concentric ring model	28
2.	Christaller's central place model	31
3.	Models of central place theory	33
4.	Loschian concept of economic landscape model	35
5.	Map of Kadayanallur block	45
6.	Institutional scalogram	57
7.	Location of settlements	73
8.	Existing infrastructural facilities	75
9.	Seed facility as utilized by settlements	85
10.	Fertilizer facility as utilized by settlements	87
11.	Repair of farm implements and machineries	89
12.	Agricultural credit society as utilized by settlements	91
13.	Bank facility as utilized by settlements	93
14.	Marketing facility as utilized by settlements	95
15.	Health facility as utilized by settlements	98
16.	Educational facility as utilized by settlements	100
17.	Bisection between top level settlements	104
18.	Bisection between low level settlements	105
19.	Space preference for different facilities	112
20.	Recommended infrastructural facilities	135
21.	Existing and proposed infrastructural facilities	136
22.	Model for the block	137

Introduction

CHAPTER I

INTRODUCTION

The unit for the administration of community development programmes at the local level is the block which has still valid reference for developmental plans. But, its location and area are not scientifically determined on the basis of its specific needs and spatial characteristics. Thus the task of area planning in India as viewed by Haldrup (1970) is most essential in the context of its ecological difference from area to area. It is because of this reason that the percolation theory approach should be dispensed with by following micro-level planning which would improve the operational efficiency at that level. Thus planners in India have now begun to evince growing interest in the question of optimal location of investment. So, the spatial dimension is gradually acquiring a status of equality with the other well known dimensions of development planning, namely activity sectors and time-horizon.

(Tracing the history back, the need for area planning was recognised in all the national plans of the Government of India. In the Planning Commission Document of the First Five Year Plan (1952), the planners indicated their desire to draw developmental programmes in terms of regions determined by

physical, economic and administrative considerations. Eventhough there are studies conducted here and there, they do not answer one of the most important questions in area planning, namely, where should a particular activity - social or economic - be located. Problems of area development have been emphasised for the first time in the fourth Five Year Plan (1966). But there had been no attempt to define a conceptual frame work for the solution of such problems. This could be solved only through research studies in the field of area planning.

Task of area planning

The task of area planning differ from country to country. In India, one could say that the tasks of area planning are chiefly related to the aspects of development growth and balance rather than adjustment. The building of infrastructural facilities for the development of and investment on economic activities and creation of employment possibilities remain the major tasks of area planning. In other words, it is aimed in India to have a transition from a predominantly agrarian economy to an industrial one. One of the consequences of such a transition as stated by Bulsara (1964) was a deterioration in the standards of social facilities due to attendant process of rapid urbanisation. ^{Quoted by DICKINSON/} Therefore, area planning in India as stated by

Friedmann (1969) should aim at creating a spatial organisational framework which would be capable of sustaining the strains of transition.

The existing imbalance and future development are the present problems. The former comprises two kinds of imbalances-functional and spatial/locational. The removal of functional and spatial imbalances will prevent further deterioration in the standards of social or economic activities. This balanced situation as reported by Mayer and quoted by Wannali / (1970) would provide an useful base for future development. ^{and Khan /}

Present stature of the situation

Most of the studies carried out in all agricultural universities as stated by Singh et al. (1970) on agricultural extension or the diffusion of innovation stop short at identifying the characteristics of adopters or describe the process of adoption. They did not give the changes in land utilization or water resources, nor did they accurately gauge the amounts of new agricultural land bought and sold, nor the spatial movement of village people for their input and output between villages and within villages (Roy and Patil, 1977). The successful implementation of any agricultural programme depends upon the efficient employment of the ruralite. This will help to assess the locational needs through locational

decisions. To ensure this, as stated by Planning Commission (1974) it will be necessary that arrangements needed to be made for detailed planning to bring about physical convergence of different facilities at specific points.)

Eventhough planning at the lower level had been felt very necessary in practice, right kind of planning envisaged was often missing.

When panchayats and panchayat samithies were reorganised they were conceived not merely as a political device for providing training in democracy but as the principal agency for rural reconstruction. In addition to their mandatory and discretionary functions the Panchayati Raj was expected to plan for rural development. So the lower tier should become a planning and managing unit. Otherwords, planning should be done at panchayat union level since panchayat union as opined by Roy and Patil (1977) would still remain the smallest unit for both planning and administrative programme. Moreover, there is no expertise available to plan and manage at the lowest tier of Panchayati Raj.

In August 1977, the Planning Commission decided to have community development block as the standard administrative unit for grass root planning. This decision had come from the commission's conviction that only comprehensive plans could effectively tackle rural unemployment and poverty.

Thus to develop the area, certain specific programmes were developed and implemented. The strategy followed in implementing such programmes as reported by Barnala (1978) was to allow the ongoing programmes to continue and the new programmes to be implemented through those district administrative machinery already available. The other strategy as opined by Azad (1978) is to disband the percolation theory approach by adopting micro-level block planning which is otherwise called 'direct family approach'. The Round Table Conference on Adoption of Administration to Rural Development at its meeting held during August 1978 at New Delhi, recommended decentralised planning to upgrade the level of professionalism at the village level.

The decision of the planning commission was followed by the constitution of Dantwala committee to prepare comprehensive guidelines for block level planning taking into account the recommendations of Sivaram Committee on the role of voluntary agencies in programme for rural development. The Dantwala Committee as published in Anonymous (1978) in its final report urged the Government to go slowly with its proposal to introduce block level planning because

... for one thing, the planning machinery in several states particularly at district level, is very weak if not non-existent and a hasty adoption of the proposal may prove self defeating ... and a highly debatable issue pertains to the authority which the Panchayati Raj institutions should exercise in the preparation of the plan.

Suggesting that the responsibility of preparing rural development plan must be 'squarely borne' by the Government, the committee wanted professional institutions to get actively associated with the planning exercise. As if in response to this need, there is growing interest with the professionalists in constructing models for block level planning. The present study is one in that direction.

Importance of the problem

The development of any area has its origin in the history of the region. Some regions or some areas within a region tend to develop at the cost of other region or other areas within a region. Under Indian context, such a situation was frequently encountered. An important centre dominated the area. It tended to attract high quality resources, both natural and human, not only from rural areas but also from other areas. The major financial, economic, administrative and cultural institutions were located in it and public investment tend to respond "to the concentration of political power" (Baltimore, 1966). As against this, the hinterland of such a centre tended to diminish in its importance relative to the central city, as it was unable to make adjustments appropriate to constant socio-economic change at the centre (Friedmann, 1969). This socio-economic gap opened between the centre and its peripheral areas had been referred to by

Friedmann (1969) as development dualism. It was, therefore, necessary that the degree of functional friction between a highly developed centre and its relatively under developed dependent settlement be reduced as much as possible. Area planning helps in reducing this friction by bringing about an order to all activities which are responsible for creating a developmental dualism.

One of the ways in which this could be brought about is by "creating" intermediate centres of varying importance which will be located on the settlement scale, somewhere between a developed and under developed settlement. This is quite an important aspect of the whole question of imbalanced development. All developmental problems can be seen as aspects of a pattern of settlement. In general, a pattern of settlement of any area describes amongst other things the ways in which the population of an area and their activity are organised in the settlements of different characteristics and sizes. The relationships which tie the elements of settlements into a system consisting of a web of socio-economic transactions and communications amongst them. These interactions explain inturn the specialised roles of various communities which are manifest in the hierarchical organisation of settlements.

More important one is that the resources in the settlements must be employed in an optimum fashion for a maximum multiplier effect which will result in a self generating cycle of growth. Therefore it is necessary to provide growth impulses in the right places and in right proportion to make this possible.

The pace of economic growth especially in the field of agriculture, can be maintained by a smooth flow of credit and other inputs such as improved seeds, fertilizers, pesticides, machines, communication of innovation, administration and supervision and training facility to the localities.

Thus the locational importance of credit institutions, distribution centres and extension agencies for the efficient and economic distribution of these inputs need to be studied.

To fix the location of these facilities, spatial integration is a pre-requisite. This aspect has not at all been considered in the developmental process. To tickle development process in an area, spatial nature of functional integration is necessary since the interrelationships among various socio-economic activities depend a great deal on where they are located.

Each and every settlement cannot have each and every function. It has been observed by location theorists that

there is a hierarchy of settlements based on the number of functions of different orders present in each settlement and their specialization and also on the basis of the area served by a settlement. Functions of different orders, therefore, need to be located at optimum places. The location of a specific function in a specific settlement is meant not only for that settlement but also for its dependent territories. The pattern of linkages between the centre and its territories may need strengthening but the appropriate location of functions will necessarily be in the centre place itself. In other words, it may be stated that spatial integration through area planning should be the strategy to be adopted for accelerating development.

The above analysis leads to pose certain questions as the following: (i) Do settlements possess different ranks? (ii) Do they have homogeneity? (iii) Does the rank of the settlement has any relationship with the existing population size and the number of infrastructural facilities? (iv) Do the facilities exist in the optimum location?

This study aims to answer these questions.

Objectives

In view of the questions raised and importance of the problem analysed, this study titled 'An Approach for Spatial

Integration through Area Planning' focusses on the following general and specific objectives.

General Objective

The general objective of the study was to prepare a model for spatial integration through area planning.

Specific Objectives

The specific objectives of this study were:

- (i) To identify and rank the settlements with empirical evidence.
- (ii) To locate the existing infrastructural facilities.
- (iii) To assess the degree of existence of area homogeneity.
- (iv) To identify locale for establishing infrastructural facilities.
- (v) To propose a model for the block.

Hypotheses

In view of the objectives spelled out, the following hypotheses were derived for testing:

- (i) The rank of the settlement maintains positive association with the size of population and number of existing facilities.

- (ii) The infrastructural facilities are existing at the optimum location.
- (iii) The settlements have homogeneity irrespective of their size of population.

Limitation of the study

This study primarily depended upon secondary data. Getting such information from various departments was a hectic task and even after getting them, the question of agreement was a big problem. Contacting different departments and the availability of personnel for discussion were also the problems. Contacts and discussion were held with them whenever they were available.

This study could have been conducted in an elaborative way with field investigators. But it was conducted only by a single researcher due to the limitation of other resources.

The findings would directly apply to the locale of the study area. They may indirectly apply to other similar areas.

Definitions of Concepts

Settlement: It was a village having its definite geographical distribution.

Rank of settlement: It referred to the measurement and fixation of rank to a settlement based on the different facilities such as schools, credit institutions, administrative institutions, health institutions, input distribution centres etc. that exist.

Settlement homogeneity: It referred to the homogeneity of the different settlements studied based upon the cropped area.

Spatial integration: It was perceived to be the combination of the settlements based on their homogeneity.

Area planning: It corresponded to the fixation of the locale for the infrastructural facilities so that with least effort people will participate and utilize them.

The other terms and concepts have been defined wherever needed, at the time of their usage.

Theoretical Framework

CHAPTER II

THEORETICAL FRAMEWORK

This chapter reviews the literature on spatial integration and area planning focussing upon its empirical application to rural development. The theoretical framework is intended to serve as the background and general context into which the present study falls.

The literature related to the following aspects have been examined in light of the objectives spelled.

- A. Spatial Integration
- B. Area Planning
- C. Types of Planning
- D. Theories of Planning
- E. Spatial Integration through Area Planning
- F. Concept of Block level Planning

A. Spatial Integration

1. Spatial: According to Webster (1967) it means occupying or of the nature of space.
2. Integration: Singh (1977) clarified this term/concept in three ways as follows.

(a) It might describe a system of inter-relationships between activities falling within different sectors of development and therefore, normally entrusted to different agencies.

(b) It might refer to the processes by which a group of activities may come to be proposed and decided upon.

(c) It might explain the general design of development that has already been determined as in the pattern earlier provided in community development blocks. The expression may refer to the manner in which special programmes or activities (like rural works schemes for small and marginal farmers, etc.) may be linked to the general framework so as to obtain the desired results and to avoid waste or misuse of resources.

3. Spatial Integration: Wamali (1970) reported that spatial integration is inter-relating or attempting to combine different parts of the regional settlement system in a coherent pattern. It also involves completion of any incomplete system of settlements.

Ghosh (1972) viewed spatial integration as a process of integration between physical resources and the men in an area.

B. Area Planning

In this terminology the different concepts involved

apart from area planning are area, plan and planning. These have been reviewed briefly below.

1. Area: The term area with reference to a particular country would mean, as reported by Misra and Sundaram (1980), any segment of sub-national space. It can be a region with maximum distinctiveness, or it may be any identifiable space, the contents and contours of which are far from haphazard in terms of the multitude of the spatial associations and organizational inter-relations that can be detected.

Area in this study was perceived as the geographical distribution under an administrative control namely the block.

2. Plan and Planning: The terms plan and planning were expressed by different authors in different ways. Thus the concept of plan and planning lack precise and agreed meaning.

(a) Plan: The term plan, in general, evokes four associated ideas as stated by Rudra (1976). They include:

- specification of objectives,
- setting up of goals desired to be attained,
- pre-vision and pre-arrangement, and
- a notion of balance on consistency and a notion of optimization.

A plan thus, could be defined as a set of consistent actions designed to attain the desired end.

The idea of a plan as reported by Varadarajan (1979) could be defined by two elements viz., (i) a project - an end which one proposes to achieve and (ii) the arrangements decided upon to achieve that end - the determination of the means. In this study the latter aspect was considered with an assumption that there existed an arrangement in the study area.

(b) Planning: In the words of Merriam (1963),

"planning is the use of collective intelligence and foresight to chart direction, order, harmony and progress in public activity relating to the human environment and general welfare".

Griffin and John (1971) has defined planning as the purposeful direction of human activities.

Planning as defined by Shah (1972) is an organised, conscious and continual attempt to select best available alternative to achieve specific goals.

The term planning conveys different meaning to different people. A good classification of what planning could be was given by Lutz (1975) as:

- a system of integral planning from the centre, implying that all economic operations are centrally guided, coordinated or directed by National Plan.

- a system of partial planning from the centre entailing measures of modifying specific aspects of production, consumption or distribution.

- the government programme for the public sector, of the economy or what Masse calls the 'Plan of the State' as distinct from the National Plan of which it would constitute only a part.

Thus planning differs in form and intensity. So planning may be characterised either as 'comprehensive' or 'partial' depending upon the extent of development aimed at.

Planning at area level as explained by Misra and Sundaram (1980) was essentially an attempt to strike harmony in relations between three elements - place i.e. area, - folk i.e. people, and work i.e. employment and economy.

In this study planning is conceived to direct human activities towards an area for better utilization of the facilities existing there.

3. Area Planning: The terms area and region are interchangeably used. The word region means, as given in Webster (1967) dictionary, an administrative area, division or district. It suggests that village, the region, is area of operation for the grass root level worker like Rural Welfare Officers. Block, the region, is the area of operation for the

block agencies. District is the area of operation for the district machinery. It is with this meaning the word area has been taken into account in this study and review is made with the assumption that regional planning and area planning meant the same. This was rightly pointed out by Sundaram (1977) according to whom, the regional planning from the grass roots under the name of 'area' development was initiated to bring about total development in a spatial framework. He further states that area planning was an approach that provided a frame of reference for integrated or complementary development between different sectors of economy, areas and area levels. It involved the preparation of a plan for the optimal movement of people, goods and services between the production and consumption in an area.

Misra and Sundaram (1980) conceived area planning as, not one of starting new developments, but rather one of providing stimulus in one place and restriction in another, a problem of balance and control and of adjustment of old situations to new conditions.

Area planning as viewed by Tripathy et al. (1980) aims at achieving spatial and functional integration based on growth centre approach to development.

While they explained area planning as stated above they had also spelled out certain constraints. Each one of the elements - place or area, folk or people and work or employment and economy had its own set of constraints as follows:

- Place or area has its constraints in the factor endowments.
- Folk or people has its constraints in the quantity, quality including skills, as well as the social and attitudinal factor.
- Work or employment and economy has its constraints in the quantum and quality of utilisable resources.

In a developing country like India there are other constraints namely lack of skills and technology and paucity of financial resources for development.

These constraints apart, area planning has also to contend with certain conflicts in goals such as,

- efficiency versus equity.
- long term growth versus short-term benefits.

In this context, (area planning is one of the means to resolve conflicts in a situation full of various constraints and arriving at an optimal solution such that 'folk' and 'work' are organised in space with maximum mutual benefits and minimum mutual conflicts.

(Through area planning in this study it is aimed to locate optimum location for establishing facilities so that human activities would converge and disperse to speed up the development process with particular reference to agriculture.)

C. Types of Planning

1. Short-term and Long-term: From the temporal point of view as stated by Miera et al. (1976) planning could be short-term or long-term.

(a) Short-term planning is designed to solve certain pressing problems - increase production and employment, adjust production to market demand - which do not require large scale changes in the social and economic order.

(b) Long-term planning otherwise called perspective planning aims at the institutional and structural changes necessary for achieving the long term socio-economic goals of the society.

2. Economic and Developmental: Planning from the point of view of programme content, could be developmental or economic.

(a) Developmental planning is as reported by Myrdal (1968) suited to countries which are characterised by low labour productivity and low per capita income, small industrial

sectors, low levels of living, undesirable attitudes and patterns of performance in life and at work, and institutional barriers to change Development planning involves policy interventions to accomplish economic, social, and institutional reforms on the one hand and economic growth on the other.

(b) Economic planning as stated by Misra et al. (1976) is suited to developed countries where the social, capital and infrastructure for the necessary quantitative expansion and structural adjustment of the economy are already in existence.

3. Imperative and Indicative: Considering in the organisational angle, planning could be imperative and indicative.

As reported by Misra et al. (1976) when the public sector takes up the task of marshalling the productive resources of the country to achieve the desired economic growth, the planning is known as imperative. As against this, indicative planning allows the main spring of economic growth to remain in the private sector, although several major sectors might fully or partially be owned by the government.

4. Normative and Systems: Planning process could be considered to be normative or systems.

(a) Normative Planning: It enjoins upon planners a search for the best possible results in relation to the well

established goals. In this process there is less emphasis on the social and institutional dimensions. This approach, as viewed by Banfield (1959), examines five groups of problems:

- the procedure for defining goals and objectives,
- the phasing of the plan and defining goals and objectives,
- linking and integrating sectoral and functional elements of the plan,
- linking and integrating territorial plans, and
- determining the contribution that specialists could make and the co-ordination of their activities.

(b) Systems Planning: It treats planning as a social process operating in varying and varied socio-technical contexts. The planning system as stated by Musil (1971), is considered to be a structure formed by values, goals, roles, factors, organizations and their clients, rules, norms, regulations, the relationship between individual and collective participants of planning. The elements of systems planning in the words of Musil (1971), include:

- values, goals and ideologies,
- the concrete tasks which are to be undertaken by planning,
- the carrying out of the developmental tasks,
- the organizational units by which the developmental tasks are realized,

- the actors and professionals participating in planning,
- the roles of the actors, and
- norms regulating the relations between individual participants (actors) and between organizational units.

The two approaches, as could be seen, are complementary rather than contradictory.

5. Single-level and Multi-level: Considering the territorial level, planning could be of two types viz., single-level and multi-level.

(a) Single-level Planning: The territorial level decides planning as single-level and multi-level as stated by Misra et al. (1976). Plan formulation is done now at the national level alone. Lower territorial levels involve themselves in the planning process only at the implementation stage. This is partly due to the absence or inadequacy of technical know-how and leadership at lower levels and partly due to the lack of an institutional framework developed for the purpose.

(b) Multi-level Planning: The planning attempted at several territorial levels is called multi-level planning. It has several advantages. It helps to develop resources irrespective of the size and quantity of resources available. It trains people even at grass root level to plan for their welfare. It makes the national plans more representative of

national needs and aspirations; and it helps develop social and economic institutions, which strengthen the positive aspects of developmental process.

The former method is adopted by this country inspite of the fact reported by Planning Commission (1952) that planning should start from lower level to higher level.

6. Sectoral and Spatial: The planning strategy largely in vogue are either sectoral or spatial.

(a) Sectoral Planning: It is essentially a special purpose planning, most commonly adopted today. It is designed to develop various sectors of economy such as agriculture, industry, transportation, power, etc. either individually or collectively.

This approach suffers from several weaknesses as stated by Misra et al. (1976).

- It turns out to be technocratic and normative and hence its effectiveness in societies where the institutional frame for planning and development is weak and often questionable.
- Its lack of an integrated structure might lead to very serious social and human problems.

- It is an economic planning, the social contents of which are only peripheral, if not incidental.
- It ignores spatial factors and hence treats a country or region as a point rather than an area where human beings live and work.
- Targets set become unreliable, as they are based on averages of supply and demand on the one hand and aspirations and achievements on the other.
- Specific knowledge of potentials and the non-ubiquitous character of physical, social and economic space is not only lacking but also dispensed with.
- It brings rarely functional integration.

All these reasons could show that this country should change the strategy in planning process.

(b) Spatial Planning: This could be of two types namely adaptive and developmental. The adaptive spatial planning is primarily based on recognition of the impact of general trends of development on the spatial system. The task of adaptive planning as stated by Hermanson (1971) is as follows:

".... to streamline the process of spatial evolution so as to achieve at any point in time a spatial structure which matches the needs of industry for efficiency and growth".

Developmental spatial planning has been referred to by the same author as active spatial planning. He explained this developmental planning as one that is based on the recognition of the interplay and feedback relations between economic development and spatial evolution.

D. Theories of Planning

Developmental processes, according to Misra et al. (1976) are marked by two concomitant but opposite spatial tendencies, i.e. concentration and dispersion. Concentration refers to the consequences of centripetal forces and dispersion of centrifugal forces. Concentration leads to "point locations" or "clustering" of human activities. Dispersion brings about an even spread of such activities. Both processes occur simultaneously in real life and neither is exclusive of the other. Some behavioural scientist observed centralized concentration as a necessary condition for the development of an economy. According to Hirschman (1970), there could be little doubt that an economy, to lift itself to higher income levels, must and would first develop within itself one or several centres of economic strength furthermore, inter-regional inequality of growth be an inevitable concomitant condition of growth itself. The spatial arrangement of human activities at any point of time is the net result of the relative strength of these processes. Taking these natural

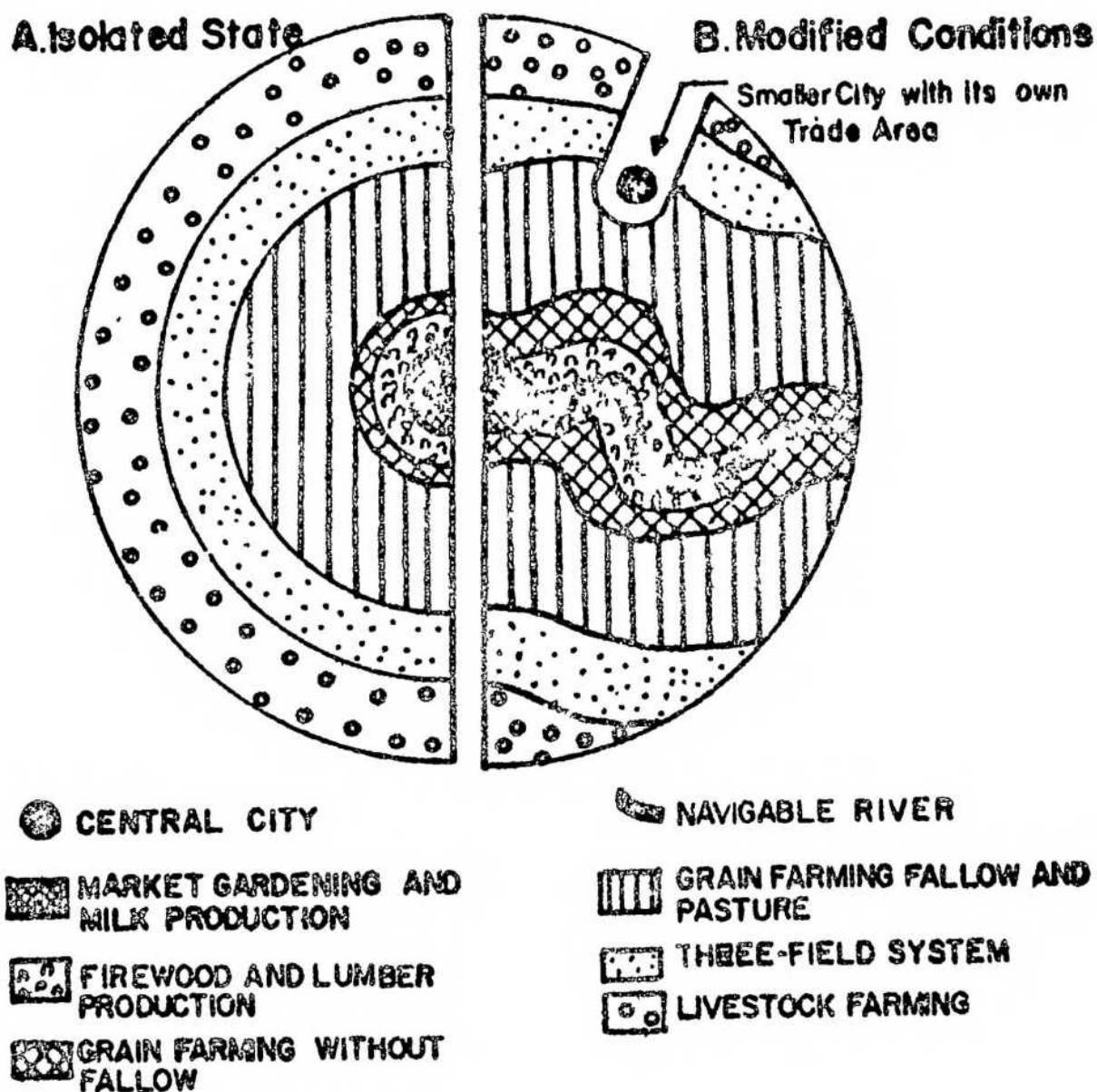
tendencies of concentration and dispersion as point of departure, attempts were made to formulate concepts and theories of spatial organization and socio-economic development. Some of them have been reviewed here.

