CHAPTER 15

DISTRIBUTION MAPS

Introduction:- *The distribution maps represent the pattern of distribution of any one element based on some definite statistical data. In other words the map showing the distribution of any natural or cultural phenomena is a distribution map. From this point of view every map can be treated as a distribution map but in actual practice map becomes a distribution map only when it shows the areal distribution of one or more geographical elements.*

According to Robinson, "All maps are distribution maps that it is impossible to represent relative geographical location without showing the distribution of something. On the other hand, the term 'distribution map' is widely employed in a much more restricted sense". For example, relief models, historical and archeological maps are not distribution maps in the true sense of the word.

Importance of Distribution Maps in Geography:-

Geography is the science of areal distribution in which we gather knowledge of the earth by studying the distribution of any element. The distribution map is an essential tool for understanding the areal differentiation. The study of geography is almost impossible with out the study of distribution maps.

General Requirements of Constructing Distribution Maps:

A distribution map provides visuality to the written material. Therefore it should be self-explanatory, neat, clear, accurate and attractive. To achieve these objectives, the man handling the distribution map should have sufficiently good background of cartography. For a good cartographic result, following basic things are essential to draw a distribution map :

1. *Correct statistical data.*
2. *Outline map of the area concerned.*
3. *A relief map of the area showing mountains, plateaus, plains, valleys, deserts, marshes etc.*
4. *A climatic map.*
5. *A soil map for showing agricultural distribution.*
6. *Topographical map for showing distribution of population etc.*

Methods of Drawing Distribution Maps:

There are two main methods of drawing distribution maps :

1. *Qualitative Maps.*
2. *Quantitative Maps.*

They are detailed as under:

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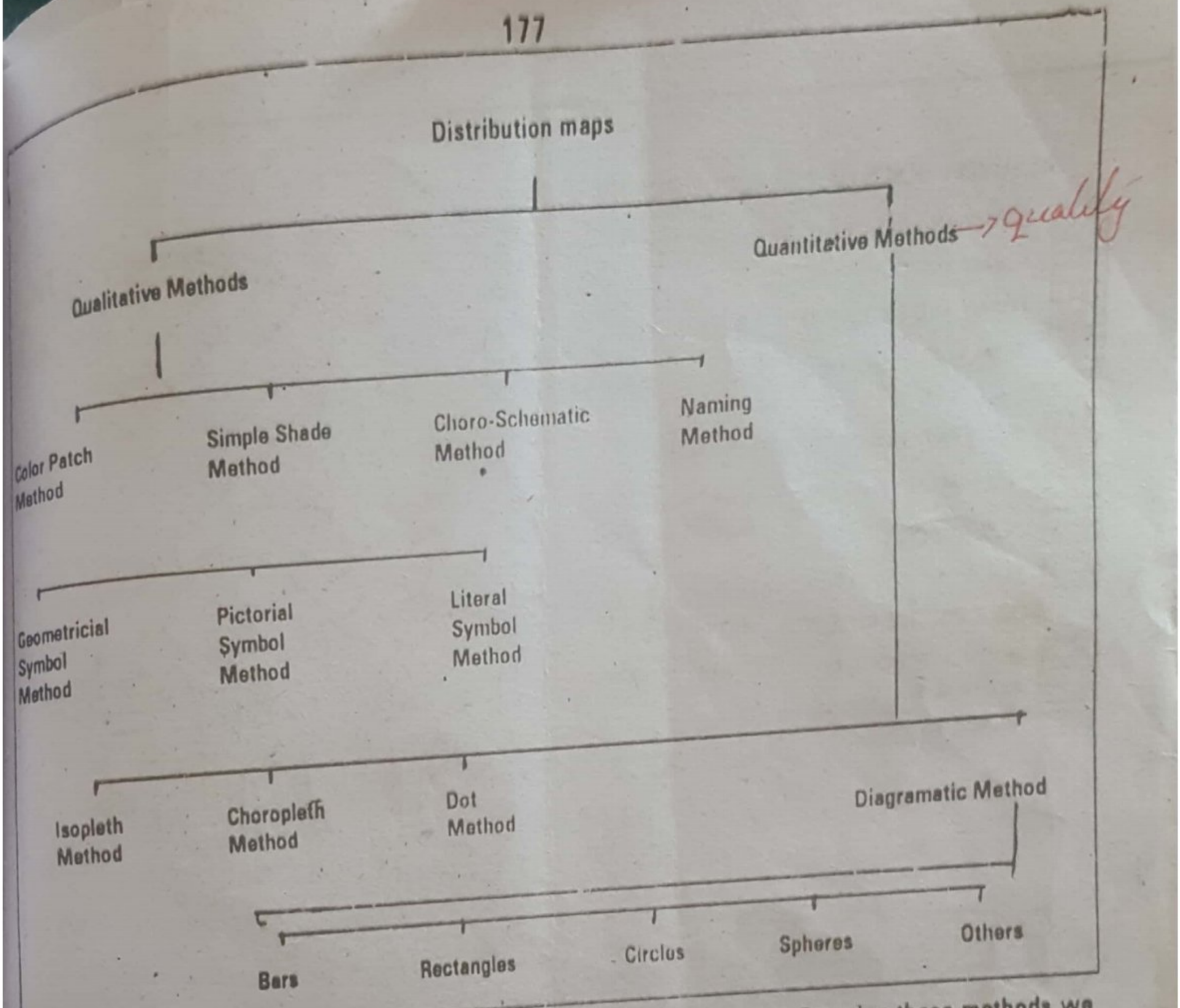


Qualitative Methods: These are also known as Non-Quantitative methods. By using these methods we can know only the general distribution of an element. In other words it just tells us as to what is where. It fails to tell as to how much is where. Following are the important methods of drawing qualitative maps :

1. Color-Patch Method: Different colors are used to show the distribution of a particular element. This method in normally used for land used maps, soil maps, vegetation maps and for showing political and administrative units. These maps are also known as color maps or Choro-Chromatic maps.

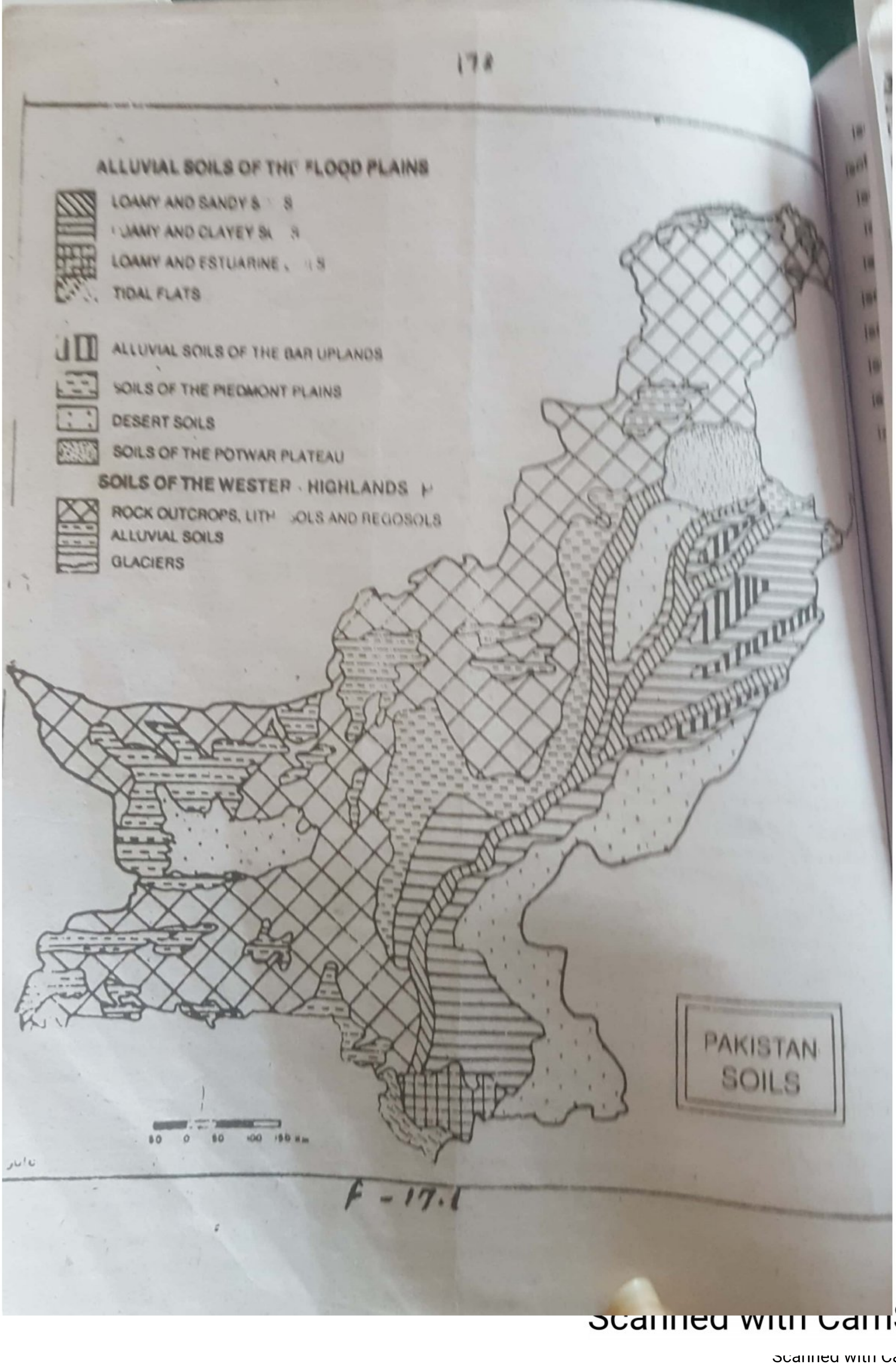
There are following three categories of color maps depending upon the method of using color.