1. Von Thunen's Concentric Ring Model: Von Thunen (1826) who proposed the concentric ring model, is the fore runner of the theorists who had attempted to explain the organization of space through a workable model in an agricultural region - Mecklenburg in Germany. This area had good land resources but extremely poor transportation linkages. He attempted to construct a theoretical model of the land-use pattern with the following assumptions:

- the quality of the land was uniform,
- farming was conducted rationally,
- the transport networks in the region - both roads and navigational canals - was poor,
- the cost of transport increased at a constant rate, and
- a town existed in the centre of the agricultural land which had no counter magnets in its vicinity.

Based on these assumptions he constructed a model of land utilization with a number of concentric belts around each town. The final model he constructed as given in Figure 1 consisted of a number of concentric rings around the town, each ring specializing in the production of those

FIGURE 1. VON THUNEN'S CONCENTRIC RING MODEL



Source: Sundaram, K.V. 1977. "Urban and Regional Planning in India." New Delhi: Vikas Publishing House Pvt. Ltd.

agricultural commodities for which it was best suited. He considered transport cost in his proposition as the catalytic factor, but his most unrealistic assumption was the existence of "isolated ostate". He did not consider in his theory the expected change in the modern transport system as well as changing demand functions of agricultural products. In spite of these weaknesses his assumptions and conclusions still hold good for developing countries.

2. Christaller's Central Place Theory: The concept of Von Thunen's model inspired and continues to inspire many social scientists, especially geographers, economists and sociologists, to conduct further inquiries into the theory of spatial organization and the mechanism of the diffusion of socio-economic development through space. Christaller (1966) was one among them. Christaller as reported by Berry and Pred (1965), was not much concerned about what went on around the towns; he was interested in finding out the general principles which determined the number, size and distribution of human settlements - rural or urban.

Christaller assumed a homogeneous plain as stated by Berry and Pred (1965) with an even distribution of natural resources, population, consumer preferences, and production techniques for each and every product. Human activities were presumed to be essentially space - utilizing. He also

assumed that transportation costs, demand functions, and economics of scale would vary from product to product and hence spatial range of goods and services produced would also vary. In Christaller's model, each of the goods is characterized by its own spatial range, determined by scale economics, transportation cost, consumer preferences and relative spatial friction, and plants producing goods of the same range will be located at equal distances from one another like the corners of a lattice of equilateral triangles as shown in Figure 2.

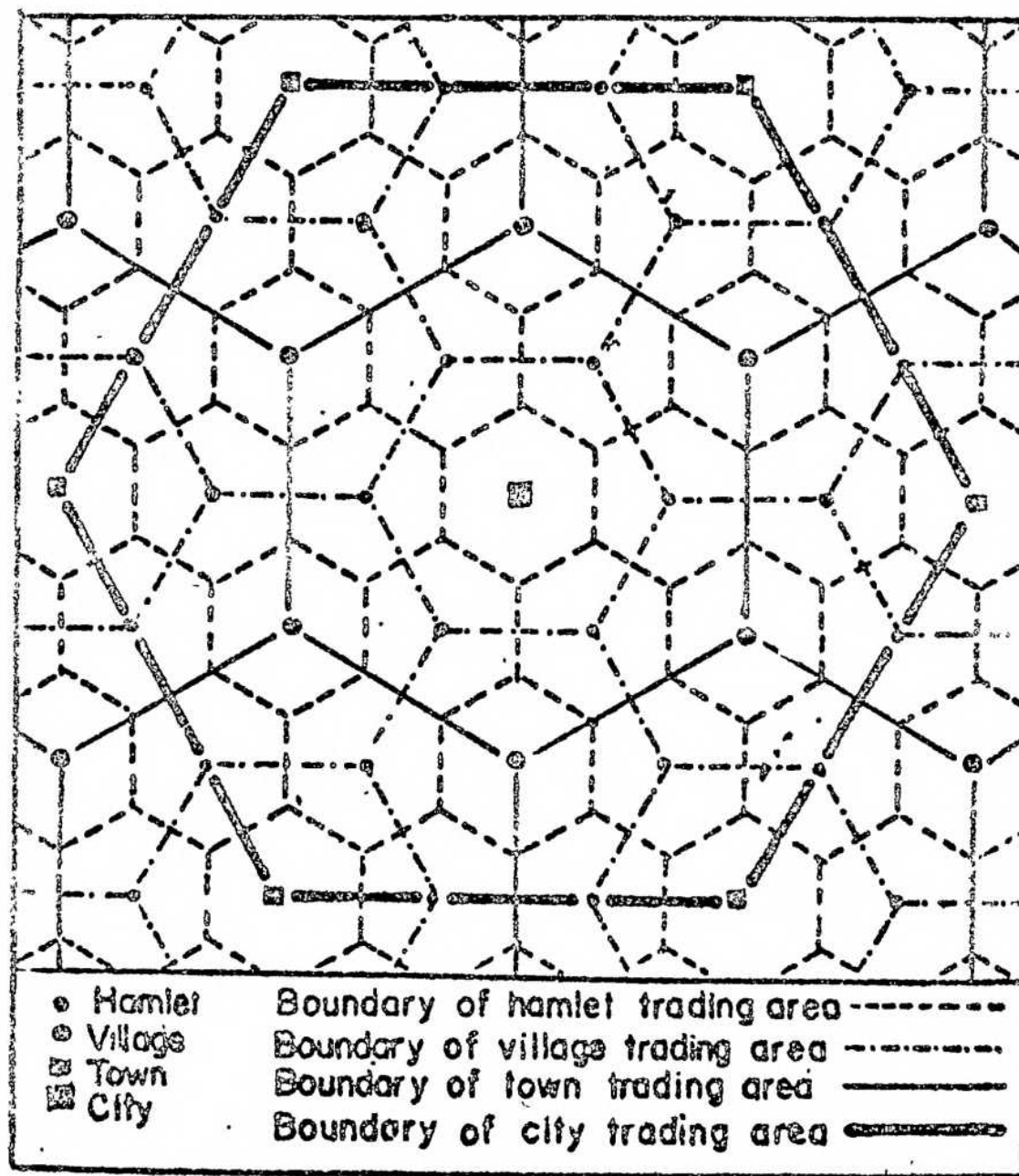
In the assumed frame of reference, the central place theory postulated by Christaller could be summed up as given below.

(a) An area could be served by goods of various types, if the central places producing different ranges of goods were evenly distributed.

(b) These central places would be regularly spaced, clusters located within hexagonal trading areas and would together form triangular lattices. Lower order centres would be located at the gravity centres of the triangles formed by the next higher order centres.

(c) The distances separating the centres could be greater in respect of higher order centres where there would

FIGURE 2. CHRISTALLER'S CENTRAL PLACE MODEL



Source: Sundaram, K.V. 1977. "Urban and Regional Planning India." New Delhi: Vikas Publishing House Pvt. Ltd.

be more than twenty five facilities and proportionately less for lower order centres where there would be one to ten facilities.

(d) All the central places would constitute a hierarchy from the smallest villages to the largest towns of national importance.

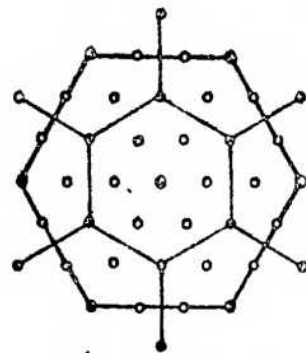
(e) The numerical relationship between the higher and lower order centres would be given by:

- two central places of next lower order (dependent place) for each central place of immediate higher order provided the principle of optimum supply to the complementary region could predominate,
- three central places of next lower order for each central place of immediate higher order provided the principle of optimum market and traffic flow could predominate and
- six central places of next lower for each central place of immediate higher order provided the principle of optimum administration could predominate. This has been depicted in Figure 3.

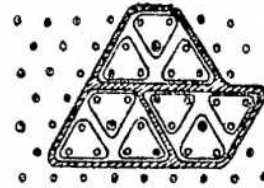
The basic weakness of Christaller's central place theory was that the assumptions were unrealistic. But one should understand at the same time that the theories and

FIGURE 3. MODELS OF CENTRAL PLACE THEORY

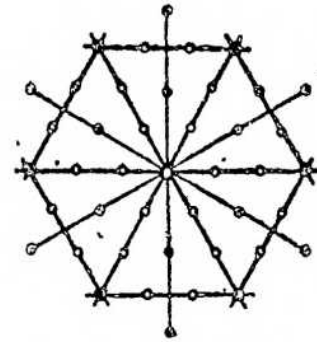
MARKETING PRINCIPLE



ARRANGEMENT

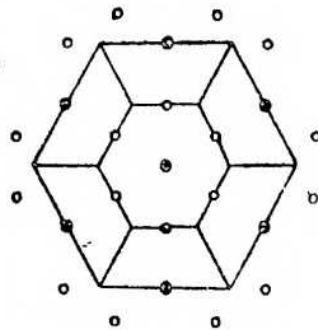


NESTING

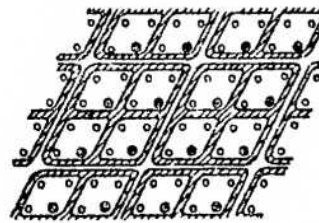


TRANSPORT ROUTES

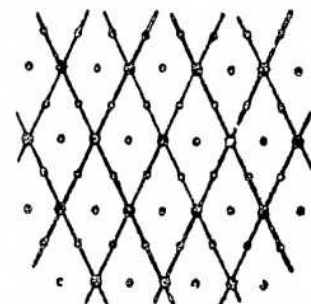
TRANSPORT PRINCIPLE



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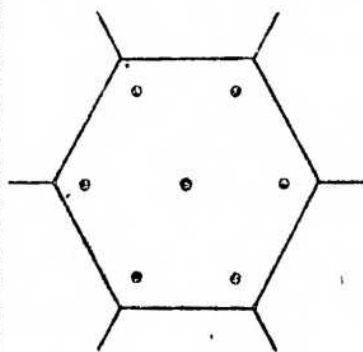


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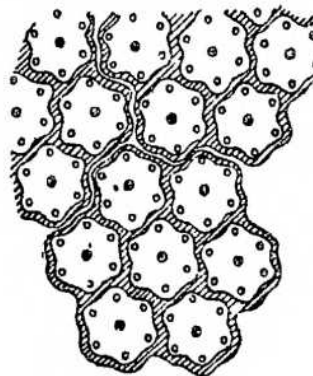


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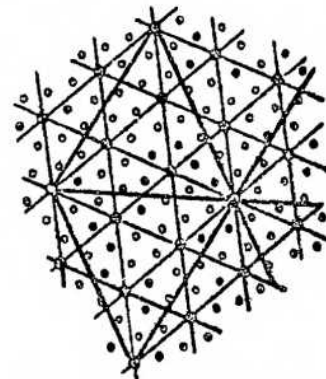
ADMINISTRATIVE PRINCIPLE



ARRANGEMENT



NESTING



TRANSPORT ROUTES

Source: Sen, Lalit, K. 1972. "Readings on Micro-Level Planning and Rural Growth Centre." Hyderabad, NICD.

models are not only meant to describe reality but also act as tools that would help to uncover the principles and laws underlying reality. They are models in the real sense. Christaller's theory provides the general framework for spatial integration and area planning.

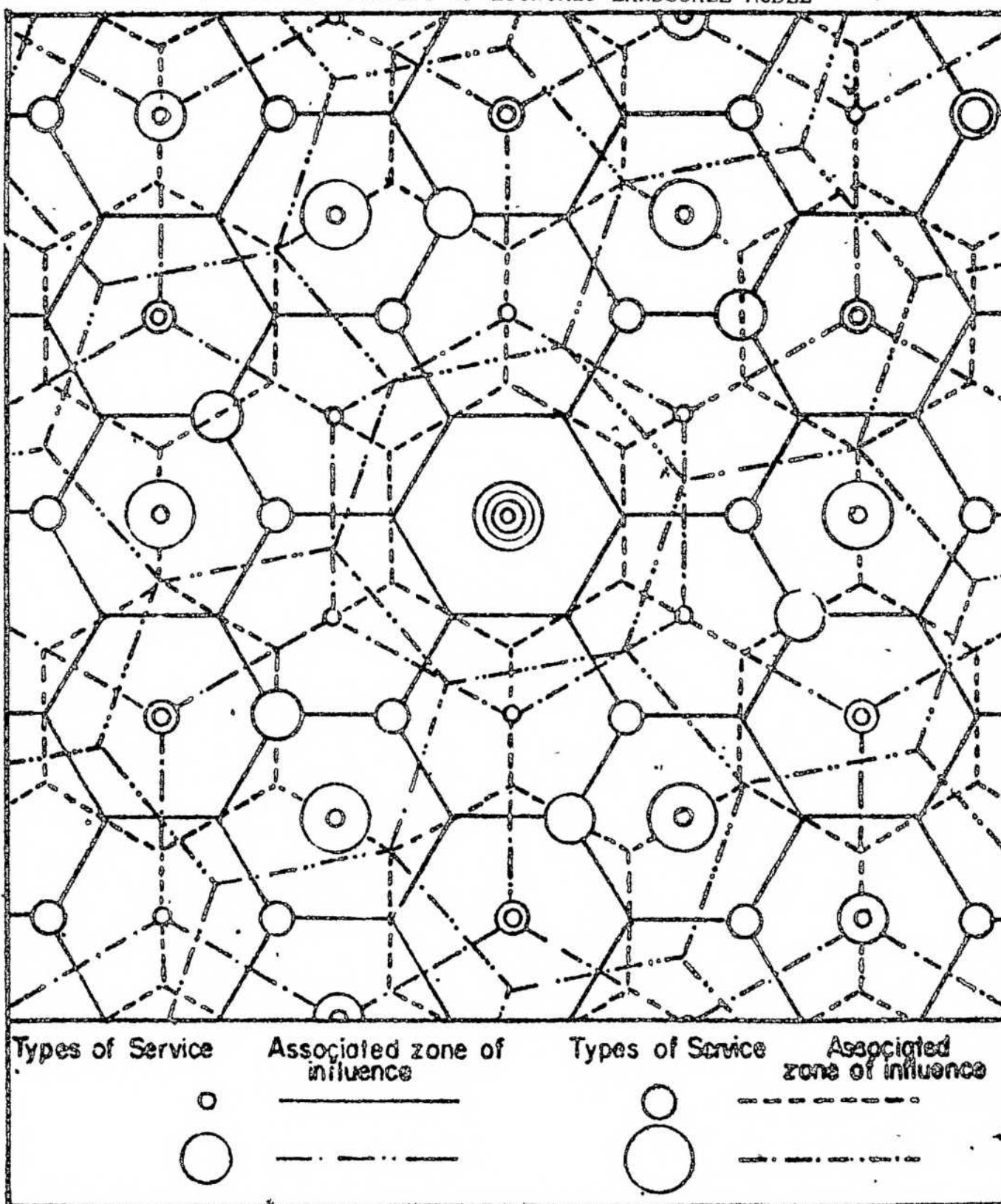
With certain modifications, central place theory could be used as a starting point for spatial integration and to suggest location for social services in any situation. It thus provides the most rational planning to the arrangement of human activities.

3. The Loschian Concept of Economic Landscape: Taking Christaller's theory as a base, Losch (1944) built a hierarchy of central places, starting from the lowest order and incorporating non-service activities in its functions. To sum up the Loschian model as given in Figure 4 could be given as follows:

(a) There always exists one superior centre where all goods are produced.

(b) Real specialization, division of labour and trade between centres are noticed. In other words smaller centres supply larger centres with their specialised products.

FIGURE 4. LOSCHIAN CONCEPT OF ECONOMIC LANDSCAPE MODEL



Source: Sundaram, K.V. 1977. "Urban and Regional Planning in India."
New Delhi: Vikas Publishing House Pvt. Ltd.

(c) There is a concentration of centres in "city-rich" separated by interstitial sectors which are less densely packed with centres.

(d) Nothing could be explained about the relative size of centres except that the superior one would be larger than rest of the centres. Centres with the same number of functions do not necessarily provide the same kind of function.

(e) Assuming that size of centre is proportional to the number of plants, it could be shown that within "city-rich" sectors, the size of centre increases with distance from the central place and that smaller centres tend to be located about half way in between larger ones.

(f) Hermanson (1969) while reviewing the theory had stated that although Losch (1944) asserted that the vertical organization would be hierarchical, this being doubtful cannot be proved without further assumptions. On the contrary, it seemed to follow from the model (Vide Figure 4) that the size distribution be of continuous nature.

From a comparison of Loschian and Christaller models, it could be noted that both assumed homogeneous and even demand for goods as the point of initiation. Losch was more concerned with the secondary activities and the functioning

of the spatial economy at the micro-level. Christaller model had the initiation from the macro-level and let his system percolate to the micro level. There observed to be substantial difference between the two in their hexagonal scheme. The Loschian system was not as that of Christaller.

E. Why Spatial Integration Through Area Planning

Indian planning as reported by Misra et al. (1976) is essentially normative single-level economic planning with a heavy reliance on the sectoral approach.

It could also be said to be normative that refers to the systems approach. A system is a set of inter connected parts or elements. There has been greater emphasis on plan formulation than on implementation. The institutional set up for implementing the plans has remained basically unchanged during the last thirty years.

Indian planning is marked by centralization at the national level. No attempt was made to prepare plans at lower territorial levels inspite of it being felt and recommended by five year plans. It has been viewed that the technocrats who planned from national level seldom had any inkling of the relationship that existed between the various institutions and a group and fail to realize that its culture could not be altered piecemeal.

Planning in this country could also be stated to be developmental only by courtesy, even though that is the only broad category to which it belongs. For all practical purposes, it has been and continues to be sectoral economic planning. The long range objectives of which are ill-defined and hazy.

Indian planning from the very start as stated by Singh (1977) was,

".... rooted in concepts of democracy and socialism and the objectives of giving equal opportunity to and creating the conditions of good life for the masses of the people".

The means employed to reach the objectives as reported by Misra et al. (1976) varied from plan to plan and the overall growth rates of the Indian economy during first three plan periods (1951-66) were below targets, except during the first Five Year Plan.

The most glaring failure of Indian planning has been in matters of social and economic justice for the poorer sections of the people. This has been rightly stated by Patel (1971) as that,

"even more striking is the fact that the top five per cent of the population is responsible for about eighteen per cent of national consumption, which is slightly less than that of the bottom 40 per cent of the population".

These inequalities - social and economical - were reflected not only in inter-personal differences but also in inter-group and inter-regional differences. A question arises as to how this could be rectified. There is no single and simple answer to this since, as viewed by Misra et al. (1976) "all the contributing factors are inter-connected". To rectify the present situation economic growth has to be used as a means to achieve higher social goals. Along with this environmental factor also should be considered. People are to be provided with not only adequate food and other daily necessities of life but also space to live-space which is so organised that it satisfies their mental and psychological requirements.

Planning, therefore, should be such that it organises people and institutions in such a way that economic growth is rapid and sustained. To achieve this, planning philosophy, methods and techniques must undergo change. Economic-oriented development, geared to investments in various sectors and unmindful of social justice and environmental quality, has to give way to socio-economic-cum-spatial planning. This study aims at spatial integration through area planning at block level.

F. Concept of Block Level Planning

Having gained understanding about spatial integration and area planning, its types and theories, this study was

proposed to conduct at block level since block was conceived as the manageable unit for efficient planning and execution. Even though this study aimed to 'partial planning' it was felt that reviewing the concept of block level planning is worthwhile. This had been done and given.

In the preindependence era there were planned attempts to develop an area in this nation by individuals and institutions here and there. They had their impact but for obvious reasons these attempts could not be continued.

The idea of planning at the block level in our country was of recent origin. This planning strategy underwent changes progressively. This had been reviewed under the following heads as: (1) Integrated Plans, (2) Local Initiative, (3) Agricultural Area Programme, (4) Regional Planning, (5) Local Area Planning, (6) Multi-level Approach and (7) Block-Level Planning.

1. Integrated Plans: Planning Commission (1952) felt to integrate state plans with the programmes of district boards and municipalities and to add to them other local programmes designed to meet the felt needs of the people.

2. Local Initiative: Then the Planning Commission (1957) stressed the need to involve local initiative and effort

such as individual villages and groups of villages such as tehsils, taluks, development blocks etc. By and large during the Second Five Year Plan the same schematic budgetary exercise continued.

3. Agricultural Area Programme: In the third Five Year Plan (1961) as stated by Shiviah et al. (1979) priority was given to agricultural development. Special programmes like Intensive Agricultural District Programme and subsequently Intensive Agricultural Area Programme were introduced. These programmes involved district-level planning with certain limited objectives.

The planning approach adopted by the first three plans was sectoral in nature. Thus naturally advantageous regions developed resulting in income disparities and unemployment to larger extent.

4. Regional Planning: To correct this imbalance, Planning Commission (1969) emphasized the need for regional planning and district-level planning on the assumption that the plans made at the state and national levels can be brought down to the people. Growth centre projects were launched to evolve a broad methodology and to indicate how the growth potential of these centres could be promoted through comprehensive and scientific study of the overall development needs, and how

these centres could be meaningfully woven into the frame of the district plan and thus help in the process of below. It is at this juncture it was felt to start planning from bottom to up, based on the needs of the people.

5. Local-Area Planning: The Planning Commission (1974) emphasised regional and district planning as essential pre-requisite for the augmentation and rational allocation of resources between areas and programmes and their optimal utilization for

- increasing productivity,
- improving distribution of incomes, and
- reducing disparities between different areas and sections of the population.

Special programmes for weaker sections were introduced with due emphasis on local-area planning.

6. Multi-Level Approach: The multi-level approach was adopted at the state and lower regional and administrative levels as envisaged by Planning Commission (1974). It was observed that the basic idea underlying this approach is that from the point of view of efficiency as well as equity, it is not desirable to mechanically impose the hierarchy of programmes priorities determined at the national and state levels without taking into consideration the peculiarities

of different areas in terms of levels of development, physico-geographic conditions, resource potentials and the coverage and quality of economic and social services. One of the important advantages of this approach would be that it would facilitate an integrated view of related activities on a spatial basis and thereby ensure their physical convergence and synchronisation.

7. Block-Level Planning: The Planning Commission (1978) emphasised to increasing productivity through a strategy of growth with social justice by having location-specific planning to achieve the objectives. It emphasised block as the primary area for local planning. The Dantawala Working Group on block-level planning made it clear that block-level planning should not be viewed as an isolated exercise but as a part of the planning done at the district, region and state levels. The working group welcomed the idea of inviting some professional institutes with required expertise to assist the State Governments in the preparation of block plans.

The concept of Christaller and Loschian as well as the observation of Dantawala Committee were taken into account in this block level study due to the fact that this study also aimed to fix points of location to establish infrastructural facilities to provide input, so as to utilise them with least cost. Also it aimed at fixing the market centres to channelize the output. The methodology as adopted in this study to meet this requirement has been detailed in the next chapter.