(a) ***Simple Color Method:*** In this method we use our own choice regarding the colors Political and administrative units are shown by this method.

(b) ***International Color Method:*** In this method we use only those colors which are internationally accepted. For example, in a relief map plains are shown by green color, plateaus by light brown color, mountains by dark brown color and snow covered areas by white color.

(c) ***Layer Tint Method:*** When different shades of the same, color are used, it is known as layer tint method. For example, several tints of varying intensity of blue color are used to show the depth of sea.

2. Simple Shade Method: This method is similar to the color method with the only difference that different shades of black ink are used in place of colors. The cartographer selects shades of his own choice and there is no need to follow a particular sequence. This method is normally used to show land-use and soil and vegetation types in a particular area. Figure 17.1 shows soils of Pakistan by simple shade method.



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3. Choro-Schematic Method: This is also known as Symbol Method. In this method, symbol of different shapes are used to show the distribution. An index is given along with the map to identify the symbols. Following symbols are normally used in distribution maps.

(a) Geometrical Symbols: There are large varieties of geometrical symbols which include triangles, rectangles, squares, circles, crosses or even a point or a dot. Figure 17.2 shows the use of these geometrical symbols for showing distribution of minerals in Pakistan.

(b) Pictorial Symbols: Symbols resembling the shape of the commodity are used to show its distribution Bags for food grains, bales for cotton and jute, buses, cars, trucks etc., for vehicles, sheep, cattle, goat etc., are the symbols most commonly used in this method. Fig.17.3. shows the use of pictorial symbols for showing industries in Punjab.

(c) Literal Symbols: Literal symbols are usually the first letter of the name of the commodity to be shown. In case of agricultural crops we write. W for wheat, R for rice, T for tea, C for coffee and M for Maize. Similarly for showing minerals we write C for coal, I for iron and M for mica.

The main drawback of this method is that sometimes more than one commodities start with the same letter. For example both cotton and coffee start with 'C' and it leads to confusion. This difficulty can be removed to some extent by adding the second letter also. For example we can write Mi for Mica and Ma for Manganese. But the difficulty remains as such even by doing so in case of coffee and cotton in which the second letter is also common.

The another drawback of this method is that certain letters appear to small in size though actually their size may be the same. For example C for coal would always look larger than I for iron even if they are of equal sizes. Fig. 17.4. shows the use of literal symbols for showing the distribution of crops in Pakistan.

Some times geometrical symbols are mixed with literal symbols when there are large number of items to be shown. This combination of symbols has been used for showing industries in Punjab. (Fig. 17.5)

In certain other cases, geometrical and literal symbols are combined with simple shading method to make clear the distribution of a complex phenomena as in figure 17.6.

4. Naming Method: Full names of the commodities are written at the place of its occurrence on the map. In this way, it is somewhat similar to literal symbols. There is no need for an index in this method. Naming method has been used in figure 17.7 to show the distribution of important languages in Pakistan. ***(See page for figure).***

Quantitative Methods: The quantitative methods not only tell us about general distribution of commodities but also give us details of their quantities. We can also show the density and intensity with reference to time and space. The quantitative methods have gained much popularity during the 20th century. They are being used at a large scale to prepare the distribution maps. Following are the main quantitative methods of preparing the distribution maps:

1. *Isopleth Method.*
2. *Choropleth or Shading Method.*
3. *Dot Method.*
4. *Diagrammatic Method.*

1. Isopleth Method: The word Isopleth has been derived from the Greek 'Isos' (equal) and Plethron (value). Thus isopleth is a line joining places of equal value. This value can be in terms of quantity, intensity and density. Hence isopleth means the line of equal value in the form of quantity, intensity and density. Isopleths have been given different names by different scholars. These are isarithms, isontic lines, isogramas and isolines. Following are the outstanding examples of isopleths.