Research Methodology

CHAPTER III

RESEARCH METHODOLOGY

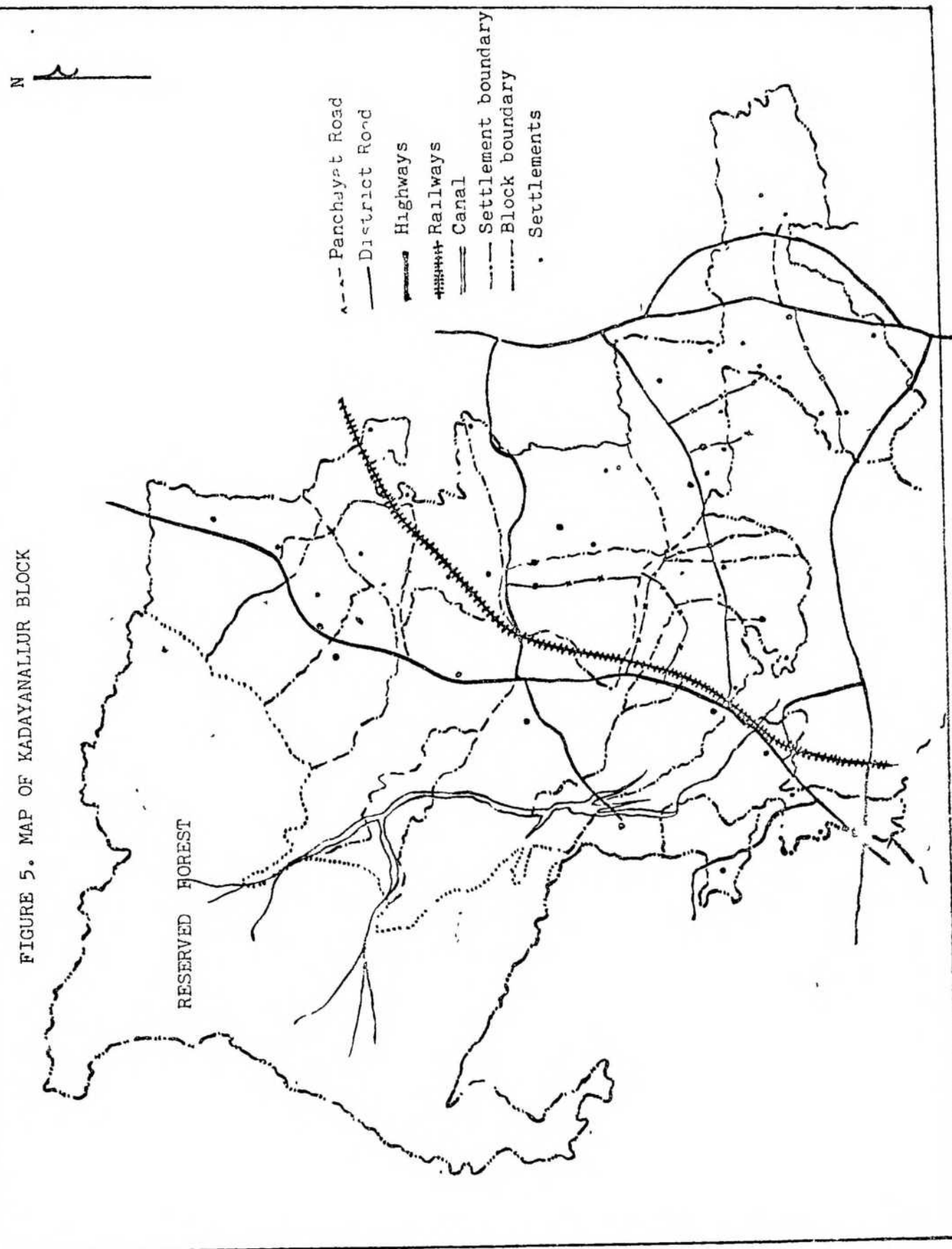
This study aims to develop a planning strategy for the establishment of infrastructural facilities in the rural areas. This was aimed at increasing the agricultural production through well established facilities in a spatial framework of transportation so as to link service centres and service areas at different levels. This will be done in an integrated and comprehensive pattern.

A. Locale of research

This is the first study of its kind in Tamil Nadu. One district (Tirunelveli) was purposively selected since no research study of any nature in the field of agricultural extension was undertaken in this district. The officials of the development departments were consulted to select the study area. Kadayanallur block (Vide Figure 5) was selected due to the following reasons.

- It represented the rural character, so essential for this study.
- It had varying soil conditions including land under forests.
- This area had well distributed area under irrigated and unirrigated lands.

FIGURE 5. MAP OF KADAYANALLUR BLOCK



- Food and non food crops were under cultivation relatively in equal proportion.

This block has sixteen revenue villages and 56 settlements. The entire area was considered for the study since the study aimed at preparing a block level plan.

Description of Study Area

Kadayanallur block is spread over 21160.20 hectares. It consists of eighteen panchayats with sixteen revenue villages besides the Kadayanallur Municipality. The population of this union was 96,524 as per 1971 census. The number of families living in this block accounts for 21,038. The details of the work force available in the study area is given in Table 1.

Table 1. Work force in Kadayanallur Block

S.No.	Work force	Male	Female	Total
1.	Agriculture	6536	1212	7748
2.	Cottage industries	5954	3775	9729
3.	Self employed	3534	276	3810
4.	Agricultural labourers	7430	4635	12065

1. Agriculture

The major area is occupied by gardenlands. Of the total geographical area of this block, the cultivable land

accounts for 10394.27 hectares (51.48 per cent). The major crops of this block are paddy, cholam (Jowar), pulses, chillies, coconut and cotton.

The cropping pattern followed in this block is chillies in kharif season, paddy in rabi season and cholam (jowar)/cotton in summer season in the case of irrigated lands. Cotton followed by cholam/pulses is the cropping pattern in the case of unirrigated lands. Farmers cultivate atleast two to three crops if it is irrigated land and one to two crops if it is unirrigated land annually.

2. Agricultural Extension Work

Extension work is primarily carried out at village level by Rural Welfare Officers (R.W.O.). There are fifteen R.W.Os under the guidance and support of two Agricultural Officers (Extension Officers). The Agricultural Officers are supported by one Assistant Agricultural Officer, one Compost Development Inspector, one Depot Manager and two Demonstration Officers who are stationed at headquarters. These extension agents act as the most important communication link between research system and farming system. Besides, a large number of non-governmental input agencies also carry out agricultural extension work through their infra-structural facilities to market their products like fertilizers, seeds, pesticides and implements.

3. Infrastructure

The infrastructural facilities available in the block area are presented in Table 2.

C. Selection of Respondents

A list of farmers was collected with the help of village and block agencies. From the list three farmers from each village were selected at random. Thus the total sample size was (56 x 3) 168 farmers.

D. Selection of Infrastructural Facility

Among the facilities which are essential for the development of an area, the three important facilities include:

- Agricultural facility,
- Health facility, and
- Educational facility.

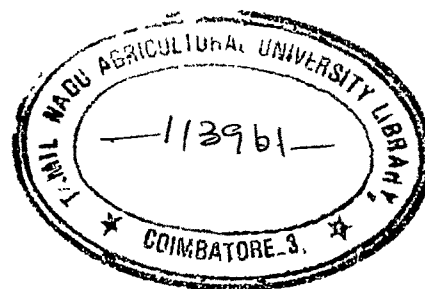
A panel of specialists as well as extension workers was prepared in the selection of facilities, as judges. Thus, from the 36 enlisted facilities, only 26 coming under the above important facilities were selected for the purpose of this study as per the judges' opinion.

The facilities thus selected to identify, rank and classify the levels of settlements were as follows:

Table 2. Infrastructural facilities existing at the block level

S.No.	Name of the facility	Numbers
1.	Primary school	53
2.	Fertilizer shop	30
3.	Private clinic	25
4.	Bus stop	26
5.	Branch post office	24
6.	Higher elementary school	23
7.	Milk collection centre	23
8.	Village munsif office	16
9.	Karnam office	16
10.	Medical shop	16
11.	R.W.Os office	15
12.	Agricultural credit society	10
13.	Bank	5
14.	Maternity centre	5
15.	Market centre - daily	4
16.	Agro-service centre	4
17.	Artificial insemination centre	4
18.	Rural Bank	3
19.	Agricultural depot	2
20.	Agricultural office	2
21.	Market centre - weekly	2
22.	Higher secondary school	2
23.	Primary health centre	2
24.	High school	1
25.	Post office	1
26.	Hospital	1
27.	Petrol bunk	1
28.	Telegraph office	1
29.	Railway station	1
30.	Bus stand	1
31.	Block office	1
32.	Tractor workshop	1
33.	Pumpset workshop	1
34.	Veterinary hospital	1
35.	Carpentry unit	1
36.	Leather processing unit	1

- Primary school
- Higher elementary school
- High school
- Higher secondary school
- Fertilizer shop
- Agro-service centre
- Agricultural depot
- Tractor workshop
- Pumpset workshop
- Agricultural credit society
- Rural bank
- Bank
- Market centre - daily
- Market centre - weekly
- Artificial insemination centre
- Veterinary hospital
- Private clinic
- Primary health centre
- Hospital
- Medical shop
- Milk collection centre
- Village munsif office
- Karnam office
- Rural welfare officers' office
- Agricultural office
- Block development office



E. Data Needed

Before collecting the data, the planning goals need to be clear to the researcher. It was felt that once the planning goals were well defined and clearly stated, it would be easy for the planner to collect the required relevant data.

It was further kept in mind that the data requirement would vary with varying situations and requirements.

Both quantitative and qualitative data were required to comprehend the conditions and problems. These kinds of data could be collected from two main sources namely primary sources such as local people, leaders, officials, etc., and secondary sources such as agricultural census, livestock census, revenue records and registers, different institutional records and registers, and district census book.

F. The Schedule

Since this study was largely based on secondary data, a proforma form of schedule was constructed (vide Appendix A) and used. The proforma comprised:

- Area, land use pattern and locational importance
- Irrigation
- Population, literacy and occupational distribution
- Agricultural, health and educational facilities
- Land utilization pattern
- Area under six major crops
- Yield performance of six major crops
- Types of farmer families and soils

Judges opinion were also sought to rank the levels of settlement beside other techniques.

Apart from this, an interview schedule was constructed and used to assess the 'space preference' of people for infrastructural facilities.

The interview schedule was pretested with a sample of 30 farmers who were out of the sampling purview. The data collection was done from December 1980 to June 1981. The collected data were tabulated and analysed by the following procedure.

G. Identification and Ranking of the Settlements

With the information available about the infrastructural facilities, the settlements were ranked based upon the number of existing units. This facilitated in assessing the sectoral needs of the population and rationalization of infrastructural facilities location. This needed to be done due to the fact that in the absence of such methods the decisions of locating something, somewhere, would likely to influence in some manner, somewhat by rational uneconomic and political forces and set irreversible trends in the process of institutional and infrastructural development (Roy and Patil, 1977). It was therefore, felt necessary to go beyond common-sense, intuition and the educated guess to develop a set of principles and methods by which locational decisions could be taken in a rational manner. Thus the following procedure was adopted to meet the requirement.

H. Identification of Service Centres

Before getting into the process, the following assumptions were made:

- People have bio-physical as well as economic needs.
- They utilize physical and human resources i.e., goods and services to satisfy their needs.
- They settle in a space in the form of homesteads, hamlets, villages, towns or cities and continue to stay together as long as resources are adequate to meet their needs.
- They migrate to other places in search of goods, services and for employment which are not available in their own situation.

Identification of service centres was done to develop infrastructural facilities for the fullest utilization of the capabilities of people and resources and equitable distribution of essential goods and services.

There are many methods of identifying service centres, using various criteria such as distance, population, existing institutions and movement of people to avail of these facilities. If a method based on distance as a single criterion is used, it would not take into consideration the distribution of people and their resources in space. If methods based on population as the only criterion are used it would not take

into account the distance and resource factors. The methods based on infrastructural criteria alone might tend to emphasise the irrational nature of the past and consequently might inhibit the ideal nature of future development. Methods based on the criterion of movements alone would manifest the factors of space preference or alternatives and opportunities available in the past. Therefore, it was felt that use of more than one method based on multiple criteria would be more reliable than the use of any single method based on a single criterion.

In this study three methods which required a minimum amount of data and maps on the one hand and statistical and cartographic skills to analyse on the other were used. They were:

- A scalogram method based on the number and type of infrastructural facilities to rank the settlements.
- A sociogram method based on preferences of people for different service centres to locate the existing facility and to identify locale for establishing infrastructural facilities.
- A bisectonal method of dividing space on purely geometric logic of allocating areas to lower level service centres from higher level ones on maps.

Finally, however, the most rational solution using all the three methods were adjusted to the existing revenue boundaries of villages.

Other techniques used were:

- Kendall's coefficient of concordance to assess the homogeneity of the area by taking into consideration the cropping pattern.
- Transportation model based on optimization technique to locate market centres.

The above methods as adopted in this study are detailed below.

1. Scalogram method

This method has been used to rank in terms of importance, the places on the one hand and the institutions or the infra-structural facilities on the other. The selected 56 villages were arranged in the descending order of the existing infra-structural facilities. Here the rows represented the villages while infrastructural facilities constituted the columns. The total facilities were added (Each row was summed). Based on these sums, by interchanging the rows, the villages were written in the descending order of the total facilities available. Now the column sum was computed. This sum gave the total number of each facility existing in all the 56 villages. Based on

this column sum by interchanging the columns the facilities were brought in the decreasing order. Now as shown in Figure 6, all the facilities were brought to the left end. A thick trace line was drawn along the boundary of least errors showing the compact scalogram.

2. Sociogram method

The sociogram method was used to show graphically the pattern of interaction/interdependence by the movement of people between settlements for selected facilities. This pattern was prepared on maps on the basis of the preference for service centres by the people indicated by arrows showing which villagers go where for what. Three such graphics were prepared for (a) agricultural facilities, (b) health facilities and (c) educational facilities. These graphics had been prepared as ray diagrams with straight lines from origin to destination. This would help to identify the spatial gaps as well as suggest the possibility of locating new service centres.

3. Bisection method

The bisection method was designed to identify on a map, the high level, middle level or lower level service centres, by geometrically dividing space on the basis of some knowledge of the ranking of service centres, following the principle of spatial efficiency using a series of graphic

progressions. The villages were classified into 3 levels as top, middle and low level centres.

A top level centre was one where there existed twenty five and more infrastructural facilities. A middle level centre was one wherein ten to twenty four infrastructural facilities existed. A low level centre was one which possessed one to nine facilities.

The rationale for such a classification was arrived at based on the judges opinion. In this process, the number of possible facilities that should be available in a village were listed. It was then given to the judges who were the subject matter specialists and extension workers to rate the villages on a three-point continuum based on the number of facilities as top, middle and low level centres. Based on judges opinion the villages were classified as top, middle and low levels.

Having done this, bisection method was adopted with the assumption that the lower level service centres are the "half-way houses" expected to develop in the middle of top level service centres. In other words, if one or two of the most important centres in the block and in the neighbouring blocks are known, it is then possible logically to expect low level service centres around the bisection line. The service centres at various levels in the hierarchy could, thus, be identified as detailed.

After identifying the top level centre(s) in the block area as well as in neighbouring block area depicting the hexagonal shape as conceived by the Christaller's Centrality Theory, they were connected by straight lines. Then they were divided by drawing perpendicular lines to show their respective zones or service areas and to facilitate the search for low level service centres, (i) on or around the meeting points of bisection lines, (ii) on or around the bisection points, and (iii) at the fixed distance on both sides of bisection lines, considering these, service centres were selected.

4. Existence of Area Homogeneity

Kendall's coefficient of concordance - W - was used to test the homogeneity of the area by taking into consideration the cropping pattern over different years in different villages as well as in the same village(s) over the years.

The method is described below: If it were to find out the concordance for the different years over different villages, then the crops were ranked in each year separately and the ranks would be given in the form of the following table. That is each row will have the numbers 1, 2, 3, ... in some order.

Table 3. Rank of cropped area over years

	Crop	Crop I	Crop II		Crop N
Rank for	C_1	C_2			C_N
Year I Y_1					
Year II Y_2					
Year K Y_K	R_1	R_2	$R \dots$		R_j

At first, the sum of each column was found out as,

$R_1, R_2, R_3, \dots R_j$. The mean of the sum was denoted by

$\bar{R} = \frac{\sum R_j}{N}$, where

N = the number of crops

Let K be the number of years (or villages) as the case may be.

Again S was estimated as $S = \sum (R_j - \frac{R_j}{N})^2$

Then the Kendall's coefficient of concordance - W - was calculated as:

$$W = \frac{1}{K} \frac{S}{(N^3 - N)}$$

To test the significance of a calculated W , χ^2 was used where $\chi^2 = K(N-1)W$, which followed the χ^2 distribution with $N-1$ degree of freedom. If the calculated χ^2 exceeded the table value, W was said to be significant.

If uniform cropping pattern was observed through this test over a set of villages that would be considered as homogeneous.

5. Transportation Problem

Operations research methods are applicable to planning problems which involve optimization. The optimization may be for a single year or over many years. Here the optimization was used for area planning wherein the goal is to minimise the transportation cost. Linear programming being a powerful optimization technique was used to locate storage and market facilities which was felt equally important like other facilities.

A linear programming problem has three quantitative components:

- An objective function
- Alternative methods or processes for attaining the objective
- Resource or other restrictions.

(a) General format of the problem: The technique of linear programming could be applied whenever the objective is to optimize (maximise or minimise as the case may be) the function $f(X)$ where,

$f(X) = F X + K$. $f(X)$ is linear and

F is a functional

K is a constant, and

X ranges over a convex polyhedral set of points.

A convex polyhedral set as defined by Hillier and Gerald (1974) is a convex set formed by the intersection of closed half spaces.

The maximization (or minimization) of the objective function is subjected to certain linear constraints. The usual way of writing a maximization problem in a matrix form is

Maximise $Z = C' X$ subject to

$$A x \leq B, x \geq 0$$

Where

A is an $m \times n$ matrix of technical coefficients,

C is an $n \times 1$ vector of prices or other weights for objective function,

X is an $n \times 1$ vector of activities (commodities to produce),

B is an $m \times 1$ vector of resource or other restraints, and

$C'X = Z$ is the objective function.

This problem can be written as

Maximise $Z = C_1 x_1 + C_2 x_2 + \dots + C_n x_n$ subject to

$$a_{11} x_1 + a_{12} x_2 + \dots + a_{1n} x_n \leq b_1$$

$$a_{21} x_1 + a_{22} x_2 + \dots + a_{2n} x_n \leq b_2$$

$$a_{m1} x_1 + a_{m2} x_2 + \dots + a_{mn} x_n \leq b_m$$

$$x_1 \geq 0, x_2 \geq 0, \dots, x_n \geq 0$$

In a compact form the problem can be written as

$$\text{maximise } Z = \sum_{j=1}^n c_j x_j \text{ subject to}$$

$$\sum_{j=1}^n a_{ij} x_j \leq b_i$$

where

$$j = 1, 2, \dots, n; \text{ and } i = 1, 2, \dots, m$$

Here the terms used include:

(i) Objective function-the object of the problem.

In respect of linear programming, the function should be a linear expression. In the maximization problem it would represent the total profit whereas in the minimization problem it would represent the total cost. Here it was decided to minimise the total transport cost.

(ii) Constraints - referred to limitation of the resources.

Thus the general form of the transportation problem which could be presented in mathematical form has been given below.

The general form of the problem is

$$\text{Maximize. } \sum_i \sum_j c_{ij} x_{ij}$$

Maximize
subject to

$$\sum_j x_{ij} = D_j \text{ for all values of } j$$

$$\sum_i x_{ij} = S_i \text{ for all values of } i$$

where it is true that

$$\sum_i S_i = \sum_j D_j$$

Here S_i is the supply position in source i

D_j is the demand of destination j

x_{ij} is the amount transferred from source i to destination j

C_{ij} is the cost of quantity x_{ij} transported.

(b) Definition of the symbols used: In the present problem the symbols which are to be used have been defined and given below:

C_{11} is the transportation cost per unit between Kadayanallur and Sankarankoil

C_{12} is the transportation cost per unit between Kadayanallur and Tenkasi

C_{13} is the transportation cost per unit between Kadayanallur and Surandai

C_{14} is the transportation cost per unit from Kadayanallur to any unknown place (Dummy variable)

C_{21} is the transportation cost per unit between Nainaragaram and Sankarankoil

C_{22} is the transportation cost per unit between Nainaragaram and Tenkasi

C_{23} is the transportation cost per unit between Nainaragaram and Surandai

- C_{24} is the transportation cost per unit between Nainaragaram to any unknown place (Dummy variable)
- C_{31} is the transportation cost per unit between Chockampatty and Sankarankoil
- C_{32} is the transportation cost per unit between Chockampatty and Tenkasi
- C_{33} is the transportation cost per unit between Chockampatty and Surandai
- C_{34} is the transportation cost per unit between Chockampatty to any unknown place (Dummy variable)
- C_{41} is the transportation cost per unit between Kulayaneri and Sankarankoil
- C_{42} is the transportation cost per unit between Kulayaneri and Tenkasi
- C_{43} is the transportation cost per unit between Kulayaneri and Surandai
- C_{44} is the transportation cost per unit between Kulayaneri to any unknown place (Dummy variable)
- X_{11} is the marketable surplus available at Kadayanallur which can be transported to Sankarankoil
- X_{12} is the marketable surplus available at Kadayanallur which can be transported to Tenkasi
- X_{13} is the marketable surplus available at Kadayanallur which can be transported to Surandai
- X_{14} is the marketable surplus available at Kadayanallur which can be transported to any unknown place (Dummy variable)
- X_{21} is the marketable surplus available at Nainaragaram which can be transported to Sankarankoil
- X_{22} is the marketable surplus available at Nainaragaram which can be transported to Tenkasi
- X_{23} is the marketable surplus available at Nainaragaram which can be transported to Surandai
- X_{24} is the marketable surplus available at Nainaragaram which can be transported to any unknown place (Dummy variable)

- X_{31} is the marketable surplus available at Chockampatty which can be transported to Sankarankoil
- X_{32} is the marketable surplus available at Chockampatty which can be transported to Tenkasi
- X_{33} is the marketable surplus available at Chockampatty which can be transported to Surandai
- X_{34} is the marketable surplus available at Chockampatty which can be transported to any unknown place (Dummy variable)
- X_{41} is the marketable surplus available at Kulayaneri which can be transported to Sankarankoil
- X_{42} is the marketable surplus available at Kulayaneri which can be transported to Tenkasi
- X_{43} is the marketable surplus available at Kulayaneri which can be transported to Surandai
- X_{44} is the marketable surplus available at Kulayaneri which can be transported to any unknown place (Dummy variable)
- D_1 is the total demand for Sankarankoil sixty per cent of marketable supply that could be transported to Sankarankoil from Kadayanallur, Nainaragaram, Chockampatty and Kulayaneri
- D_2 is the total demand for Tenkasi thirty per cent of marketable supply that could be transported to Tenkasi from Kadayanallur, Nainaragaram, Chockampatty and Kulayaneri
- D_3 is the total demand for Surandai ten per cent of marketable supply that could be transported to Surandai from Kadayanallur, Nainaragaram, Chockampatty and Kulayaneri
- D_4 is the marketable supply that could be transported to any unknown place (Dummy variable)
- S_1 is the total marketable surplus available at the market centre, Kadayanallur
- S_2 is the total marketable surplus available at the market centre, Nainaragaram
- S_3 is the total marketable surplus available at the market centre, Chockampatty
- S_4 is the total marketable surplus available at the market centre, Kulayaneri

Considering the definitions, the objective was to minimize the total transport cost. Now the

Objective function
of the total cost

$$\begin{aligned} W = & C_{11}X_{11} + C_{12}X_{12} + C_{13}X_{13} + C_{14}X_{14} + \\ & C_{21}X_{21} + C_{22}X_{22} + C_{23}X_{23} + C_{24}X_{24} + \\ & C_{31}X_{31} + C_{32}X_{32} + C_{33}X_{33} + C_{34}X_{34} + \\ & C_{41}X_{41} + C_{42}X_{42} + C_{43}X_{43} + C_{44}X_{44} \end{aligned}$$

The constraints are

$$\begin{aligned} 1) & X_{11} + X_{12} + X_{13} + X_{14} & = S_1 \\ 2) & X_{21} + X_{22} + X_{23} + X_{24} & = S_2 \\ 3) & X_{31} + X_{32} + X_{33} + X_{34} & = S_3 \\ 4) & X_{41} + X_{42} + X_{43} + X_{44} & = S_4 \\ 5) & X_{11} + X_{21} + X_{31} + X_{41} & = D_1 \\ 6) & X_{12} + X_{22} + X_{32} + X_{42} & = D_2 \\ 7) & X_{13} + X_{23} + X_{33} + X_{43} & = D_3 \\ 8) & X_{14} + X_{24} + X_{34} + X_{44} & = D_4 \end{aligned}$$

(c) Approach to solve the problem: The transportation method of programming was developed to schedule the optimum allocation of cargo vessels, where the optimum allocation minimizes the distance travelled and total transport cost. This method was used to determine the least cost sources of materials to a marketing place. This could also be used for firms with many production centres. The assumption made in the general spatial

problem was that each region would meet its demand from its own domestic production to the extent possible. Hence only the surpluses would be routed to the deficit areas, so that people could meet requirements from these marketing centres with minimum possible cost. The marketable surplus for each revenue village in the study area was worked out for the major crops viz., paddy, cholam (Jowar), cotton, pulses, chillies and coconut. Based on the preference of the people the following centres viz., Kadayanallur, Nainaragaram, Chockampatty and Kulayaneri were identified as sources which might be regarded as those wherein the marketable surpluses of the nearby settlements needed to be pooled. Now the marketable surplus would need to be routed from the above four sources to the nearby market places namely Sankarankoil, Tenkasi and Surandai so that the transportation cost would be kept at minimal level. The data on marketable surplus in all the sources and the demand position at all destinations are available. Similarly, the data on distance between different sources and destinations are also available.

Stepping stone method

In the present study it is aimed to minimise the transportation cost. This was achieved through stopping stone method by following the North West Corner Rule (Hillier and Gerald, 1974). Four marketing centres were identified for

pooling the marketable produce from the neighbourhood settlements. These were aimed to be transported outside area to three destinations according to the demand. The total demand at each centre was assessed and pooled. Then it was worked out for allocation of marketable surplus to these centres according to their level of demand. Thus the marketable surplus allotted were 60 per cent to Sankarankoil, 30 per cent to Tenkasi and 10 per cent to Surandai. The total cost of the transportation was worked out by using a mathematical model which is given below. Then the North West Corner rule was applied. Under this rule, initial allocation of produce was started from the North West corner as shown in the following table.

Table 4. North West Corner Rule

Source	Destination	(1)	(2)	(3)	(4)	Total
1)		a				I
2)			b	c		II
3)				d		III
4)					e	IV
Total		A	B	C	D	

Using this table, activating the inactive cells was started. The cost for activating each one of the inactive cell was worked out. This was repeated till a maximum profit attained.

The cells for which activation brought maximum profit was chosen for the transfer of goods. In this way (by stepping stone method), at each stage the cost was worked out for activation and the minimization of cost was obtained at the fourth stage. Based on this the final allocation was made.

The methodology narrated above was adopted and the findings and discussion have been presented in the next chapter.

Findings and Discussion

CHAPTER IV

FINDINGS AND DISCUSSION

Spatial and functional integration based on growth centre approach was the core around which this study was conducted. This chapter highlights the findings and discussion under the following sub-heads.

- A. Identification and Ranking of the Settlements
- B. Location and Utilization of Infrastructural Facilities
- C. Degree of Existence of Area Homogeneity
- D. Locale Identification for Establishment of Infrastructural Facilities
- E. Model for the Block

A. Identification and Ranking of the Settlements

Identification of growth centres and their zone of influence is the first task to fix the basic planning unit. A growth centre might be a village or a rural market or a rural town which operates a number of functions. In addition to its own requirements, it also meets the needs of a large population in the surrounding villages. According to the number and level of specialisation of the functions existing in each of them, the relative importance of the growth centres might vary. Therefore, a hierarchy of growth centres called

as settlement hierarchy was identified based on the infra-structural facilities that are existing in each of the 56 settlements. The location of the settlements in the study area is presented in Figure 7.

1. Scalogram

To rank the settlement and obtain a hierarchy of settlement, the settlements were arranged in a descending order of population size and the total number and type of facilities located in each settlement are presented in Table 5. This is also depicted in Figure 8.

(a) Identification of Settlements: Of the 56 settlements in one namely, Vairavankulam there is no inhabitant. Surprisingly, the cultivators of the lands in this settlement, are observed to be, living either in Krishnapuram or Kadayanallur. It can be seen from Table 5 that the population size varied from settlement to settlement. It is between zero and 37,105. So also the total number of facilities existing in each of the settlements is varying from 0 to 71. It may be stated that there is no relationship between the size of population and the number of facilities that are existing in the settlements. It can be observed that an increase in population do not increase the number of facilities in the area under study. Thus the hypotheses spelled out as the rank of the settlement maintains positive association with the

FIGURE 7. LOCATION OF SETTLEMENTS

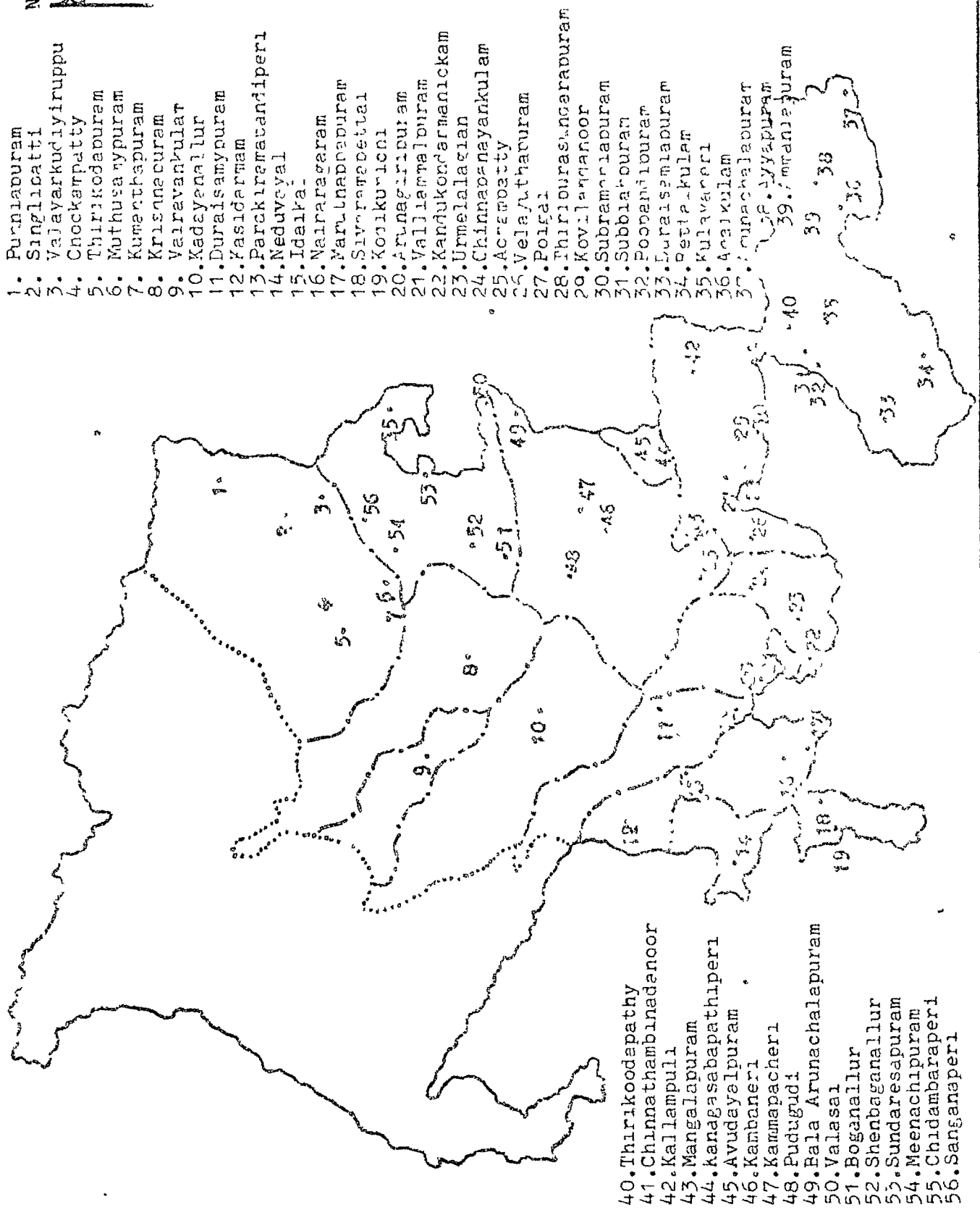
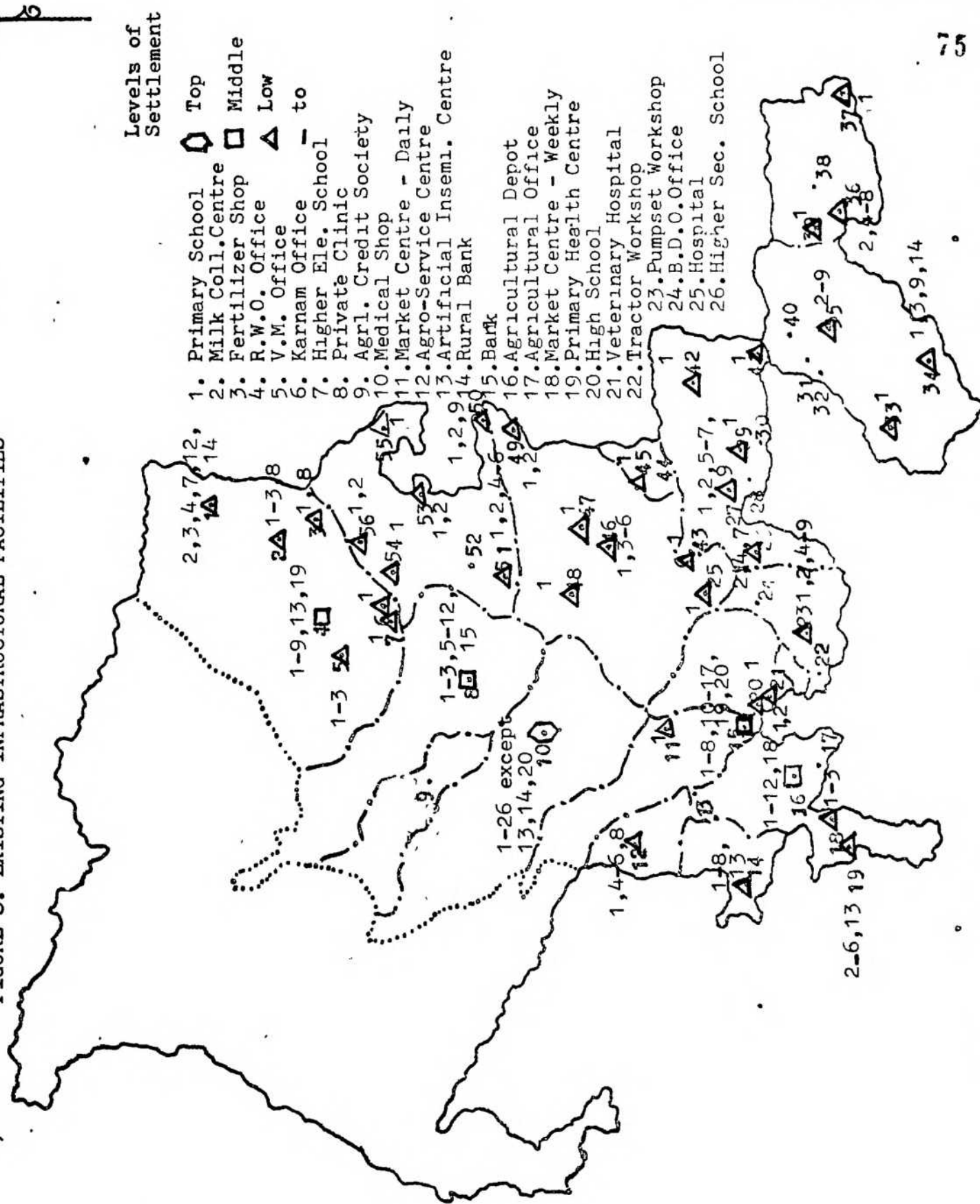


Table 5 Existing infrastructural facilities - Settlementwise

Name of settlements	Population	Name of facilities																										
		Block Office	Agricultural Office	R.W.O. Office	Agricultural Depot	Agri. Credit Society	Fertilizer Depot	Agro Service Centre	Tractor Workshop	Pumpset Workshop	Village Munsif Office	Karnam Office	Market Centre - Daily	Market Centre - Weekly	Bank	Rural Bank	Veterinary Hospital	Artificial Insemination Centre	Milk Collection Centre	Government Hospital	Private Clinics	Medical Shop	Primary Health Centre	Primary School	Higher Elementary School	High School	Higher Secondary School	Total
1. Kadayannallur	37105	1	1	1	1	2	11	1	1	1	2	2	1	1	3	0	1	1	1	1	12	8	0	7	9	0	2	71
2. Krishnapuram	13190	0	0	0	0	1	3	1	0	0	2	2	1	0	1	0	0	0	1	0	2	4	0	4	2	0	0	24
3. Chockampatty	5345	0	0	1	0	1	2	0	0	0	1	1	0	0	0	0	0	1	1	0	1	0	1	4	1	0	0	15
4. Thirukodapuram	2700	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	4
5. Punniapuram	2465	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	5
6. Urmelalegiam	2204	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	2	1	0	0	9
7. Idaikal	2153	0	1	1	1	0	1	1	0	0	1	1	1	0	1	1	0	1	1	0	2	3	1	1	1	1	0	2
8. Kasidarmam	2118	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	5
9. Sivaramapettai	1765	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	4
10. Kumanthapuram	1634	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
11. Nainaragaram	1616	0	0	1	0	1	2	1	0	0	1	1	1	1	0	0	0	0	1	0	2	1	0	2	1	0	0	16
12. Neduvayal	1615	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	2	1	0	0	9
13. Velayuthapuram	1243	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	4
14. Singlipatti	1226	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	4
15. Kallampuli	1210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
16. Kulayaneri	1170	0	0	1	0	1	1	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	8
17. Kambaneri	1111	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5
18. Parakiramapandiperi	929	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19. Pudugudi	900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
20. Duraisampuram	890	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
21. Boganallur	783	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	5
22. Ammaniapuram	780	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
23. Achampatti	780	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
24. Kammappaoheri	775	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
25. Kodikurichi	767	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	7
26. Sanganaperi	749	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
27. Sundaresapuram	739	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
28. Arunachalapuram	664	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
29. Chinnathambinadanur	658	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
30. Valasai	630	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	3
31. Anaikulam	620	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	6
32. Poigai	615	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	7
33. Mangalapuram	542	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
34. Rettaikulam	503	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	4
35. Avudaiyalpuram	454	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
36. Ayyepuram	412	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37. Chinnapanayankulam	410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38. Kandukondanmaniokam	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39. Arunagiripuram	394	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
40. Valliammalpuram	372	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
41. Thiripurasundarapuram	367	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42. Chidambaraperi	350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
43. Subbiahpuram	350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44. Kanagasabapathiperi	348	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45. Bala Arunachalapuram	270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
46. Dureisamiapuram	265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
47. Kuthusampuram	264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
48. Varuthappapuram	259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49. Thirukoodepathy	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50. Kovilandanoor	218	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
51. Valayarkudiyiruppu	215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
52. Poochandipuram	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53. Meenachipuram	206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
54. Sherbaganallur	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55. Subramaniapuram	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56. Vairavankulam	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	98373	1	2	15	2	10	30	4	1	1	16	16	4	2	5	3	1	4	23	1	25	16	2	53	23	1	3	263

FIGURE 8. EXISTING INFRASTRUCTURAL FACILITIES



size of population and number of existing facilities has been rejected.

The facilities are also observed to be unevenly distributed. This can be identified by correlating Table 5 and the space matrix given in Table 6.

To illustrate, the main agricultural depot is found to exist in the headquarters of the study area. The sub-agricultural depot is also found to exist at a distance of six kilometre (km) from the headquarters on the very same road side settlement Idaikal. The study area is found to spread over an area of about 53 sq.km. The maximum distance between the extreme settlements is 33 km. The distance between the headquarters wherein agricultural depot existing and the last settlement is found to be 28 km. This agricultural depot has been established by virtue of the location of the headquarters on the trunk road along with its population size and number of facilities existing. When the establishment of an additional depot in the block is considered, it would be reasonable to locate it at an optimum distance so that the farthest settlement also could be benefited by its presence. From Figure 8 it can be seen that the settlements in the south eastern area are found to have been served by minimum facilities. So the sub-agricultural depot should have been thought of to be established in this location.

The headquarters of the additional agricultural officer, artificial insemination centres and high school are also found to be unevenly distributed. It is thus felt unreasonable to fix office of the additional agricultural officer at a distance of six km from the block headquarters, due to the fact that this settlement, Idaikal is found to be near to the headquarters. Mobility is not a problem for the people of this settlement to avail these facilities at Kadayanallur settlement. It is therefore felt that the locale for these facilities should have been fixed in other settlements in an optimum distance so as to extend these facilities to a large population over a wider space. It was reported that sometime back Urmelalagian settlement was fixed as the office of the additional agricultural officer. But it was changed to Idaikal possibly due to political pressure or/and vested interests of some of the influentials of the locality.

From the perusal of Table 5 it can be noticed that the distribution of the infrastructural facilities is uneven. Of the 26 facilities selected none of the settlements is found to have all the 26 facilities. Only the settlement Kadayanallur which is headquarters of the block has twenty three facilities. The settlements - Chockampatty, Krishnapuram, Idaikal and Nainaragaram have facilities between eleven and eighteen. All the other settlements have none to eight facilities. It shows that these settlements viz., Chockampatty, Krishnapuram,

Kadayanallur, Idaikal and Nainaragaram would have been recognised by the people of the study area as 'community interest area' where the associations and social contacts might be of voluntary nature. Moreover, these are the settlements which satisfy most of the needs and wants of the people. Thus these settlements have become the 'core areas' in this block.

The studies conducted by Galpin (1918), Kolb and Polson (1933) revealed that people were drawn together by common interests of trade, education, recreation or religion. More or less all these facilities are available in these five settlements.

The other reason that can be attributed for the concentrated establishments of most of the important facilities in these five settlements is the availability of transport facility as well as existence of political influentials.

From this illustration, it can be noted that the planning for the establishment of infrastructural facilities has not been done according to the requirement of the area. The possible reason that may be attributed for such a kind of establishment would have been, the pulls and pressures that existed in the area.

Thus the hypothesis spelled out as the infrastructural facilities are existing at the optimum location has been rejected.

(b) Rank of the Settlements

Based on the scalogram analysis and the opinion of the judges in ranking the settlements, four hierarchical levels have been identified and ranked as given in Table 7. The analysis of the results revealed the following:

- The item reproducibility value is found to be 0.98. This showed the fitness of the scale.

- There observed to exist one top level settlement, four middle level settlements and 38 low level settlements.

- Of the 26 selected facilities considered for the study the facilities viz., rural bank, primary health centre and high schools are not in existence in the top level settlement. This is obviously due to the presence of three nationalised banks, one government hospital and two higher secondary schools (one for boys and another for girls). Thus the top-level settlement, Kadayanallur is a full-fledged one.

- The common facilities existing in the four middle level centres are the primary schools, milk collection centres, fertilizer shops, offices of the R.W.O., V.M. and Karnam, higher elementary schools and private hospitals and agricultural credit societies. Even among these facilities, the office of the R.W.O. and agricultural credit societies are absent in settlements Krishnapuram and Idaikal respectively.

Table 7. Scalogram - Ranking of settlements

Name of settlements	Primary School	Name of facilities																									Rank	Population	Level of settlement		
		Milk Collection Centre	Fertilizer Shop	R.W.O. Office	V.M. Office	Karnam Office	Higher Ele. School	Private Clinics	Agri. Credit Society	Medical Shop	Market Centre - Daily	Agro Service Centre	Artificial Insemination Centre	Rural Bank	Rank	Agricultural Depot	Agricultural Office	Market Centre - Weekly	Primary Health Centre	High School	Veterinary Hospital	Tractor Workshop	Pumpset Workshop	Block Office	Hospital	Higher Sec. School				Total No. of facilities	No. of facilities
1. Kadeyanallur	7	1	11	1	2	2	9	12	2	8	1	1	1	0	3	1	1	1	0	0	1	1	1	1	1	2	71	23	I	37105	Top
2. Idaikal	1	1	1	1	1	1	1	2	0	3	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	21	18		2153	Middle
3. Krishnapuram	4	1	3	0	2	2	2	2	1	4	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	24	12	II	13190	Middle
4. Nainaragaram	2	1	2	1	1	1	1	2	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	16	13		1616	Middle
5. Chockampatty	4	1	2	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	15	11		5345	Middle
6. Urmelalagian	2	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	8	III	2204	Low
7. Neduvayal	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	8		1615	Low
8. Kulayaneri	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8		1170	Low
9. Kodikurichi	0	1	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7		767	Low
10. Poigai	1	1	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7		615	Low
11. Anaikulam	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6		620	Low
12. Punniapuram	0	1	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	5		2465	Low
13. Kasidarmam	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5		2118	Low
14. Kambaneri	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5		1111	Low
15. Boganallur	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5		783	Low
16. Velayuthapuram	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4		1243	Low
17. Singlipatti	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4		1226	Low
18. Rettaikulam	1	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	4		503	Low
19. Thirikodapuram	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3		2700	Low
20. Sivaramapettai	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3		1765	Low
21. Valasai	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3		630	Low
22. Sanganaperi	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2		749	Low
23. Sundaresapuram	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2		739	Low
24. Valliammalpuram	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2		372	Low
25. Bala Arunachalapuram	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2		270	Low
26. Valayarkudi-yiruppu	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2		215	Low
27. Kumanthapuram	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		1634	Low
28. Kallampuli	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		1210	Low
29. Pudugudi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		900	Low
30. Duraisamiapuram	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		890	Low
31. Ammaniapuram	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		780	Low
32. Achampatti	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		780	Low
33. Kammampacheri	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		775	Low
34. Arunachalapuram	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		664	Low
35. Chinnathambinadanur	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		658	Low
36. Mangalapuram	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		542	Low
37. Avudaiyalpuram	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		454	Low
38. Arunagiripuram	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		394	Low
39. Chidambaraperi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0														

Item Reproducibility = 0.98

But these facilities are available to these settlements within a distance of one km at the nearby settlements Kadayanallur and Nainaragaram.

- It is observed that primary school is the common facility existed in all the thirty eight low level settlements of the study area.

- In the rest of fourteen settlements there is no agricultural, health and educational facilities. In view of non-existence of these facilities in the fourteen settlements, they are termed as 'very low level' settlements. Thus four levels of settlements have been identified and ranked in the study area.

- From Table 7, it can be observed that a large gap is existing between the settlements due to the non-existence of infrastructural facilities. Moreover, it is also observed that except for few of the settlements in the area, rest of them have not been considered for establishing facilities inspite of the larger population size in some of the settlements.

The above results indicates that the activities pertaining to agriculture, health and education are found to cluster in certain pockets of the study area. This is in conformity with the findings of Perroux (1955) who further stated that such an uneven distribution would result in heavy

social costs in terms of congestion, diseconomies of scale and spatial imbalances in social and economic development of an area.

The results further led to infer that the study area has large prevalence of undeveloped, underdeveloped and ill-developed settlements. This needs to be taken care of. There is therefore large scope for straightening and accelerating development in the area under analysis.

B. Location and Utilization of Infrastructural Facilities

To assess the location and utilization of infrastructural facilities, sociogram method was used. This method would show the location and the pattern of interdependence due to the movement of people between settlements to avail the selected facilities. This study was focussed on movement of people in relation to agriculture, health and educational facilities.