PAKISTAN
SELECTED NON-METALLIC MINERALS

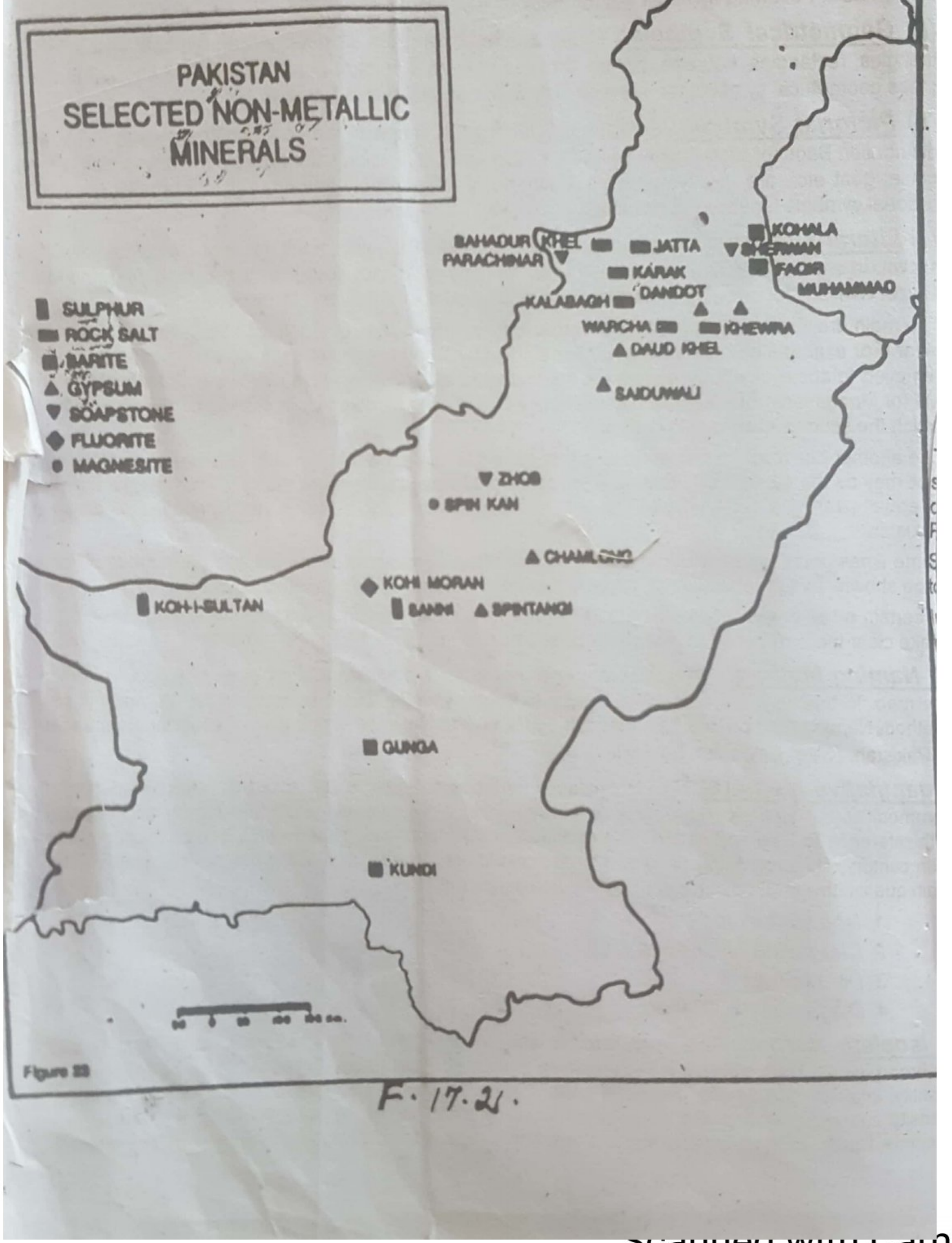

Figure 23

F. 17.21.

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PAKISTAN
VEGETABLE GHEE, CHEMICAL, CEMENT AND FERTILIZER

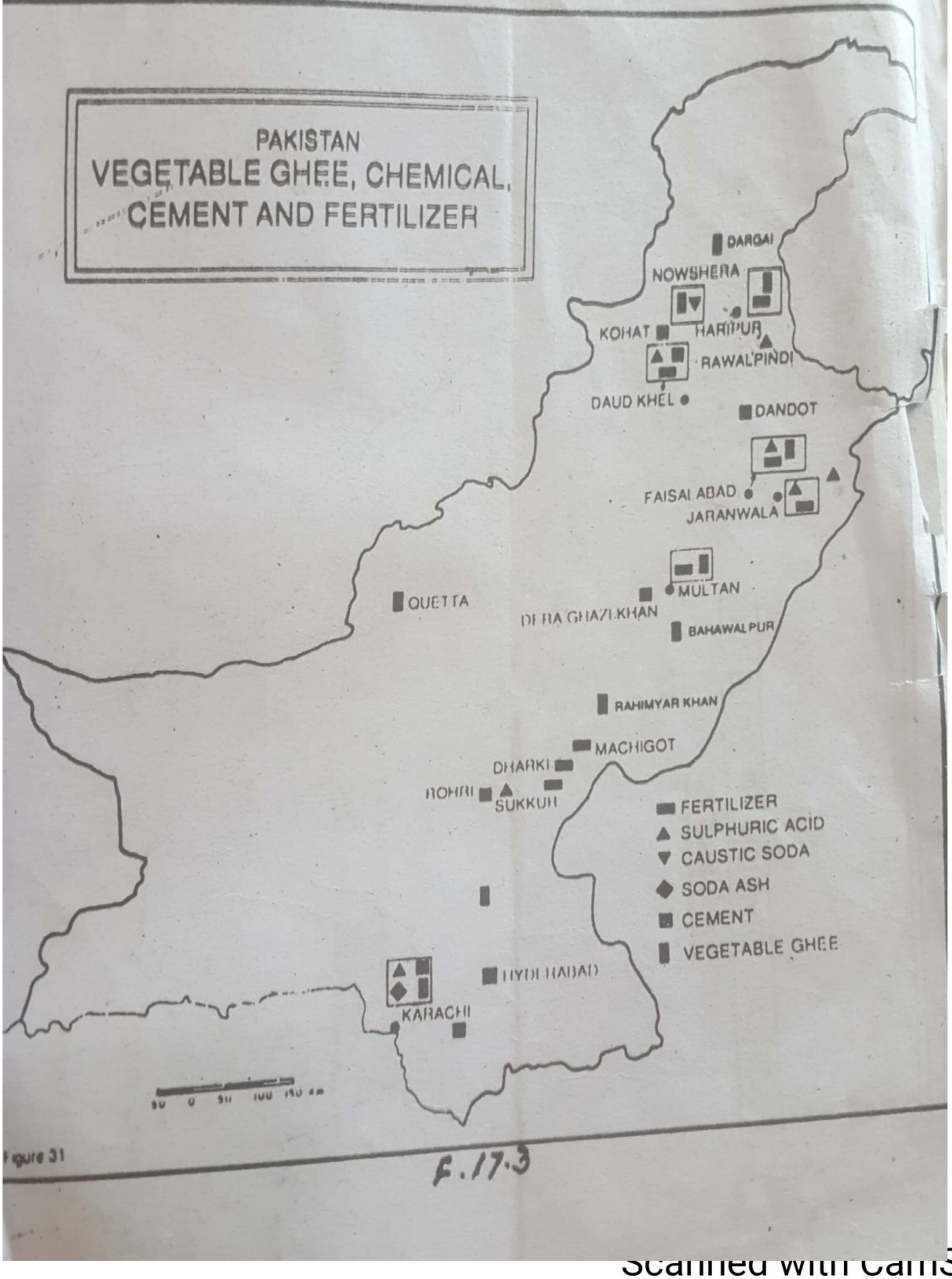

Figure 31

F.17.3

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Isobars = Lines joining places of equal pressure.

Isotherms = Lines joining places of equal temperature.

Isobase = Lines joining places of equal elevation or depression of land.

Isobath = Lines joining places of equal depth below sea level.

Isobrant = Lines joining places of equal places having thunderstroms at the same time.