1. Agriculture

The movement of the people with regard to agriculture deals with the movement for the inputs like seeds, fertilizers, credit, repair of farm implements and machineries and marketing of farm produce. To project a clear picture, this was divided into two:

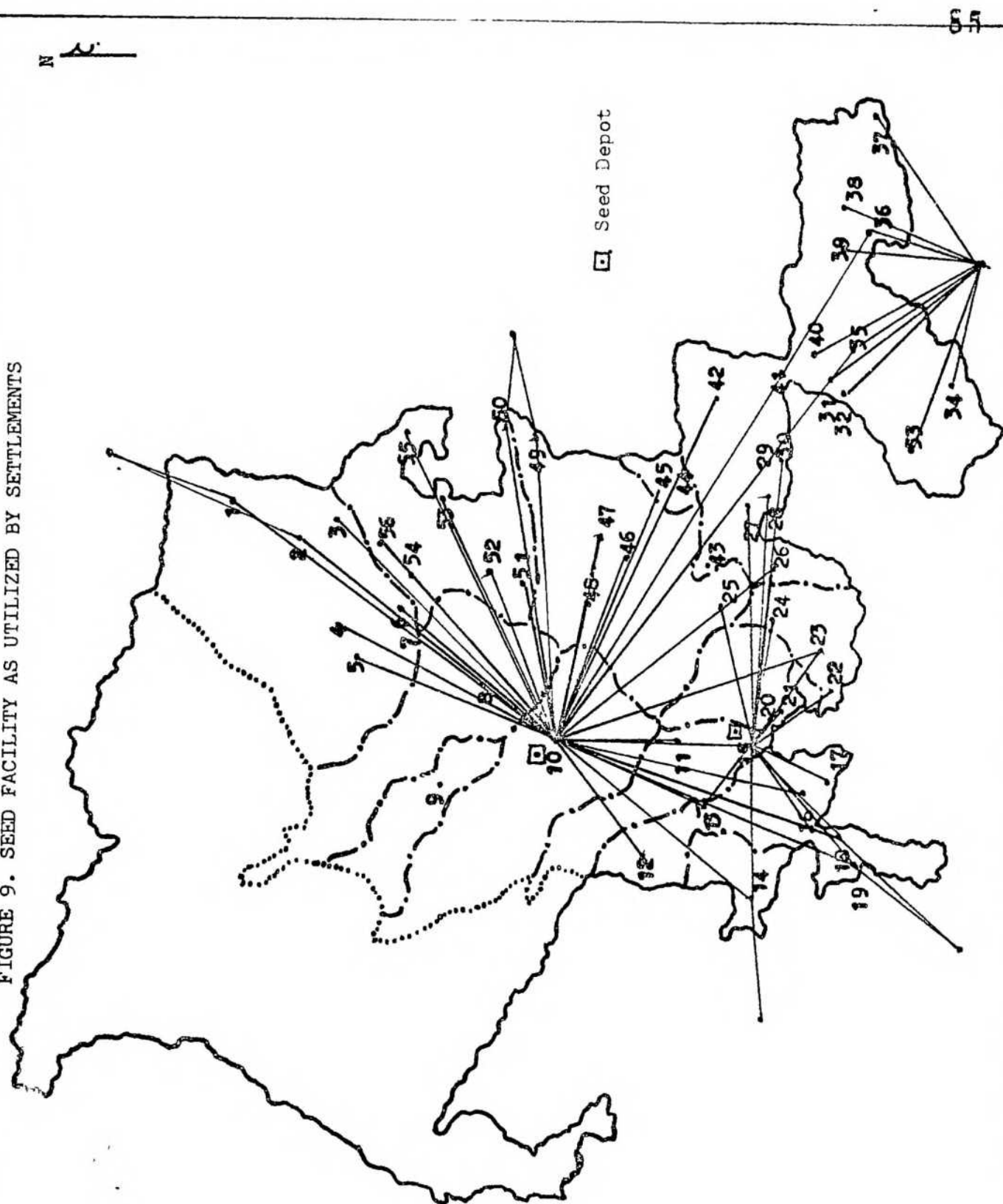
- Movements for the utilization of facilities such as seeds, fertilizers and repair of implements and machinery i.e. pumpset and tractor workshop.

- Movement for the utilization of facilities such as credit through agricultural societies and banks and marketing the produce through shandies.

The present utilization of the existing farm facilities such as seeds, fertilizers and repair of implements and machineries are depicted in Figures 9 to 11.

(a) Seed: From Figure 9 it can be noted that the facility of seed supply is existing in two settlements viz., Kadayanallur and Idaikal. It is seen that this facility which is available at present in Kadayanallur is found to be utilized by majority of the settlements located between one km and 28 km distance. Eventhough the settlements Neduyayal, Kodikurichi, Sivaramapettai, Urmelalagian, Velayuthapuram, Poigai and others surrounding these settlements are near Idaikal, it has been found out through records and registers that those settlements hardly used this facility. Instead, those settlements availed this facility of seed supply at Kadayanallur. Altogether only thirteen settlements utilized this facility at Idaikal. It was reported that there was a move to shift the sub agricultural depot from Idaikal. Due to reasons beyond control, it continued to remain in this settlement itself. It is also found that those residing in the settlements in the south eastern part and some located near periphery of the study area moved out to avail this facility. In view of this, it has been felt that the sub agricultural depot located at Idaikal should

FIGURE 9. SEED FACILITY AS UTILIZED BY SETTLEMENTS

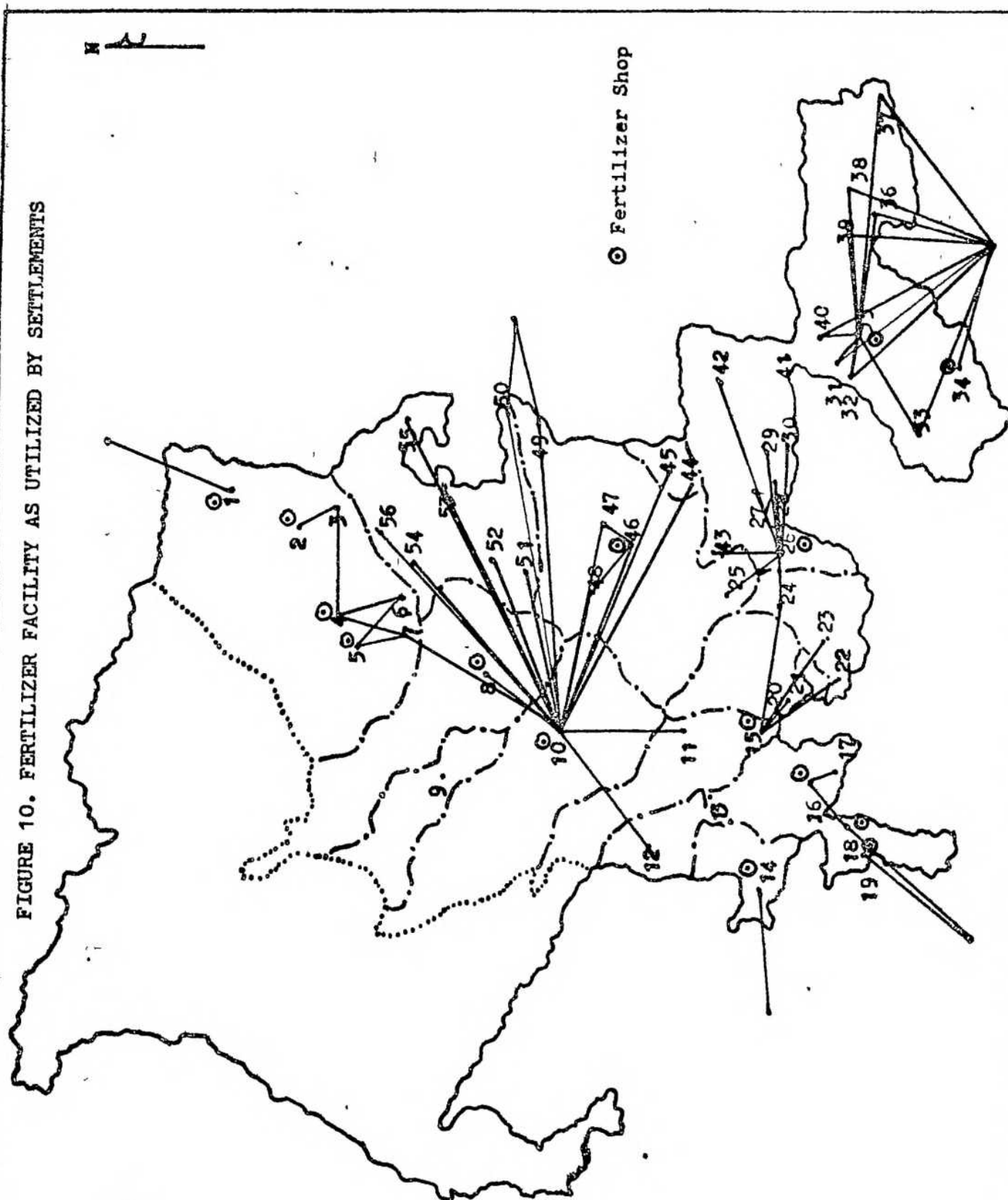


have been planned to be located elsewhere in the study area for better utilization. The place wherein it has to be located is discussed in section D of this chapter.

(b) Fertilizers: As regards the facility for the input-fertilizers, there observed to exist thirty fertilizer shops owned by private dealers (Vide Figure 10). It may be stated that on an average there is more than one fertilizer shop for two settlements since thirty shops were existing in the 56 settlements. Of the 30 shops, eleven are found to exist in Kadayanallur, three in Krishnapuram, two each in Nainaragaram, Chockampatty and Sivaramapettai and one each in the settlements IdaiKol, Meduvayal, Kulayaneri, Kodikurichi, Punniapuram, Kambaneri, Velayuthapuram, Singlipatti, Rettaikulam and Thirukodapuram. Altogether fertilizer facility is found to exist in only fifteen out of 56 settlements in the study area. In that, eleven settlements are on the roadside while the rest are found to be in interior locations. It meant that this facility is readily available for a population size of 73,974. For the rest of the population fertilizer facility is not readily available. It shows that there is scope to establish this facility in other settlements and the details of which are presented elsewhere in this chapter.

(c) Repair of farm implements and machineries: There is one pumpset and one tractor workshop in settlement Kadayanallur

FIGURE 10. FERTILIZER FACILITY AS UTILIZED BY SETTLEMENTS

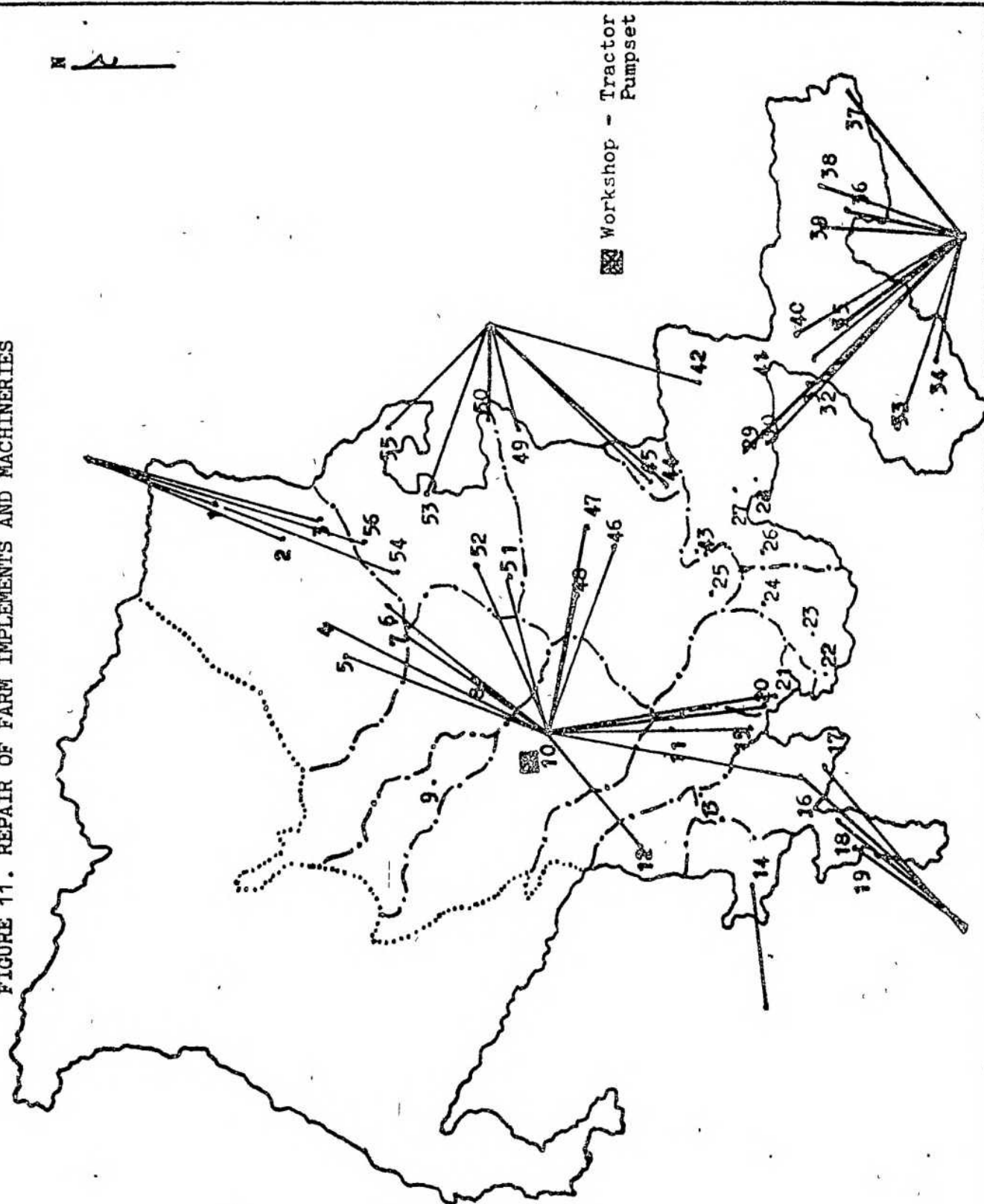


for the entire area. This has been given in Figure 11.

These are owned by private agency. It is found at the time of this investigation that there are 1423 three H.P. motors, 247 five H.P. motors, 34 ten H.P. motors, 188 oil engines, fifteen tractors and 1223 improved implements. These are the equipments and machineries supplied by block agency.

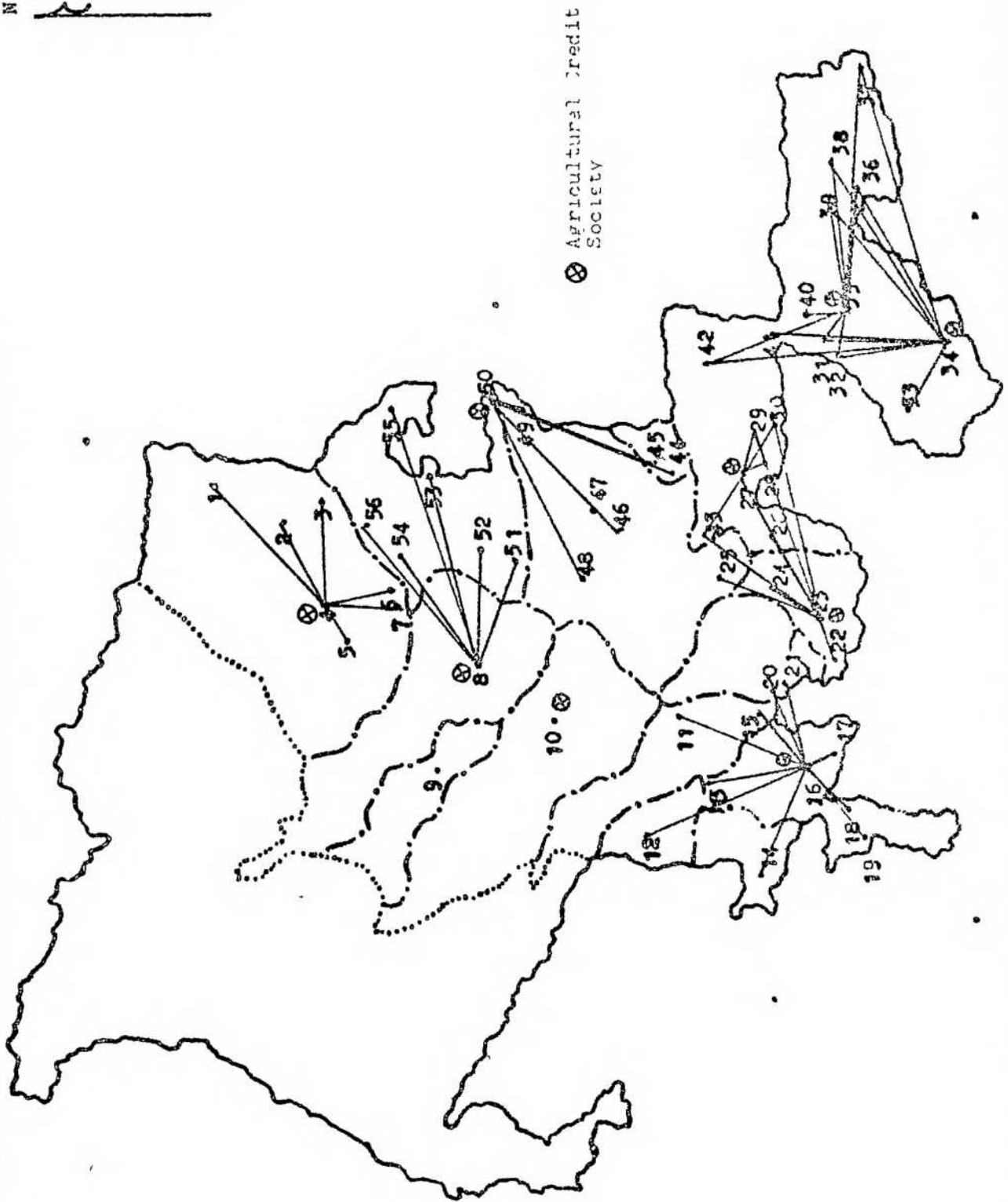
It has been found out that the farmers of this area purchased equipments directly from different private firms. Thus the availability of farm machineries and implements will be more and widespread. Since Kadayanallur is reachable by the roadside settlements, farmers are able to get their farm implements and machineries repaired. But the settlements located south and south eastern corner are not able to utilize this facility due to the absence of this facility in that locality. It is also found from the figure that farmers of these settlements moved beyond their boundary to avail this facility. When implements and machineries got repaired it has been reported that field operations would stop and the labourers would be paid eventhough they did not seem to be engaged. Thus there were loss of both time and money. This necessitates to establish this facility in the south and south eastern part of the area in a settlement which is located at an optimum distance of seven km so that the coverage of space will be more and at the same time it will be available within a reachable distance for the people of the settlements in and around.

FIGURE 11. REPAIR OF FARM IMPLEMENTS AND MACHINERIES



(d) Agricultural Credit Society: This facility exists in settlements namely Chockampatty, Krishnapuram, Kadayanallur, Nainaragaram, Urmelalagian, Poigai, Kulayaneri, Rettaikulam and Valasai. There are ten agricultural credit societies in these eight settlements. This is presented in Figure 12. From the figure it can be seen that only in Kadayanallur, there are two agricultural credit societies and in the rest of the settlements there observed to be one in each of the settlements. Of the ten agricultural credit societies, the societies existing in Poigai and Kulayaneri are of special type since they extend credit facilities for increasing irrigational facilities. Thus there are only eight agricultural facilities existing in seven settlements to meet the credit requirement for crop production. It is found that on an average one agricultural credit society is existing for seven settlements. With regard to their spatial distribution, it can be observed from the figure that they are evenly distributed over the area. But it has been stated that most of the members belonging to all the eight agricultural credit societies are not eligible to obtain fresh credit facility due to their maintenance of over dues in these societies. Eventhough there has been no need to increase this facility in the area due to their even distribution the concerned field workers should take proper educational efforts to convert the non viable members into viable members. This will enable them

FIGURE 12. AGRICULTURAL CREDIT SOCIETY AS UTILIZED BY SETTLEMENTS

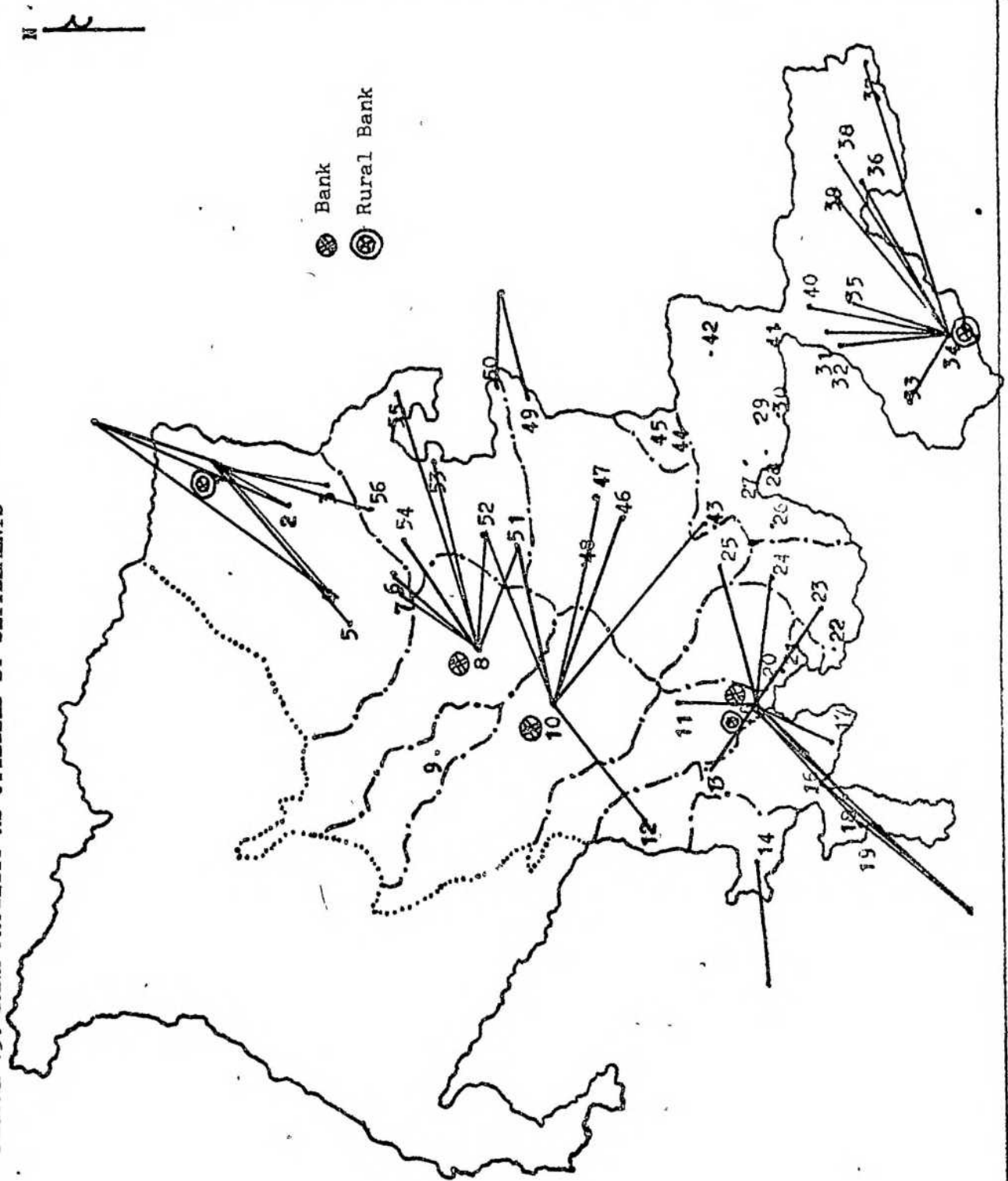


to obtain crop loan and adopt innovative methods thus helping the area to increase in its production level.

(e) Bank: There are five nationalised banks and three rural banks. This is depicted in Figure 13. Of the five nationalised banks, three are located in Kadayanallur and one in each of the settlements Krishnapuram and Idaikal. These banks are catering to the needs of the people in a general way. They are found to extend no credit facility for agricultural purposes. Their area of operation is found to be within the spatial frame of the above three settlements. The other three rural banks are located in Punniapuram, Idaikal and Rettaikulam. The distances from Punniapuram to Idaikal and Idaikal to Rettaikulam are sixteen and eighteen km respectively. The area in between Idaikal and Punniapuram operates four nationalised banks which are located in the settlements Kadayanallur and Krishnapuram. But between Idaikal and Rettaikulam, there exist no banking facility.

It can be seen from Figure 13 that the southern part of the area is devoid of this facility. These three rural banks which are located at Punniapuram, Idaikal and Rettaikulam are found to extend credit facilities to the farmers. While the nationalised banks need to be asked to extend this facility, new bank facility should also be thought of in the area where it is found to be missing. Most preferably, this facility can

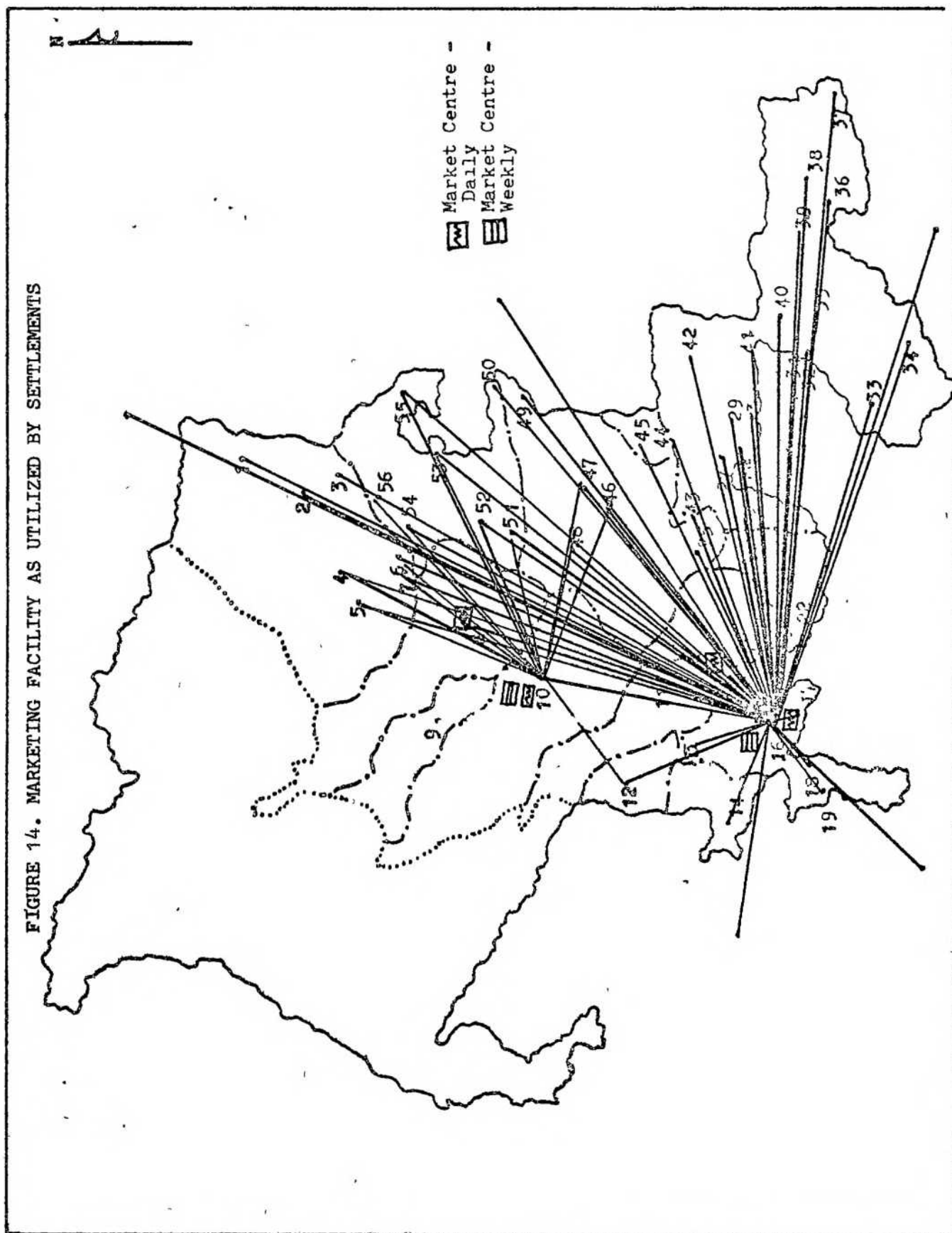
FIGURE 13. BANK FACILITY AS UTILIZED BY SETTLEMENTS



be thought of to be established between Idaikal and Rettaikulam so that it will enable the farming community to meet their credit requirements. In doing so, the norm fixed in the Fifth Five Year Plan document under Minimum Needs Programme should be given due consideration. The norm is that there should be one bank for every 40,000 to 50,000 population. Due to larger awareness of the banking facility among the people as reported by Seetharaman (1975), Iqbal (1980), Subburaj (1980) and Aristotle (1981), it is felt that this norm should be changed. Thus it necessitates to recommend one bank of any nature for every 10,000 population. As the population size of the study area according to 1971 census is about 1,00,000, it is felt that there must be atleast ten banks to meet the credit requirements of the study area. At present, there are eight banks. Thus there is scope to establish two more banks in the study area. The locale for establishing such a facility should be assessed by employing the bisection method.

(f) Marketing: Looking at the marketing facility, it has been found out that there exist four daily and two weekly markets. The location of markets are presented in Figure 14. A glance at the figure would reveal this facility as inadequate. The daily markets are reported to meet only the domestic requirement of the people of the locale such as Krishnapuram, Kadayanallur, Idaikal and Nainaragaram. The two weekly markets are situated in Kadayanallur and Nainaragaram. Among these two

FIGURE 14. MARKETING FACILITY AS UTILIZED BY SETTLEMENTS



the market at Kadayanallur has been found to cater the domestic needs of the ruralites of the surrounding settlements. But the market at Nainaragaram is observed to meet the requirements of all types of ruralites not only in the study area but also in neighbouring blocks. This is found to act as a centre for transaction of varied goods and commodities. It can be inferred through this research that the other market at Kadayanallur should be elevated to this stature and that this kind of a facility should be established at the south eastern corner of the study area due to the absence of this facility in that region.

Based on the above discussion, the following are summed up:

- It is felt that the present sub-agricultural depot needs to be shifted to a viable space.
- There is scope to establish fertilizer shops.
- One more workshop for repairing of farm implements and machinery needs to be established in an optimum location.
- Agricultural credit societies existed are found to be adequate. But they should be made viable.
- There seems to be necessity to establish two more bank facility.
- One or more marketing centres need to be established.

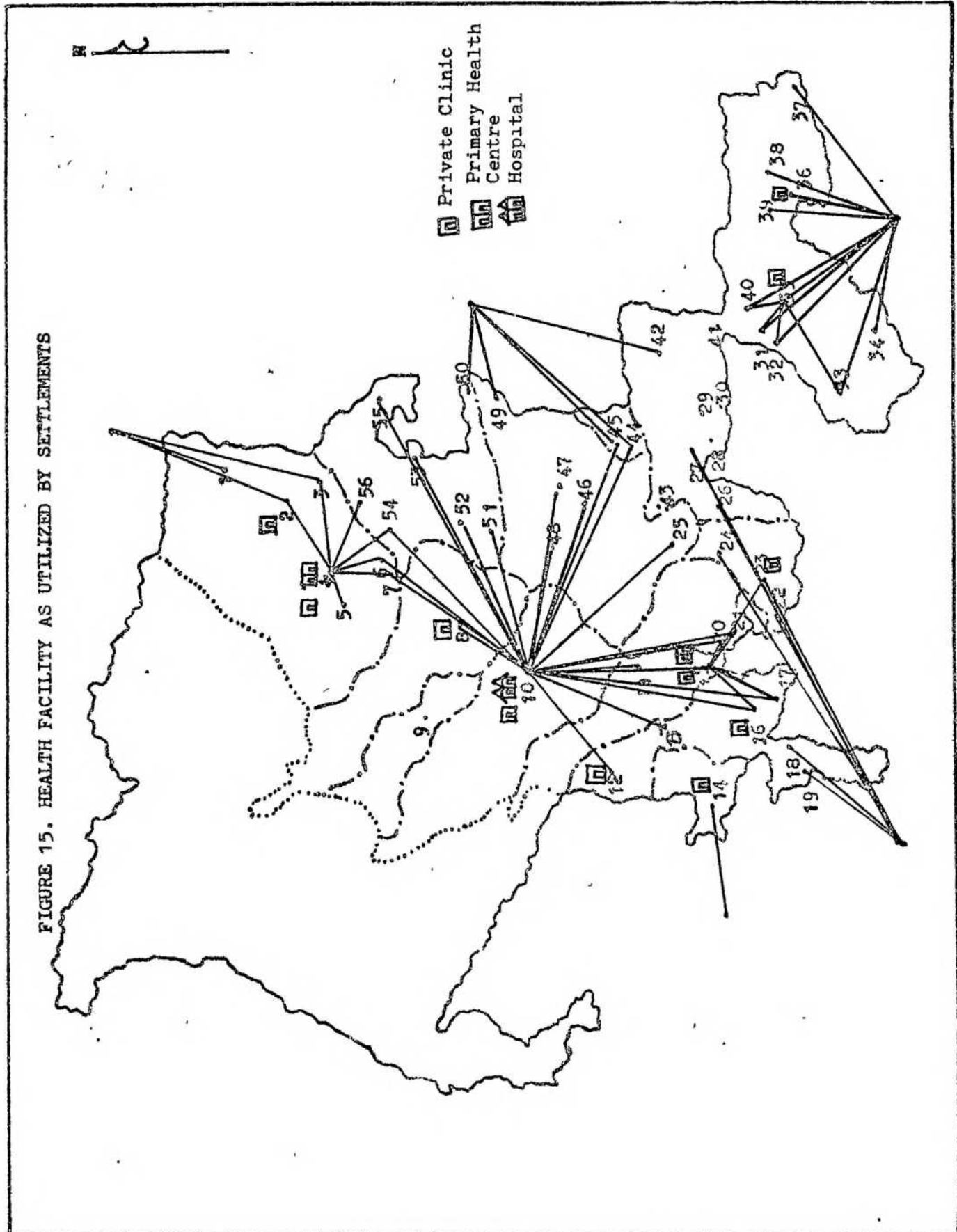
2. Health

There exist one hospital, two primary health centres and twenty five private clinics (Vide Figure 15). The hospital is situated in Kadayanallur. The primary health centres are located in Chockampatty and Idaikal. It meant that the primary health centres are located within a distance of the six km on the northern and southern side of the settlement Kadayanallur. It is observed that these facilities are utilized frequently by the nineteen settlements. The primary health centres are found to be utilized by the settlements situated within a radius of five km. The south eastern area has no such facility and thus depends on the facility located outside the boundary. Eventhough the private clinics are in existence in eleven settlements, they do not seem to function properly. In the south eastern part of the study area, three settlements viz., Urmelalagian, Kulayaneri and Anaikulam have this facility.

Thus it could be inferred through this research that it is necessary to establish primary health centre in this region in a settlement so that it would cover larger space. It would also facilitate participation by the people in other activities since International Labour Organisation once stated that good health would facilitate participation, which inturn would strengthen the claim for the material needs.

To summarise, the health facility is not adequate and the south eastern part of the study area should be provided with this facility.

FIGURE 15. HEALTH FACILITY AS UTILIZED BY SETTLEMENTS



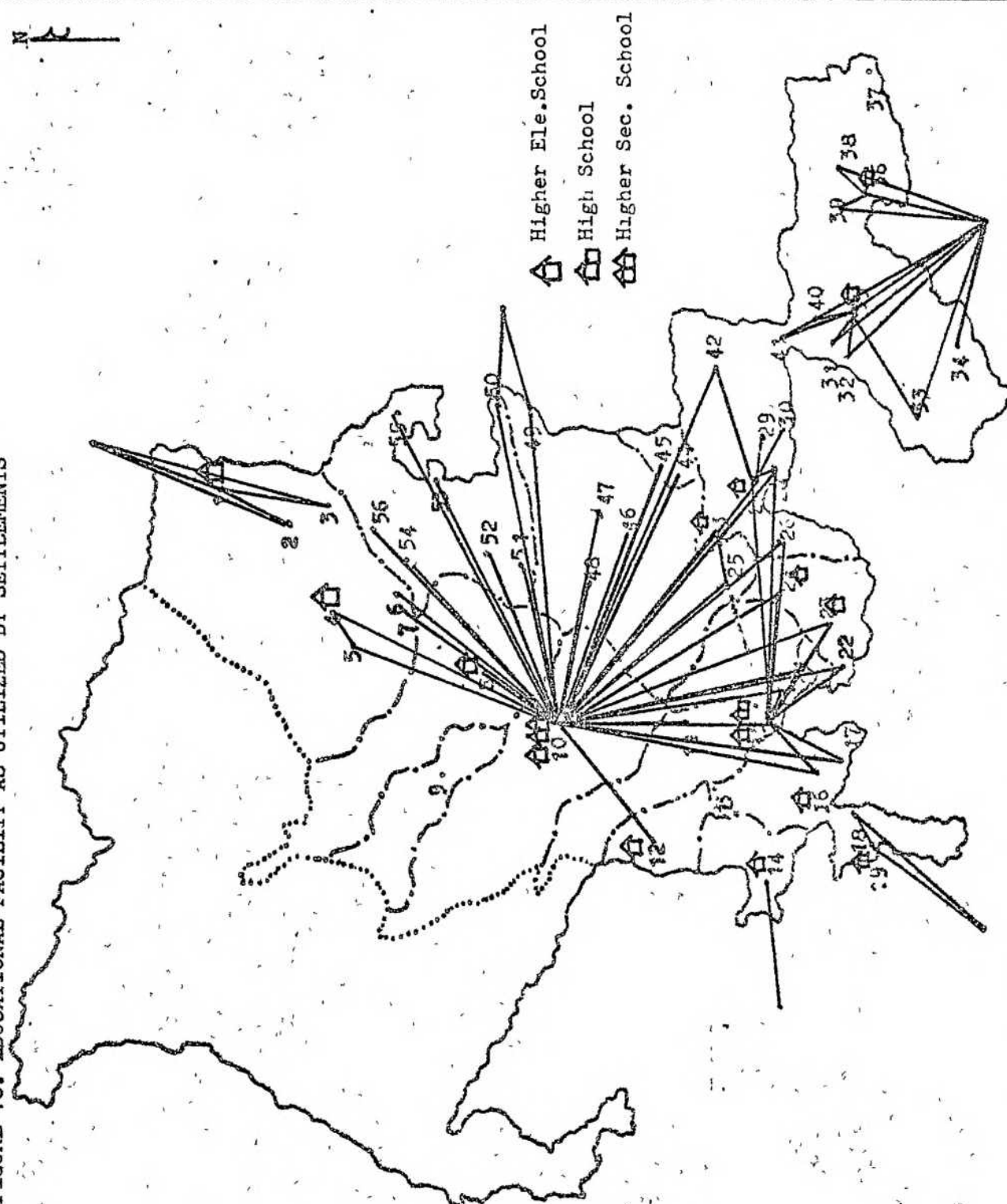
3. Education

The education facility as existing in the study are presented in Figure 16.

(a) Primary School: There are 53 primary schools. Of the 56 settlements, nineteen settlements do not have this facility. Six settlements have higher elementary schools and thirteen settlements are devoid of this facility of which one is not inhabitant. Eventhough the settlement Parakiramapandiperi has a population of 929, it does not possess this facility whereas the settlement Meenachipuram has this facility inspite of its population size of 206. It is the population threshold to sustain this facility in the study area. Hence it could be inferred out of this observation that this settlement Parakiramapandiperi needed to be provided with educational facility. In the same way it is also suggested that the educational facilities should be established in settlements whose population size vary from 206 and more. Thus there is scope to establish ten more primary schools in this block.

(b) Higher Elementary School: It is found that there are twenty three higher elementary schools located in fourteen settlements. Of the twenty three schools, nine are in Kadayanallur, two in Krishnapuram and one each in Punniapuram, Chockampatty, Kasidarmam, Idaikal, Nainaragaram, Kodikurichi, Neduvayal, Urmelalagian, Velayuthapuram, Poigai, Kulayaneri

FIGURE 16. EDUCATIONAL FACILITY AS UTILIZED BY SETTLEMENTS

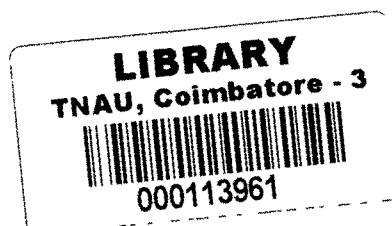


and Anaikulam. It is seen from Figure 16 that the space between the settlements Kallampuli and Sanganaperi do not possess higher elementary school. This area need to be provided with this facility in settlements so as to cover the space and thus helping reduction in rural illiteracy.

(c) High School and Higher Secondary School: There are two higher secondary schools and one high school in Kadayanallur and Idaikal respectively. Again it is found that the southern and south eastern regions are short of this facility and hence the school going children are forced to go beyond their boundary to avail this facility. It is therefore felt that a settlement located in an optimum space should be selected for establishing this facility which is given elsewhere in this section. It has been observed that there is no facility for collegiate education for the study within a radius of 20 km.

To summarise, the present educational facilities are inadequate and thus,

- Ten more primary schools are to be established.
- One or two higher elementary school should be established between the space Kallampuli and Sanganaperi.
- One more high school in the south eastern part should be established.
- Collegiate education should also be established.



To conclude, the sub agricultural depot now existing at Idaikal should be shifted. Present fertilizer shops could cater to the needs of nearly 75,000 farm population. To meet the need of the rest, fertilizer shops are to be established. One workshop to repair farm implements and machineries has to be established to meet the space requirement of south and south eastern region. Efforts should be taken to make the non viable agricultural credit societies into viable ones. There is scope for the establishment of two more banks in viable settlements. As such there is a need to establish marketing facilities. The health facility existing now is inadequate. Thus the area needs to be established with one more health facility in the south eastern region. There is possibility to establish to a maximum of ten more primary schools followed by one or two higher elementary school between the space Kallampuli and Sanganaperi and one more high school to meet the space requirement of south eastern region. Since there is no arts or technical college in and around twenty km, there is possibility to establish such institutions in the study area.

4. Bisection Method

To establish the above needed facility, viable settlements are to be identified. This could be done by employing bisection method. By this method it would be possible to identify the settlements among middle, low and very low levels to raise their present level of establishing the needed facility.

It has already been identified and stated that there is only one top level settlement - Kadayanallur. This was combined with the top level settlements outside the boundary of the study area and bisected as the methodology warranted such combination. This has been presented in Figure 17. Due to this bisection, there emerged the middle level settlements Chockampetty and Nainaragaram, the low level settlements Kasidarmam, Poigai, Kammapacheri and Sanganaperi and the very low level settlements Parakiramapandiperi, Kandukondanmanickam and Thiripurasunderapuram.

There observed to be insufficient number of middle level centres. Hence bisection was not done with respect to the middle level settlement. This was in conformity with the study conducted by Tripathy et al. (1980). Thus the next level namely the low level centres were bisected by working out different combinations. Bisection was done to arrive pentagons instead of hexagons (Roy and Patil, 1977) as the north western part of the study area was completely occupied by reserved forest. Thus pentagon was tried throughout the area. Among the different combinations worked out, only four pentagons were more suitable. This is presented in Figure 18. The settlements Kadayanallur - the top level settlement, Chockampetty, Krishnapuram, Idaikal and Nainaragaram - the middle level settlements, Singlipatti, Duraismampuram, Arunagiripuram, Achampatty, Anaikulam, Mangalapuram, Sundaresapuram and

FIGURE 17. BISECTION BETWEEN TOP LEVEL SETTLEMENTS

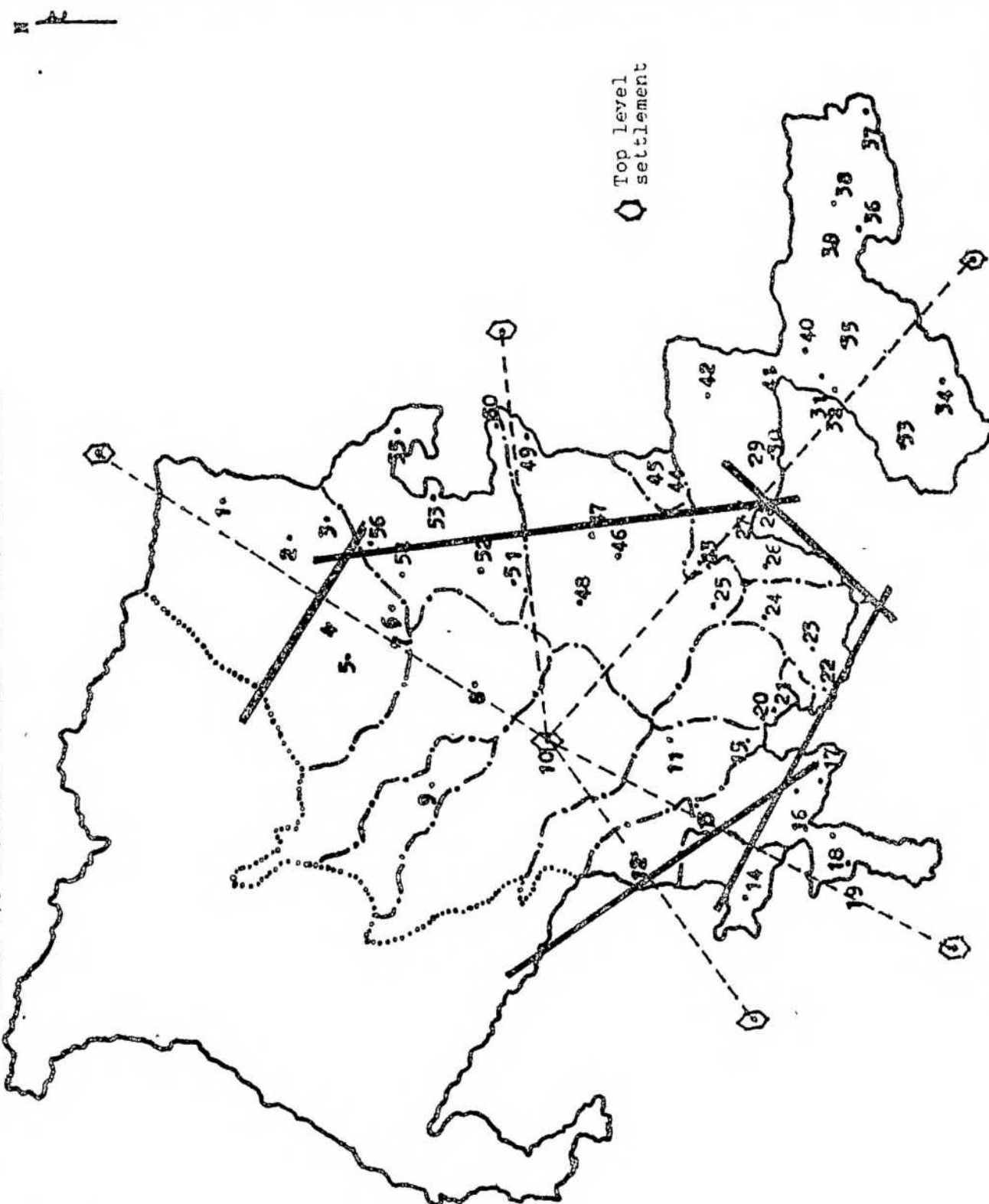
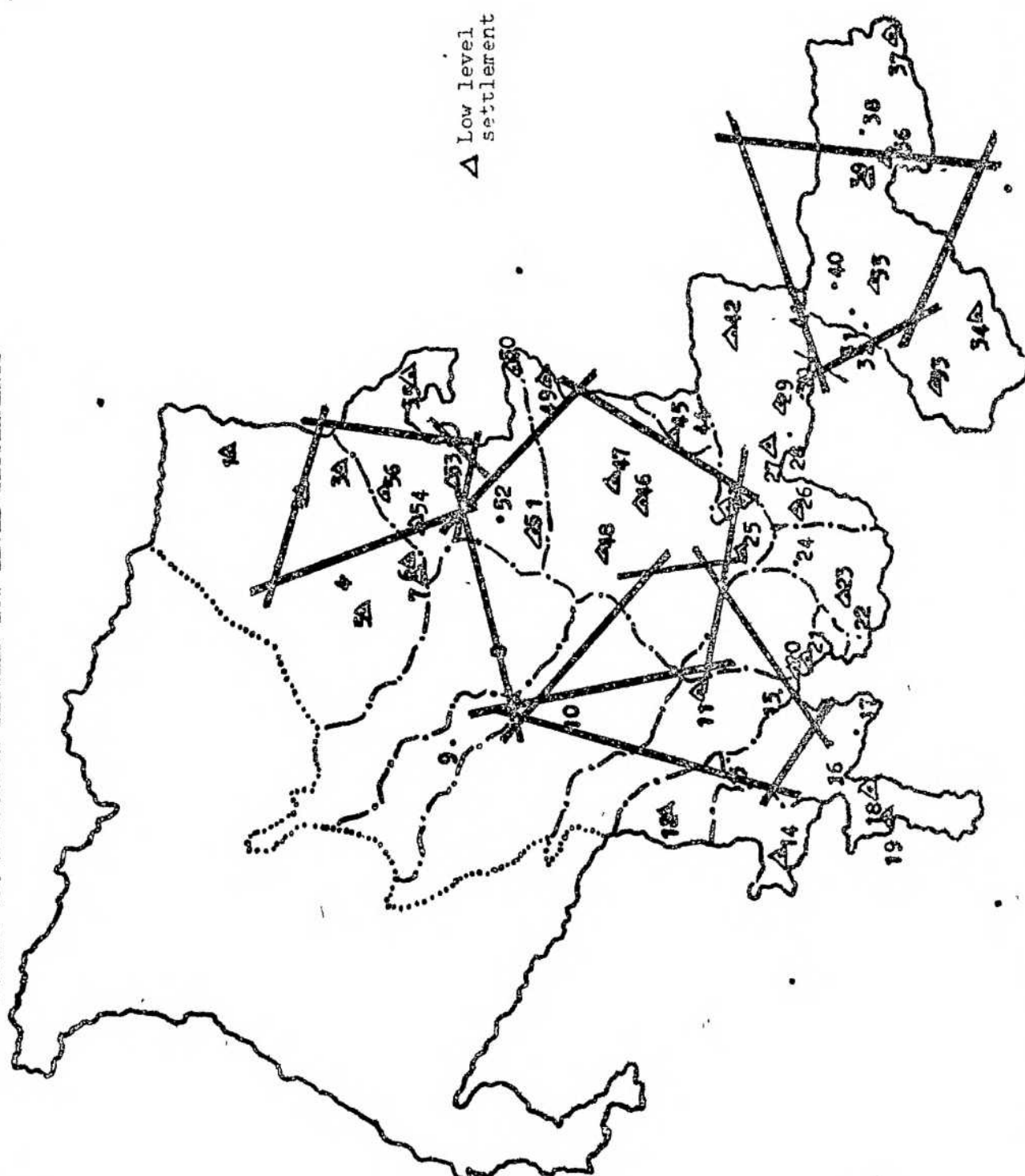


FIGURE 18. BISECTION BETWEEN LOW LEVEL SETTLEMENTS



Meenachipuram - the low level settlements, and Parakiramapandiperi and Chinnathambinadanur - the very low level settlements have emerged out. The identification of the above settlements leads to the conclusion that these settlements should be considered to improve from their present level. As most of the very low level settlements are existing in the south eastern region, bisection is not possible. Thus the identified settlements have been presented in Table 8 so as to consider to raise their present level.