Isocheim = " " " " " " winter temperature.

Isochrone = " " " " " " equal traveling time.

Isogon or Isogonic line = " " " " " " magnetic variation.

Isobaline = " " " " " " salinity.

Isobel = " " " " " " sun shine.

Isohyet = " " " " " " equal rainfall.

Isoneph = " " " " " " cloudiness.

Isonif = " " " " " " amount of snow.

Isozeismal line = " " " " " " earthquake intensity.

However contour is the best example of an isopleth line. When an isopleth is used for a density of ratio map, such as the density of population or the percentage of arable land under a certain crop, the problem is rather more difficult. The four main variables determining the manner in which such isopleths may be drawn (and their resultant patterns) are : (i) the selected value intervals; (ii) the shapes and sizes of the units for which statistic are available; (iii) the situation of the plotting-points (which may or may not be central) within each unit; and (iv) the actual method of interpolation. The value intervals should be carefully selected, based on the overall range of quantities to be mapped and on a trial scatter of distribution (see p.39); they may be isarithmic, that is, on a rhythmic interval basis (e.g. 10, 20, 30), geometric (2, 4, 16), or they may be based on natural breaks in a frequency distribution. The size of the statistical units (whether communes, parishes, countries or provinces) will determine the number and density of evaluated points from which each isopleth can be interpolated. and therefore its precision. The location of the central point of a statistical unit is a difficult matter, particularly when its shape is irregular or elongated. Interpolation is usually done by assuming a uniform increase of value between two points and so placing the isopleth proportionally (as in fig. 17.8); in this case, and in interpolating contours on a uniform slope, this is quite permissible and a fair degree of accuracy can be attained. But for agricultural and population densities this may be far from the case. Various techniques are suggested to overcome some of these difficulties.

Merits of Isopleth Method:

1. It is good scientific method of showing distribution. The pattern of distribution can be easily grasped by reading the values of isopleths.
2. The isopleth lines are best suited to know the gradient of distribution. Closely spaced isopleths show steep gradient while gentle gradient is shown by isopleths placed distant apart.
3. Isopleths do not follow the administrative boundaries are best suited to show the climatic elements.

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4. Isoplethe are ideal to show the areal distribution when point data are given. For example, tem rainfall, pressure are expressed as point data with the help which isotherms, Isohyets and Iso easily drawn. Thus isoplethe are chief tools of climatologists.
5. Elements with transitional belts such as temperature and pressure can be perfectly shown by I only.
6. Choropleth and dot maps can be converted into isopleth maps