It is found that the middle level settlements Chockampatty and Nainaragaram and the low level settlement Parakiramapandiperi emerged out through top as well low level bisection. Thus there are 21 settlements which emerged out are to be considered for establishing facilities. In doing so, the distance between the different levels should be kept optimum. The Rajasthan Canal Development Authority in consultation with the experts from World Bank as cited by Thapliyal (1979) stated that for a population density of 150 per sq.km, the distance between second level settlements should be 15 km. Thapliyal (1979) suggested a distance of 15 to 20 km between such settlements for a population density of 505 per sq.km.

As the density of the study area is 811 per sq.km, the distance between the very low levels should be 5 km, between low levels 7.5 km, between middle levels 10 km and between top levels 12.5 km. This suggestion has been made based on

Table 3. Identified settlements for raising their present level

S. No.	Name of the settlement	Present level	Proposed level
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A. Top level Bisection

1. Chockampatty	Middle	Top
2. Nainaragaram	Middle	Top
3. Kasidarmam	Low	Middle
4. Poigai	Low	Middle
5. Kammampacheri	Low	Middle
6. Sanganayeri	Low	Middle
7. Parakiramapandiperi	Very low	Low
8. Kandukondanmanickam	Very low	Low
9. Thiripurasundarapuram	Very low	Low

B. Low level Bisection

10. Kadayanallur	Top	Top
11. Chockampatty	Middle	Top
12. Krishnapuram	Middle	Top
13. Idaikal	Middle	Top
14. Nainaragaram	Middle	Top
15. Singlipatti	Low	Middle
16. Duraisampuram	Low	Middle
17. Arunagiripurem	Low	Middle
18. Achampatty	Low	Middle
19. Analkulam	Low	Middle
20. Mangalapurem	Low	Middle
21. Sundaresapuram	Low	Middle
22. Meenachipuram	Low	Middle
23. Parakiramapandiperi	Very low	Low
24. Chinnathambinadanur	Very low	Low

the system of living in the study area. The system of living is cluster in nature.

Bearing in mind this suggestion, the identified settlements may be considered to raise from their present level by establishing new facilities in the settlements. By virtue of it being identified through the techniques employed, the settlements need not be provided with additional new facilities, as it requires capital investment. Thus there must be a rationale for suggestion to establish facilities in the settlements most preferably in the identified settlements. The rationale adopted in this study was population threshold i.e. minimum population required to sustain a function/ facility and the space preference of farmers for different facilities. The details of this technique has already been elaborated elsewhere.

C. Degree of Existence of Area Homogeneity

In the context of area planning from the grass-root level, the identification and mapping of homogeneous areas have acquired considerable significance (Misra et al., 1971). There were attempts to develop statistical framework (Sherr, 1966). The main problem of area planning lie in the selection of suitable criteria for identification of homogeneity, their representation and elucidation of the factors that shape them (Dickinson, 1964).

This study aims at the identification of the location establishment of infrastructural facilities that would either directly or indirectly contribute to agricultural development in the study area. This was assessed by the use of Kendall's coefficient of concordance (Siegel, 1956). To assess this, the area under major crops, for each village, over a period of five years was considered. The data on cropped area are available at the revenue villages of the study area. The coefficient of concordance-W and the chi-square arrived at are presented in Table 9.

Table 9. Coefficient of concordance and the chi-square values among the sixteen villages over five years

Year	1975-76	1976-77	1977-78	1978-79	1979-80
Values					
W	0.38	0.53	0.70	0.61	0.58
χ^2	30.40	42.40	56.00	48.80	46.40

Table 9 shows the concordance value -W- and corresponding χ^2 values. The χ^2 values were found to be significant even at 0.01 per cent level of probability. This indicated a high degree of agreement in all the villages over years. This meant that in each of the years the sixteen villages taken for study area had followed the same cropping pattern.

In the previous analysis it was concluded that during 1975-80 all the villages had followed one cropping pattern. In subsequent years all the villages might have shifted to new cropping pattern. In order to test this, the concordance was worked for all the sixteen villages separately over different years. The results are presented in Table 10.

The table indicates that each village continued the same cropping pattern over the years under analysis. From this it could be inferred that as far as the study area is concerned, a fixed and common cropping pattern over years could be observed. This might be due to the irrigation potentiality of the area. Hence it can be concluded that there exists homogeneity in all villages as regards agricultural practices are concerned.

Thus the hypothesis that the settlements have homogeneity irrespective of their size of population holds good for the study area.

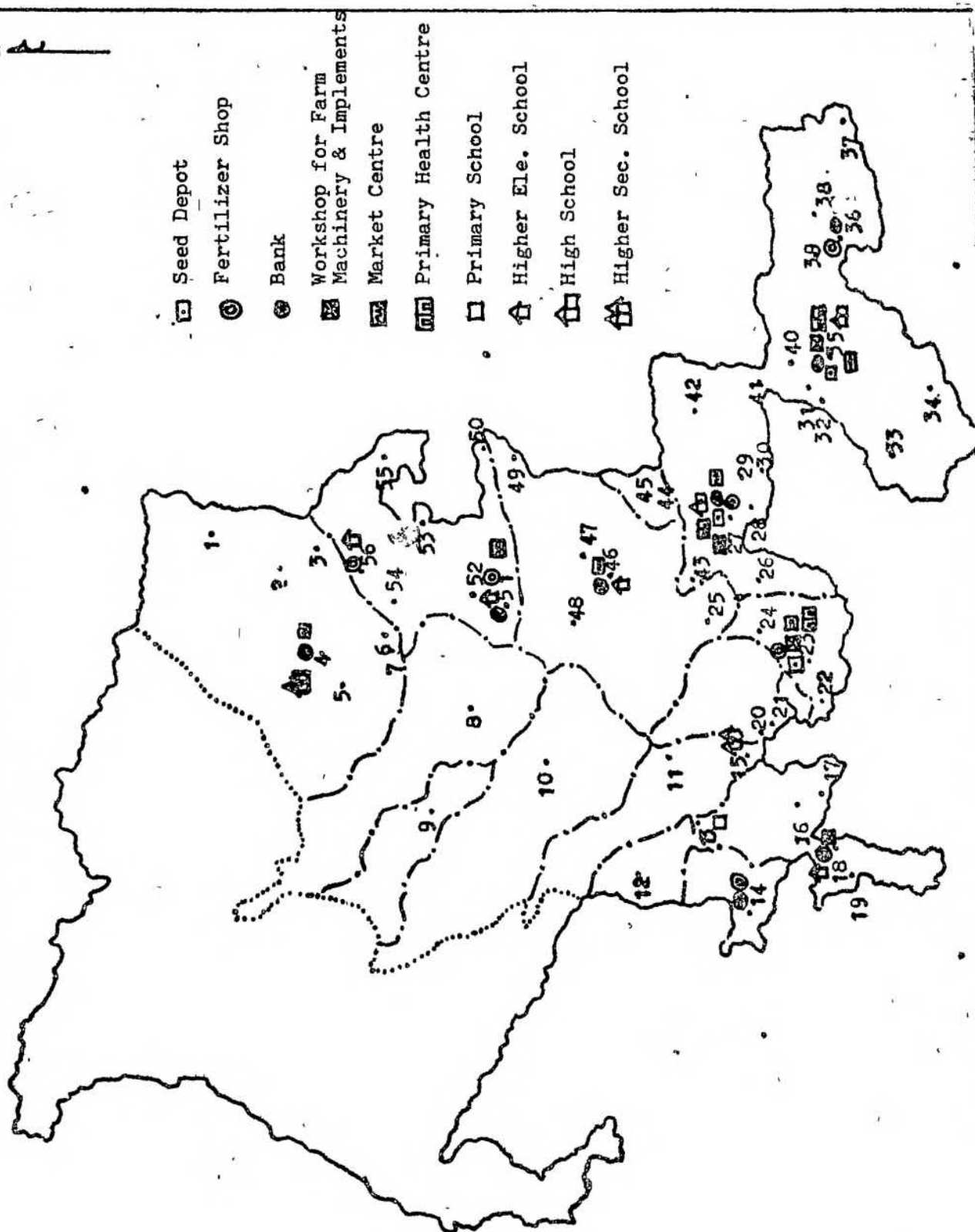
D. Locale Identification for Establishment of Infrastructural Facilities

Keeping in mind the settlements emerged out of the bisection method, space preference technique was employed to assess the preferred settlements where newer facilities need to be established. The preferences are depicted in Figure 19 and discussed as under.

Table 10. Coefficient of concordance-W- and the chi-square values for each village over five years of time

Villages	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
W	0.65	0.81	0.73	0.76	0.78	0.69	0.76	0.57	0.48	0.67	0.74	0.67	0.70	0.45	0.33	0.57
χ^2	13.00	16.20	14.60	15.20	15.60	13.80	15.20	11.40	9.60	13.40	14.80	13.80	14.00	9.00	6.60	11.40

FIGURE 19. SPACE PREFERENCE FOR DIFFERENT FACILITIES



1. Agriculture

(a) Seed Depot: There are two seed depots - one at Kadayanallur and another at Idaikal. It has been pointed out in earlier pages that this facility at Idaikal needs a shift elsewhere. Farmer residents of the settlements Urmelalagian, Poigai and Kulayaneri together with the surrounding settlements stated that this facility needed to be established in these settlements. Those belonged to the rest of the area expressed their willingness to utilize the present facility at Kadayanallur and Idaikal. These two settlements are observed to be located very close to each other at a distance of six km. It was also stated in previous section that there was a proposal to close down this facility at Idaikal. Thus, it warrants a shift to a viable settlement in the study area. In as much as the farmer residents of the three settlements viz., Urmelalagian, Poigai and Kulayaneri expressed to have this facility in their settlement, these settlements can be considered for establishing the seed supplying facility in any of the settlements. Of the three settlements, Poigai exists at reasonably middle of south eastern area. Thus, it would serve the settlements of this region and also the settlements outside the boundary of the study area. This settlement has been found out to be elevated by the application of bisection method. The distance between Kadayanallur and Poigai is thirteen km. As per the norm fixed by the Fifth

Five Year Plan, under National Minimum Needs Programme, the standard for spatial distribution of seed facility should be available within a maximum travel distance of five km. The proposed settlement satisfies this norm. Thus it can be suggested that the existing facility of seed depot needs a shift from Idaikal to Poigai, which may act as an additional seed depot. This may serve on an average twenty four settlements. This may account for 50.00 per cent of the area under analysis.

(b) Fertilizer Shop: As such there are 30 units of this facility spread over fifteen settlements. These fifteen settlements meet the need of 56 settlements of the study area. All these units are owned by private dealers. The governmental agencies do not operate this facility. The farmers of six settlements, Neduvayal, Urmelalagian, Poigai, Anaikulam, Boganallur and Sanganaperi preferred the establishment of fertilizer facility in their settlements since this facility has not been found to exist there. However in Neduvayal an unit of this facility exists. The farmers except those belonging to Neduvayal, are reported to have travelled a distance of five to eight km to get fertilizers for their crops. They have expressed their preference for the establishment of this facility in their settlements. According to the norm fixed by the Fifth Five Year Plan, under Minimum Needs Programmes, the people should be able to avail this

facility within a maximum travel distance of four to five km. Studies conducted by Extension Educationists had shown that the non-availability of fertilizer acted as a barrier in fertilizer use. The possible reason that can be attributed is that there are minimum number of fertilizer shops over the space. Hence it is suggested to increase the number of fertilizer units in the study area.

It is observed through this study that all the six settlements which have expressed their desire to have this facility are low level ones. They need to be elevated from the present level. Then only there would be a possibility for introducing newer programmes with least task. As this facility is to be handled by private sectors, it is suggested that the private firms can take note of the farmer's desire and approach the change agency for the establishment of fertilizer shops in these settlements. Of these six settlements, Uremalagian, Poigai and Sanganageri have been identified by the bisection method to be elevated from low level to middle level. Hence it is suggested that while issuing license for such facility the competent authority, may give priority to these settlements.

It is therefore suggested through this analysis that settlements Neduvayal, Urmelalagian, Poigai, Anaikulam, Boganallur and Sanganageri should be provided with the

fertilizer shops and thus the levels of these settlements may be improved.

(c) Workshop for repairing and maintenance of farm implements

and machineries: At present there exists only one tractor and implement workshop. It is owned by private agency at Kadayanallur. It caters to the needs of most of the farmers in the study area. It was assessed that there are 1,892 pump-sets, 1,223 implements and fifteen tractors. Apart from these there are pumpsets, implements and tractors purchased directly from private agencies. To meet the repairing requirements of different settlements, the present position in respect of this facility is found to be inadequate. The present facility at Kadayanallur is found to be utilized by fourteen number of settlements where there are fifteen tractors, 982 implements and 1,047 pumpsets. Study conducted by Rao (1973) revealed that the implements and tools once went out of order kept idle without use even during crop cultivation by farmers. Farmers utilized the implements and tools of neighbouring farms causing inconvenience to them. This indicated the necessity to provide this facility for repairing farm implements and machineries. In the present study area, there is no facility at the south and south eastern region. Thus it may be beneficial to the farmers if it is established in that area. It is found that most of the farmers from different settlements

move out beyond the boundary of the area under analysis to avail this facility. Only those in settlements Sivarama-pettai, Urmelalogian, Poigai and Kulayaneri have expressed a desire for this facility. Of these four settlements, Poigai is found to exist in the middle west to east of the study area. Moreover, there is a credit society meant to meet the credit requirement for establishing irrigation facilities in the farms. Thus it is found that a public unit can be established in the settlement - Poigai.

It is therefore concluded that a workshop for repairing and maintenance of farm implements and machineries needs to be established at the settlement Poigai which is situated at the centre in the south and south eastern region of the study area.

(d) Agricultural Credit Society: There exist ten agricultural credit societies in nine settlements of the study area. Each society has its own jurisdiction. They are found to be evenly distributed in the study area and satisfy the credit needs of farmers. Thus the farmers of this area have not expressed their desire for new agricultural credit societies. However, it is found that these societies are non-viable ones due to their over due nature. Educational efforts need to be taken to convert the non-viable members as viable members. The price of the agricultural inputs are steadily increasing and hence the farmers need credit assistance for successful farming.

Thus it is found out through this research that efforts need to be taken to make these institutions more viable than the existing level.

The farmers of the settlements have expressed to have no need for new credit societies as the existing ones are found to be evenly distributed over the space under analysis. However the existing agricultural credit societies need to be made as viable ones.

(e) Banks: There are five nationalised banks within a distance of eight km. These are located along the roadside in three settlements - Krishnapuram, Kadayanallur and Idaikal. This showed the urban living attitude of the personnel belonging to the nationalised banks. Apart from this, there exist three rural banks each in the settlements of Punniapuram, Idaikal and Rettaikulam. The analysis has shown that the adjoining settlements to these settlements are able to avail this bank facility. The settlements that exist between Idaikal and Rettaikulam as well as between Poigai and Sundaresapuram are found to be devoid of banking facility.

It is also found that those in settlements Chockampatty, Neduvayal, Sivaramapettai, Poigai, Kulayaneri, Anaikulam, Kambaneri and Boganallur have expressed their preference for the establishment of banking facility in their settlements.

There is a rural bank at Punniapuram on its northern side at a distance of four km to Chockampatty and another one at Krishnapuram on its southern side.

Hence it is suggested that at present, settlement Chockampatty need not be provided with banking facility.

The farmers of settlements - Sivaramapettai and Neduvayal have expressed their willingness to have banking facility in their settlements. But this facility is found to be available at Idaikal located at a maximum distance of three km and seven km to Sivaramapettai and Neduvayal respectively. Moreover, the settlement Neduvayal is located near the boundary of the study area. It is assessed through this research that this settlement avails this facility in its nearby settlement which is located just within a distance of one km. The population of these settlements account to 3,480. As per the standard fixed by the Fifth Five Year Plan under National Minimum Needs Programme there should be one bank for every 40,000 to 50,000 population. This study has recommended to have banking facility for every 10,000 population due to the higher awareness among the people about this facility.

Hence it is found out that the establishment of banking facility at Neduvayal and Sivaramapettai may be uneconomical.

It is thus recommended not to establish this facility in Sivaramapettai and Neduvayal due to the reasons stated earlier.

The farmers of the settlement at Poigai and adjoining settlements have expressed their desire to have banking facility at Poigai. At present, to these settlements, this facility is available at a distance of eight km at Idaikal on the western side and eleven km at Rettaiikulam on its eastern side. In between Idaikal and Rettaiikulam, there exists no banking facility.

It has been found through this research that if the settlement Poigai is provided with banking facility it can serve fifteen settlements.

It is therefore suggested to establish banking facility at Poigai.

Farmers in the settlement of Kulayaneri requires this facility to be established inspite of it having the rural bank at Rettaiikulam within a distance of one km. It has also the agricultural credit society. This settlement has a population of 1,170. The settlement has not emerged out through bisection method for the consideration of it being raised from the present level.

Thus it may be unreasonable to establish this facility at Kulayaneri eventhough it desires.

Another settlement Anaikulam has no credit institution. But banking facility is available at a distance of one km at

Rettaikulam. The farmers belonging to Anaikulam settlement have expressed a desire to have banking facility. There are only three settlements around it. The total population of this facility to be established would serve only 2,476 population.

So this settlement could not be considered for establishing with banking facility.

Farmers of Kambaneri and Boganallur too want banking facility to be established in their settlements. But the banking facility found to exist within a distance of ten km at Kadayanallur where there are three nationalised banks. Thus these settlements along with the other surrounding settlements can utilize the present facility existing in Kadayanallur.

It is therefore proposed to establish no facility in Kambaneri and Boganallur.

It is concluded through this analysis and observation that there is scope to establish banking facility only at Poigai. Hence it is concluded that banking facility needs to be established at the settlement Poigai.

(f) Marketing Centres

The study area has four daily market centres located at Kadayanallur, Krishnapuram, Idaikal and Nainaragaram.

The settlements Kadayanallur and Nainaragaram possess two weekly markets too. Of these, Nainaragaram acts as a major marketing centre and farm produces from neighbouring block areas are brought and marketed.

As agriculture has the largest share in value of goods and services produced in the block, distribution of its marketable surplus becomes an important activity which needs deep consideration. With the given distribution of settlements and road facilities, a few centres of trade, mostly assembling centres of trade, have emerged over a period of time in the study area which may facilitate farm produce marketing. However existing centres are inadequate and less optimally located. This is due to the fact that there are two weekly centres one at Kadayanallur and another at Nainaragaram. Among these, the centre at Nainaragaram alone is viable. Most of the settlement at north and south eastern regions are far of. So the farmers market their produce either to middle man or some others. With the objective of drawing a plan for optimal location of assembling centres in the area under analysis, the transportation model has been worked out after receiving response from farmers of different settlements, the results of which are presented below.

(1) Transportation model: As a pre-requisite, the desire for market facility location has been assessed. It has indicated Kadayanallur, Chockampatty, Nainaragaram, Boganallur, Kambaneri, Urmelalagian, Poigai and Kulayaneri as market centres.

Of these, Boganallur and Kambaneri are nearer to Kadayanallur located at a distance of six km. Poigai is on the ninth km from Kulayaneri. Moreover, Kulayaneri has been found to exist on the Tenkasi and Sankarankoil road. Both Tenkasi and Sankarankoil act as the marketing centres for the marketable surplus of Kadayanallur block.

Poigai is also found to be not far away from Nainaragaram. Urmelalagian is still nearer to Nainaragaram than Poigai. Hence the settlements Boganallur, Kambaneri, Poigai and Urmelalagian are dropped out.

Then the problem has been to study the location for assembling centres in Kadayanallur, Nainaragaram, Chockampatty and Kulayaneri. These assembling centres are required to collect the marketable surplus from a cluster of surrounding settlements and to deliver the same to the nearby important wholesale market centres. Hence they are called as 'sources'. Sankarankoil, Tenkasi and Surandai are found to be the important wholesale markets for transaction of the marketable surplus within the block boundary. In this analysis, they are called 'destinations' as the distribution of produce beyond

those wholesale markets has no direct impact on the block's economy. Given the potential sources and feasible destinations, marketing may be efficient if the cost of transport between them has been the least. Therefore, cost-minimization has been fixed as the criterion to evaluate a plan for the development of assembling market complexes in the block and thus this transportation model of linear programming technique as suggested by Hillier and Gerald (1974) has been applied.

In a transportation model, total supply at each of the sources and total demand at each of the destinations and transportation cost per unit of produce per km are considered as known parameters. The objective has been to choose the least cost way of distributing the produce by choosing appropriate 'routes'. Choice of the routes may determine, in turn, the quantity to be transacted between each of the sources and destinations. Thus the results may link the sources to the destinations and show the quantity to be transported between them.

Application of transportation model requires estimation of surplus that is available for distribution at each of the sources and the demand at each of the destinations. The total volume of annual transaction of major commodities of the block in each of the destination, for a period of five years has been

analysed from the records of the assembling markets. It was assessed that the average purchase capacity of these centres from the block were found to be in the proportion of 6:3:1 for Sankarankoil, Tenkasi and Surandai respectively. Hence total available surplus is assumed to be received in the same proportion. Based on this assumption, demand for each destination can be estimated, provided the total surplus for the block as a whole is known. Hence the first task has been to estimate the marketable surplus. The estimates of mean yields of major crops raised in the block area and the marketable surplus are presented in Table 11.

Table 11. Estimates of mean yield and percentage of marketable surplus for major crops

S. No.	Crop	Mean yield (kg/acre)	Percentage of marketable surplus to production
1.	Paddy	816	65.64
2.	Cholam (Jowar)	380	84.36
3.	Cotton	1101	100.00
4.	Pulses	287	58.00
5.	Coconut(Nos/year)	7000	97.00

The estimates in Table 11 are compared with other estimates of marketable surplus. The difference between the two estimates has been found to be less than five per cent for all the major crops raised.* The total surplus for the

* Estimates made for the scheme for estimation of cost of cultivation of principal crops in Tamil Nadu by the Department of Agricultural Economics, CARDS, TNAU, Coimbatore was used in this study.

study area has been found to be 19,948 tonnes of which 10,534 tonnes are available at Kadayanallur while 6,755, 1,145 and 1,514 tonnes are the market surplus available at Nainaragaram, Chockampatty and Kulayaneri centres respectively. During the course of this research, Kulayaneri and Chockampatty acted as non-assembling centres. They have been included due to the farmers' desire to have market centres at these places. The total surplus of 19,948 tonnes is then distributed in the ratio of 6:3:1 to estimate destination-wise demand. With all these estimates the data matrix for the transportation model is as follows.

Table 12. Matrix of basic data for transportation model

Sources	Destina- tions	Sankaran- koil (1)	Tonkasi (2)	Surandai (3)	Total supply of sources(1)
Kadayanallur	(1)	27.55(29)	19.00(20)	31.55(33)	10534.00
Nainaragaram	(2)	34.20(36)	11.40(12)	25.65(27)	6755.00
Chockampatty	(3)	19.00(20)	22.80(24)	36.10(38)	1145.00
Kulayaneri	(4)	22.80(24)	22.80(24)	4.75 (5)	1514.00
Total demand of destinations	(j)	11968.80	5984.40	1994.80	19948.00

i = 1, 2, 3, 4 and j = 1, 2, 3

(i) Figures in the cell show actual cost of transport in rupees per tonne from the sources (i) to the destinations (j)

(ii) Figures in the parentheses show respective distances in km for the costs shown in the cell.

The transportation as given in methodology is solved and the final plan of distribution arrived at is shown in Table 13.

Table 13. Final plan of transportation model

Sources	Destina- tions	Sankaran- koil	Tenkasi	Surandai	Total supply of sources
Kadayanallur		10534.00			10534.00
Nainaragaram		954.00	5320.20	480.80	6755.00
Chockampatty		480.80	664.20		1145.00
Kulayaneri				1514.00	1514.00
Total demand of destinations		11968.80	5984.40	1994.80	19948.00

Figures all in tonnes.

The results indicate that the source Kadayanallur is likely to send all its surplus only to Sankarankoil whereas Nainaragaram is likely to send the largest share of its supply (78.76 per cent) to Tenkasi. From the rest 14.12 and 7.12 percentage of surplus are likely to be sent to Sankarankoil and Surandai respectively. Chockampatty may send farm produces to Sankarankoil (41.99 per cent) and the rest to Tenkasi. Kulayaneri may send whole of its surplus to Surandai.

A look on the geographical location of these sources and destinations, the results can be inferred as to be realistic. During the conduct of this research, it has been noted that for

want of an assembling centre at Kulayaneri, the produce has been found to be taken to Kadayanallur and then to Nainaragaram. If the proposed centre is developed, its nearest destination will be Surandai. Kadayanallur has been reported to have sent the supply both to Sankarankoil and Tenkasi. But the results indicate that it may be cost saving if the whole of the produce is sent to Sankarankoil. Nainaragaram is also found to send the produce to Sankarankoil and Tenkasi. Results (Vide Table 13) suggest that this centre can continue to send produces to Sankarankoil and Tenkasi as in practice and also to Surandai (7.11 per cent). Chockampatty by virtue of its position on the trunk road has been found to supply the marketable surplus to Tenkasi and Sankarankoil, the process of which may be continued.

From the above analysis, the four settlements viz., Chockampatty, Kadayanallur, Nainaragaram and Kulayaneri are identified as market centres for the area under analysis. The advantage for these centres may be that they also operate agricultural credit societies. They may, therefore, be provided with the facility of assembling and storage.

Based on the above analysis, it is concluded that market centres should be established at Chockampatty, Kadayanallur, Nainaragaram and Kulayaneri.

(2) Health: This facility is found to be looked into by the following centres.

- One Government hospital at Kadayanallur
- Two primary Health Centres at Chockampatty and Idaikal
- Twenty five private clinics located at different locations of the study area

Health facility has been found to be adequate which is described elsewhere. However, it has been noted in the spatial distribution that there exists no public unit to offer the health facility at the south eastern area. The respondents go beyond the boundary to avail the health facility. This has been expressed as a felt need of the settlements Urmelalagian, Polgai and Kulayaneri as stated by cent per cent of the contacted respondents.

The Fifth Five Year Plan document under Minimum Needs Programme has fixed a norm. In that it has been pointed out that there should be one primary health centre for every 40,000 to 50,000 population. Keeping this as a guideline it may be possible to propose yet another primary health centre for the study area which can be located at the south eastern part. Of the three settlements which have expressed a desire to have this facility, Polgai has been found to exist in an optimum location of eight km radius so as to serve nearly 26 settlements of the south eastern area. Urmelalagian has

been found to exist nearer to Idaikal than Poigai.

Kulayaneri is found to utilize the primary health centre, existing at a distance of five km. Thus Poigai may be an ideal locale for establishing another primary health centre.

It is, therefore, suggested to establish yet another primary health centre at the settlement Poigai besides the existing two primary health centres at Chockampatty and Idaikal.

(3) Education: The present study area has 53 primary schools, twenty three higher elementary schools, one high school and two higher secondary schools. The adequacy of the educational facility and proposal for establishment of this facility at different settlements are presented below.

(a) Elementary School: Of the settlements in the study area thirteen do not operate even elementary schools inspite of their population size varying from 79 to 929. One settlement has no inhabitant and hence it has not been considered for the analysis. The population threshold of this facility has been found to be 206. Of the twelve settlements, ten viz., Parakiranapandiperi, Maruthoppapuram, Kandukondanmanickam, Chinnapanaiyankulam, Thiripurasundarapuram, Subbiahpuram, Poopandipuri, Ayyapuram, Thirukoodapathy and Ganegasabapathiperi operate no primary schools. The population threshold standard for this facility as suggested by Sundaram (1977) ranges between 2,000 and 2,500.

For the rural population, it should be 250 to 1,000 since more than 75.00 per cent of the villages in India have a minimum population of 250. Considering this as a feasible solution, it has been felt reasonable that seven out of ten settlements, namely Parakiramapandiperi, Kandukondanmanickam, Chinnapanaiyankulam, Thiripurasundarapuram, Subbiahpuram, Ayyapuram and Ganagasabapathiperi may be provided with this facility whose population as per census 1971 range between 225 and 929. Moreover, these settlements are located at one km distance away from the settlements in which this facility exist.

Sundaram (1977) suggested the accessibility standard for the establishment of educational facility to range from 0.40 to 0.60 km. Of the seven settlements, those in Parakiramapandiperi alone has expressed a desire to have this facility. Eventhough other settlements have not expressed their desire to have this facility, it is observed that the school going children walk beyond one km to avail the facility of primary school education.

It is thus recommended that the seven settlement listed above should be established with this facility of primary school.

(b) Higher Elementary School: There are twenty three higher elementary schools existing in thirteen settlements. Of which

more than one third of this facility has been found to exist in Kadayanallur. Rest of them have been found to be distributed spatially in an uneven manner. There exists no educational facility in between Kallampuli and Sanganageri. It has been found through the settlements' preference that Sivaramapettai, Kampaneri, Boganallur and Sanganageri have opted for this facility to be established in their settlement. As these settlements along with their neighbourhoods have relatively more than 1,500 population, it has been suggested that they can be considered for the establishment of higher elementary school.

It is, therefore, proposed that the settlements Sivaramapettai, Kampaneri, Boganallur and Sanganageri which have been identified through projection for raising their present level may be provided with this facility of higher elementary school.

(c) High School and Higher Secondary School: As such there exist one high school and two higher secondary schools located at Idaikal and Kadayanallur respectively. It has been opined by all the respondent of the settlement Idaikal, the present high school needs elevation as higher secondary school. This has been found to be a genuine felt need since the school going children of this settlement have been observed to come all along to Kadayanallur for availing this facility. Since the

existing two higher secondary schools are over crowded, nearly 40.00 per cent of the students are reported to be denied of this facility. If this being the plight of this nearby settlement, the position with respect to distinct settlements does not require explanation. Hence it becomes increasingly important that the high school at Idaikal needs elevation as higher secondary school.

The settlement Chockampatty, Poigai and Kulayaneri have expressed a desire for high school in their area. Since the settlement Kulayaneri is located in one corner, it is uneconomic to establish this facility at Kulayaneri. The population as per 1971 census of Chockampatty and the neighbourhood settlements account for nearly 20,000, hence a high school needs to be established in this settlement. If another high school is established at Poigai, the spatial coverage of the study area in respect of this facility will become adequate. Also, these two settlements have been projected out and identified for raising their levels.

Besides these, no arts or technical colleges have been observed within a radius of twenty km from the study area. One arts college for women exists on the twenty fourth km. Thus it is felt that there is larger scope for the establishment of a collegiate institution in Kadayanallur where most other facilities exist.

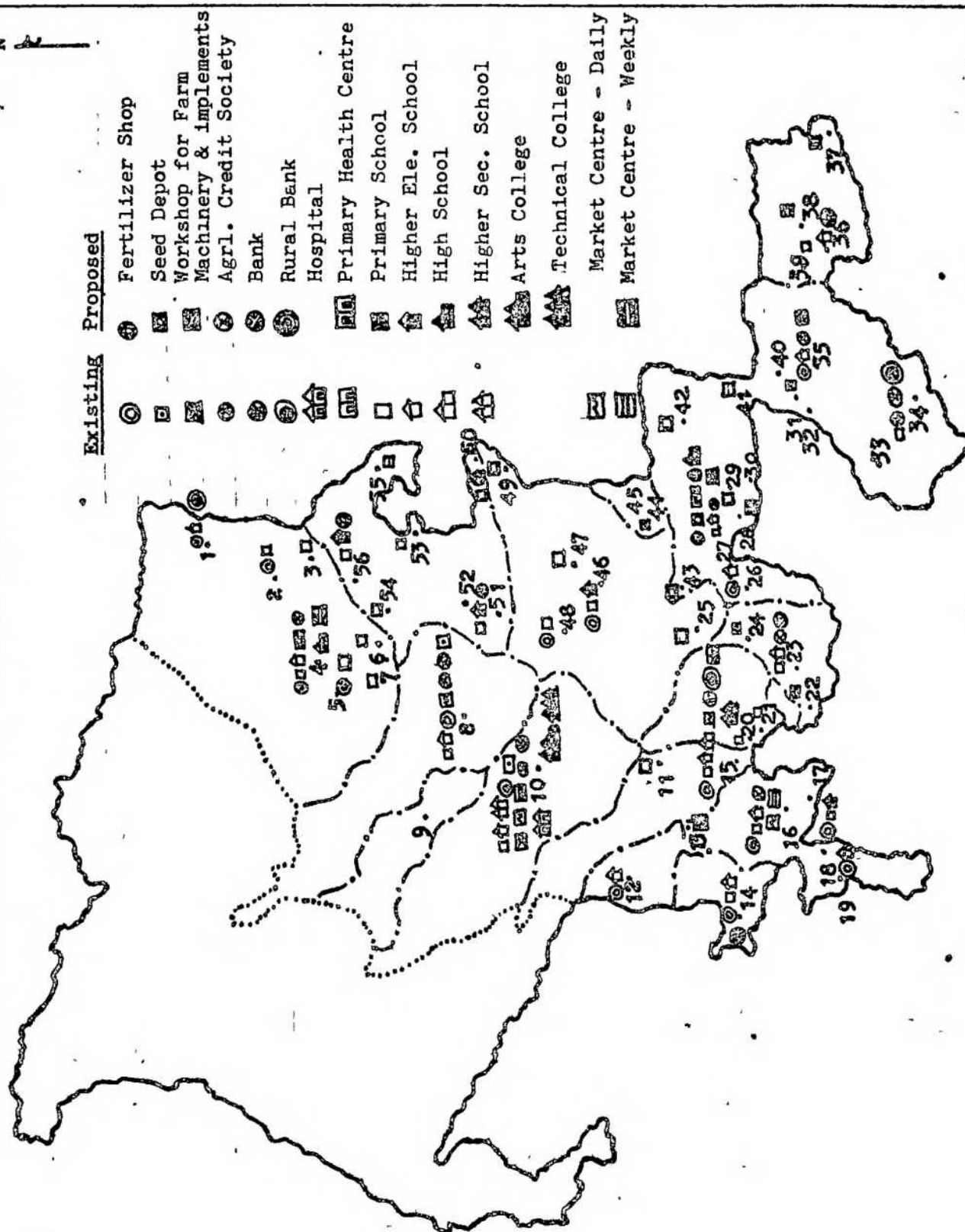
It is thus concluded that two high schools one at Chockampatty and another at Poigai should be established. The standard of the high school at Idaikal should be raised to the standard of higher secondary school. The collegiate institution may also be considered to be established in Kadayanallur because of its top level nature.

The facilities preferred by the settlements and recommended through this research have been depicted in Figures 19 and 20.

E. Model for the Block

The last phase of this study is to propose a model for the block. This has been systematically attained through identification and ranking of the settlements, location and utilization of infrastructural facilities, degree of existence of area homogeneity, and locale identification for establishment infrastructural facilities. The model thus arrived at has been given in this section. It has been depicted in Figures 21 and 22.

FIGURE 21. EXISTING AND PROPOSED INFRASTRUCTURAL FACILITIES



Summary and Conclusion

CHAPTER V

SUMMARY AND CONCLUSION

(The block has been considered even now as the suitable unit for planning. But the location of such unit and the institutions existing have not been scientifically determined based on the needs and spatial characteristics. Thus planners started evincing interest in finding out the optimum location for establishment of infrastructural facilities. There had been certain attempts to answer the questions namely where should a particular activity - social or economic - be located. This is the crucial problem of area planning in the context of spatial integration.) Unless it is aimed and achieved imbalance between area continue to grow. Area planning helps in reducing this imbalance by bringing about an order to all activities which are responsible for creating a development dualism. Functions of different orders, therefore need to be located at optimum places. This could be done by following an approach for spatial integration through area planning. This approach focusses on the following specific objectives.

1. To identify and rank the settlements with empirical evidence.
2. To locate the existing infrastructural facilities.

3. To assess the degree of existence of area homogeneity.
4. To identify locale for establishing infrastructural facilities.
5. To propose a model for block.

The present study was carried out in Kadayanallur block of Tirunelveli district, Tamil Nadu state. The entire area was considered for the study since the study aimed at preparing a model for block. The important findings are summarised below:

1. There exists no relationship between the size of population and the number of facilities present in the settlements.
2. The infrastructural facilities are unevenly distributed.
3. Facilities have been established due to the political pressure and/or vested interests of some of the influentials.
4. There are four levels of settlements namely top level (one), middle level (four), low level (thirty eight) and very low level (thirteen).
5. No settlement has all the 26 facilities considered for the study.
6. Primary school is the common facility existing in most of the settlements.
7. Fourteen settlements have no agricultural, health and educational facilities.

8. Activities pertaining to agriculture, health and education are found to cluster only in core areas.
9. Present sub agricultural depot need to be shifted to a viable settlement.
10. There is scope to establish fertiliser shops.
11. One more workshop for repairing of farm implements and machinery needs to be established in an optimum location.
12. The agricultural credit societies are adequate and are found to be evenly distributed over the space.
13. Two more banks need to be established.
14. More marketing centres are found essential.
15. Health facility has been found to be inadequate and one more primary health centre needs to be established.
16. Ten primary schools, two higher elementary schools, one high school are to be established and elevation of the present high school, arts and technical colleges need to be considered.
17. Bisection method projects out twenty one settlements to be considered for raising their present level for the establishment of additional infrastructural facilities.
18. The distance between very low settlement should be 5.0 km, low levels 7.5 km, middle levels 10.0 km and top 12.5 km if the system of living is cluster in nature.

19. The present sub agricultural seed depot should be shifted to the settlement Poigai.
20. Settlements Neduvayal, Urmelalagian, Poigai, Anaikulam, Boganallur and Sundaresapuram should be provided with fertiliser shops.
21. One more workshop for repair and maintenance of farm implements should be provided at Poigai to cater to the needs of south and south eastern region of the study area.
22. Banking facility should be established at Poigai.
23. Market centres have been less optimally located. To correct this, market centres at Chockampatty, Kadayanallur, Nainaragaram and Kulayaneri need to be established. In these centres, agricultural credit societies are existing and these can be provided with the facility of assembling and storage.
24. A model to tackle transportation problem has been arrived at for use elsewhere.
25. The southern part of the study area has been found to be devoid of health facility. Hence one primary health centre needs to be established at Poigai which is centrally located in that region.
26. The settlements having a population size of 250 and more should be provided with the facility of primary schools.

Thus seven such settlements in the study area should be established with primary schools. This facility should be available to students within a distance of one km.

27. Higher elementary schools should be established at settlements Sivaramapettai, Kambaneri, Boganallur and Sanganageri. Then only this facility would satisfy the spatial requirement.
28. The high school at Idaikal should be elevated as higher secondary school to meet the present requirement to avoid crowding in the schools at the settlement Kadayanallur.
29. Two high schools, one at Chockampatty and another at Poigai should be established since this is a felt need of these settlements.
30. Since there is no facility for collegiate education in the study area within a radius of 20 km one college preferably an arts college, to start with, may be established at the settlement Kadayanallur.

Implication of the study

(The procedure adopted in this study would help the development workers to identify the right kind of infrastructural facility for the right kind of settlement.)

(As the population size did not have any relation with number of facilities existing in settlements, planners should consider hereafter the size of population atleast to identify locale for establishing infrastructural facilities.)

(Infrastructural facilities have not been established based on scientific methods. There is an imbalance between areas. Scientific methods should be followed while establishing facilities in areas.)

Minimum needed facilities are not established in certain settlements. Settlements of viable nature, if not all settlements, should be provided with infrastructural facilities.

(While proposals for establishing infrastructural facilities come up, pulls and pressure by politicians and influentials with vested interests need to be considered with great caution.)

(Wide disparity between settlements with respect to their levels has been noticed. This should be narrowed down.)

Minimum facilities in respect of agriculture, health and education should be established in most of the settlements.

Equal importance should be given to transportation problem of the entire area. This should be tackled separately

since this is the one which is responsible for higher price of the commodities and goods.

(In spite of the existence of required number of facilities they would serve none if they are not optimally located.)

(The agricultural credit societies which are non viable should be made viable through proper educational efforts by the concerned field workers.)

Suggested area for future research

1. The impact of the model recommended in this study need to be studied after a reasonable period from the day of its implementation.

2. Study of this nature can be conducted in other blocks too which require elevation in farm front.

3. It is suggested that research study of comprehensive nature i.e. taking all developmental activities such as agriculture, industry, education, health, cooperation, etc., may be conducted.

4. Study on the impact of development schemes implemented by different agencies in the context of spatial framework can be conducted to identify spatial gap and suggest remedy to overcome such a malady.

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Appendix

APPENDIX - A
SCHEDULE

A. AREA, LAND USE AND LOCATIONAL IMPORTANCE

Sl.No.	Name of settlement	Area in sq.miles/ sq.kilometres	Total	Well	Tank	Tube well	River	Canal	Forest	Area unirrigated	Cultivable waste	Area not available for cultivation	Name	Distance (in kms)	Day or days of the weekly market	Places of Religious historical or archaeo- logical importance
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

B. IRRIGATION

Sl. No.	Name of settlement	Number of wells for irrigation		Subsoil water table metres/feet	Sources of Irrigation																		
		gation			Wells/Tube Wells			Canals			Tanks			Rivers/ Springs									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19					
		Manual	Animal	Diesel	Electric	Disused	Tube	Total	Highest in October	Lowest in June	Number	Area	Number	Area	Number	Area	Number	Area					

C. POPULATION, LITERACY AND OCCUPATIONAL DISTRIBUTION

Sl.No.	Name of settlement	Number of households	Persons	Males	Females	Scheduled Castes	Scheduled Tribes	Males	Females	Total workers	Cultivators	Agricultural labourers	Livestock forestry etc.	Mining and quarrying	Household industry	Other than household industry	Construction	Trade and Commerce	Transport and Communication	Other services	Non-workers
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

D. AGRICULTURAL, HEALTH AND EDUCATIONAL FACILITIES

Sl.No.	Agricultural										Health								Educational					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
			Agricultural co-opera-	Fertilizer depot	Seed depot	Grain Godown/storage	Agro-produce market	Stockman centre/ Veterinary dispensary	Veterinary Hospital	Agricultural imple-	Hospital	Primary Health Centre	Sub-health Centre	MCH/FP Centre	Chemist/Pharmacist	Private Clinic/Doctor	Valds	Homeopaths	Traditional Dals	Primary school (1-4/5 classes)	Middle school (5/6-7/8 classes)	High/Technical school	College/Higher Education	

E. LAND UTILIZATION PATTERN

Land utilization (Year Unit)

Sl.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Name of settlement																
Total geographical area																
Forests																
Landput to non-agricultural uses																
Barren and unculturable land																
Permanent pasture and common grazing land																
Miscellaneous tree crops and groves																
Culturable waste																
Fallow land other than current fallows																
Current fallow																
Net area sown																
Area sown more than once																
Total cropped area																
Area irrigated																
Area irrigated more than																

F. AREA UNDER SIX MAJOR CROPS

Area under five major crops (Year Units)

Sl. No.	Name of settlement	1st	2nd	3rd	4th	5th	6th	Remarks													
		Total	Irrigated	HV	Total	Irrigated	HV	Total	Irrigated	HV	Total	Irrigated	HV	Total	Irrigated	HV	Total	Irrigated	HV		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	

G. YIELD PERFORMANCE OF SIX MAJOR CROPS

Per Hectare/Acre Normal Yield and Surpluses of the Six Major Crops

Sl. No.	Name of settlement	1st	2nd	3rd	4th	5th	6th
1	Irrigated	Local	Local	Local	Local	Local	Local
2	Unirrigated	Local	Local	Local	Local	Local	Local
3	Irrigated	Local	Local	Local	Local	Local	Local
4	Unirrigated	Local	Local	Local	Local	Local	Local
5	Irrigated	Local	Local	Local	Local	Local	Local
6	Unirrigated	Local	Local	Local	Local	Local	Local
7	Irrigated	Local	Local	Local	Local	Local	Local
8	Unirrigated	Local	Local	Local	Local	Local	Local
9	Irrigated	Local	Local	Local	Local	Local	Local
10	Unirrigated	Local	Local	Local	Local	Local	Local
11	Irrigated	Local	Local	Local	Local	Local	Local
12	Unirrigated	Local	Local	Local	Local	Local	Local
13	Irrigated	Local	Local	Local	Local	Local	Local
14	Unirrigated	Local	Local	Local	Local	Local	Local
15	Irrigated	Local	Local	Local	Local	Local	Local
16	Unirrigated	Local	Local	Local	Local	Local	Local
17	Irrigated	Local	Local	Local	Local	Local	Local
18	Unirrigated	Local	Local	Local	Local	Local	Local
19	Irrigated	Local	Local	Local	Local	Local	Local
20	Unirrigated	Local	Local	Local	Local	Local	Local
21	Irrigated	Local	Local	Local	Local	Local	Local
22	Unirrigated	Local	Local	Local	Local	Local	Local
23	Irrigated	Local	Local	Local	Local	Local	Local
24	Unirrigated	Local	Local	Local	Local	Local	Local
25	Irrigated	Local	Local	Local	Local	Local	Local
26	Unirrigated	Local	Local	Local	Local	Local	Local
27	Irrigated	Local	Local	Local	Local	Local	Local
28	Unirrigated	Local	Local	Local	Local	Local	Local
29	Irrigated	Local	Local	Local	Local	Local	Local
30	Unirrigated	Local	Local	Local	Local	Local	Local
31	Irrigated	Local	Local	Local	Local	Local	Local
32	Unirrigated	Local	Local	Local	Local	Local	Local

1. The first step in the process of creating a new product is to identify a market need. This involves conducting market research to understand the preferences and behaviors of potential customers. Once a need is identified, the next step is to develop a concept that addresses this need. This concept should be unique and offer a clear value proposition to the target market.

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

I. 1. RANKING THE SETTLEMENTS - JUDGES OPINION

Tick mark those facilities which, in your opinion, contribute to Agricultural Development of a Block.

1	B.D.O. Office	2	Agricultural Office	3	Agricultural Depot	4	Agro-Service Centre	5	Tractor Workshop	6	Pumpset Workshop	7	Agricultural Credit Soc.	8	Bank	9	Rural Bank	10	V.M. Office	11	Karnam Office	12	Fertilizer shop	13	Private Clinic	14	Primary Health Centre	15	Maternity Centre	16	Hospital	17	Medical Shop	18	Artificial Inseml. Centre	19	Veterinary Hospital	20	Milk Collection Centre	21	Primary School	22	Higher Elementary School	23	High School	24	Higher Secondary School	25	College	26	Branch Post Office	27	Post Office	28	Telegraph Office	29	Bus Stop	30	Railway Station	31	Market Centre - Daily	32	Market Centre - Weekly	33	Petrol Bunk	34	Carpentry Unit	35	Leather Processing Unit	36	R.V.O. Headquarters	37	Bus Stand
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Tick

2. What would be the minimum number of facilities required to classify the settlements as top, middle and low levels among those ticked by you

No. of facilities required to classify levels as

Sl. No.

904

Wade

Low

160

J. SPACE PREFERENCE OF PEOPLE

Name of the settlement

Sl.No.

What is the nearest place where most of the people go for the following facilities?

Seed
Fertilizer
Repair of Farm
machinery and
implements
Agricultural
credit society
Bank
Marketing
Primary Health
Centre
Hospital
Primary School
Higher Elementary
School
High School
Higher Secondary
School
Others
Will you/your
settlement bear
the establishment
cost of the facil-
ities?

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Place	Distance	Place	Distance	Place	Distance	Place	Distance	Place	Distance	Place	Distance	Place	Distance	Place	Distance
Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