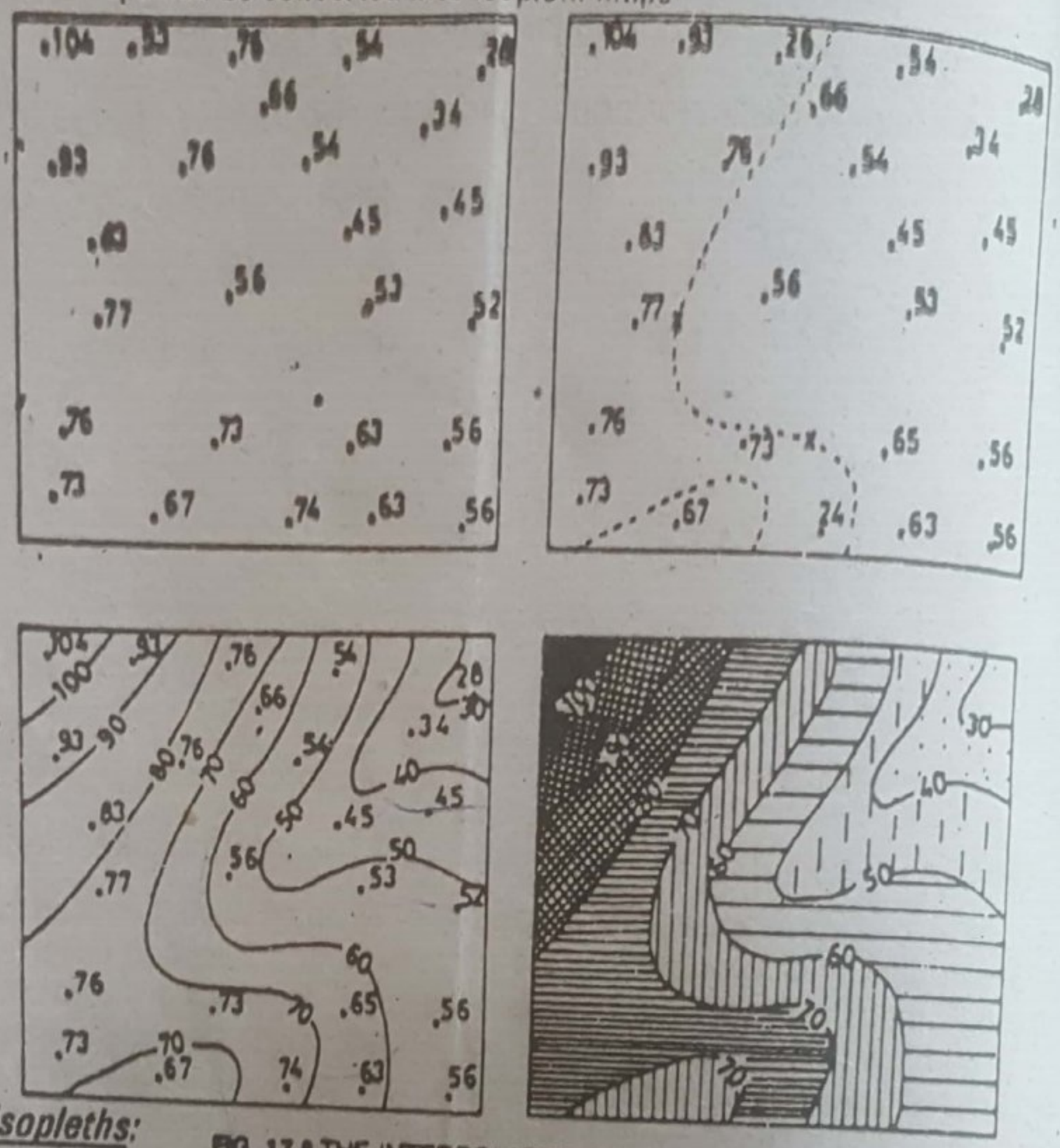

FIG. 17 THE INTERPOLATION OF ISOPLETHS

Demerits of Isopleths:

1. The proper drawing of isopleths requires interpolation which is not an easy job.
2. Drawing of isopleths requires data for a large number of stations which is often not available.
3. This method is useful only when the transitional bolt is quite wide as is in case of temperature and pressure of the air. This method becomes useless whenever there is sudden change in the quantity, intensity or density as is the case in population density.

Choropleth Method: The word Choropleth is derived from Greek Choros (a place) and plethos (a measure). Thus the literal meaning of Choropleth is the *'Quantity in area"* -Different shades are used to show the distribution as a result of which it is also known as 'Shading Method'.

This method is applicable to maps drawn on a quantitative areal basis, calculated as average values per unit area within specific units. These units are usually the administrative units because data are normally available according to the administrative units e.g. density of population per sq. 10 km the percentage of land under cultivation, the yield hectare of arable land etc. Therefore this method is very useful in human and economic geography.

According to F.J. Monkhouse *"If the isopleth is the chief tool of climatologists, the Choropleth may be said to be the chief tool of the human geographer in his quantitative treatment of the distribution aspects of population".*

Draw a map of Pakistan using Choropleth method showing the population on the basis of the following data.

Arrange the given data in descending order of population density. In this case the descending order will be as per details given in the following table:

Population in Sindh (March, 1998)

No.	Division/Districts	Population
1. LARKANA DIVISION		
1.	Larkana	1,903,020
2.	Jacobabad	1,400,575
3.	Shikarpur	885,893
2. SUKKUR DIVISION		
4.	Sukkur	877,858
5.	Ghotki	952,461
6.	Khairpur	1,514,768
7.	Nowshehro Feroze	1,064,651
8.	Nawabshah	1,046,986
3. HYDERABAD DIVISION		
9.	Hyderabad	2,840,653
10.	Dadu	1,631,427
11.	Badin	1,108,394
12.	Thatta	1,099,528
4. MIRPUR KHAS DIVISION		
13.	Mirpur Khas	899,947
14.	Sanghar	1,420,022
15.	Umerkot	565,124
16.	Thar Parkar	906,720
5. KARACHI DIVISION		
17.	Malir	1,041,029
18.	Karachi (East)	2,716,789
19.	Karachi (West)	2,080,303
20.	Karachi (North)	1,724,915
21.	Karachi (Central)	2,239,098

Total Divisions are : 5 Total Districts are : 21

lect five different shades for the above five categories of population density. Care should be taken that ter shade is selected for lessor density and heavier shade is selected for higher density of population. In er words the intensity of shade should increase with the increase in the density of population. Prepare

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Select five different shades for the above five categories in such a way that lighter shade is given to lower ratio while heavier shade is meant for higher ratio. Given an index to identify these shades. The final map will be shown in figure 17.12.

Dot Method: The simplest of all the maps that use point symbols is the one where in the data are represented by verying number of uniform dots, each representing the same amount. This method is best suited to show the absolute figures. Population, cattle, crops, minerals industries etc. are easily shown by dot method.

Preparing A Dot Map: Although the usual map reader does not believe that he experiences particular difficulty in that it is not as a straight forward a kind of symbolization as many have thought. It seems especially difficult for the untrained reader to estimate relative visual densities on an interval scale with much success, although ordinal decisions appear not to be difficult. The latter is probably the most important function to be performed by the dot map.

Preliminary information is necessary for which following three things are required:

1. The outline map of the concerned area with administrative boundaries. The accuracy of the dot map depends upon the size of administrative divisions. The smaller the size the more accurate the dot map.
2. Absolute figures with reference to administrative divisions.
3. Relief, climate, soil, vegetation, irrigation etc., maps of the concerned area. These help us in demarcating the negative areas as well as areas of high concentration.

Following four aspects are to be properly considered for an accurate dot map.

1. Determining the value of dot: Much of the success of the Cartographer depends upon his ability to accurately fix value of the dot. If the value of the dot is too small, the dots in areas of higher density will coalesce and form a dark area. On the contrary, if the value of the dot is too large, the areas of lesser density may not have even a single dot and the map may give false idea about the distribution.

Selection of scale of dot depends upon the following three factors:

(a) Scale of the map.

(b) Range of data.

(c) Type of the element to be shown.

(a) Scale of the map: If the scale of the map is small then the value of the dot should be so fixed that they do not exceed the required number. If this thing happens, the areas of high density will become black and even areas of low density will appear to have higher density. If, on the other hand, the map is drawn on large scale, even areas of higher concentration will look as areas of low concentration if the number of dots is less.

(b) Range of data: The range of data is to be given due consideration while selecting the value of dot. It should be fixed in such a way that even areas of least concentration have a few dots and at the same time, the dots do no coalesee too much in areas of maximum concentration.

The Type of the element to be shown: The second important thing is to determine the size of the dot. It should neither be too small so that the map looks almost empty nor it should be too large so that the map appears to be overcrowded.

Merits of Dot Method:

1. This is best method of drawing distribution maps because dots shows the distribution accurately.
2. This is the suited method for showing the absolute figures.
3. It gives a visual impression of distribution and also gives a bird's eye view.
4. It can be converted into data by counting the dots.
5. A dot map can be converted into shade map which a shade map cannot be converted into a dot map.
6. It does not require any index. It is sufficent to mention the value of the dot.
7. A dot map can be more useful if multiple dot method is applied.

Demerits of Dot Method:

1. It requires sufficient practice to draw a dot map.
2. It is unfit to show relative data such as densities and percentages. This can be used only for showing the absolute figures.
3. Sometimes enough data are not available to make an effective dot map.
4. For making a perfect dot map we require relief map, climatic map, soil map, vegetation etc. in addition to the political map. Such a large variety of maps is not easily available.
5. The dot can be faulty without the proper geographical knowledge of the concerned area.
6. Sometimes the scale of map is quite different from the scale of dot which gives a very misleading figure.
7. An inexperienced cartographer will draw a faulty map.

Diagramatic Maps:

The map in which the distribution is shown with the help of certain diagrams (bars, squares, rectangles, circles, spheres, cubes or line-graphs) are known as diagrammatic maps. The diagrams are superimposed on the map corresponding to areas shown by them.

Diagrammatic maps are used under following conditions :

1. There are certain elements which can be shown by diagrams alone. For example, if we are to show different used graduated circles as in wheel diagram to show the different ratio are used as it is clean from the population on size Rural & Urban ration of Pakistan.
2. When variation in a geographical element such as rainfall, temperature, relative humidity is to be shown, then line graph or bar graph for all the 12 months of the year with respect to the concerned places are drawn. This is illustrated in Fig. 17.21.
3. When data for sufficient places is not available and it is not possible to draw the isopleths we resort to the use of diagrammatic maps.