CHAPTER V
CHAPTER - V

CRITICAL EXAMINATION OF THE SURVEY TECHNIQUES:

The principal objectives which prompted to undertake the survey are carried out in the three different districts of West Bengal, India, were to describe, classify, map and assess the land qualities with special reference to soil character and landform character and ultimately to establish a relation between soil and landform in these areas.

It was not possible within available time to map the areas in detail. Therefore, a method was adopted whereby the field details could be mapped as complexes of the country. To do this the concepts of "Land units" and "Land systems" as well as the basic techniques of the surveys of the Commonwealth Scientific and Industrial Research Organisation, Australia, known as C.S.I.R.O. were taken into consideration.

The advantages and disadvantages of this type of survey experienced by different persons working in this field are laid down:

(A) Some Criticisms:

Notwithstanding the apparent success of the land-system's (C.S.I.R.O.) approach as applied to agricultural land evaluation, the method has been criticized (Thomas, Moss). The
criticism is made on both conceptual and practical grounds. It is accepted that the approach provides much information about the land but it does little or practically nothing to measure or evaluate the important complex of functional relationships between soils, climate, plants, and animals. This emphasizes the static, cataloguing approach of the land-systems method, and reinforces the need for an alternative dynamic approach.

The accuracy of some land-system surveys has been questioned by Wright on the ground that little account is taken of local variations, and that classification may be based on impressive criteria and strongly influenced by the more evident contrasts in air-photo patterns wherever used. In some cases Wright observed that this leads to final subdivisions into land units which differ both in kind and in order of magnitude.

(B) Alternative approaches:

(1) The biocenological approach:

For agricultural purposes Moss proposed a biocenological approach, by which agricultural development is thought of in the context of the biological system within which it is to take place. This follows from the fact that the agricultural production operates according to the ecological laws in the chosen location. Moss argued that an approach based upon established ecological principle and theory, with reference to the
contemporary interactions and influences between the different class of feature to be found at the surface of the earth, offers a more valid, and, therefore, a more relevant approach to the problem of land assessment, particularly in areas such as tropical countries. In addition, Moss suggested that the operation of the ecological system is frequently independent of such of the data collected during a land-systems survey (e.g. geology, slope), but more dependent upon present-day human land use, in the broadest sense of the term. It is not denied by Moss that plant and agricultural data can be grouped on a land form basis in any particular situation, as in the land-systems approach, but his point is that meaningful relationships, either functional or causal, cannot be universally demonstrated between the features thus classified and grouped. Since the bioconological approach focuses upon plant-soil relationships in relation to agricultural practices, a different balance of data, a distinct order of presentation, and a separate view of slope, soils and climate are inevitable. In particular, soil genesis is of little importance, and denudation chronology and stratigraphy are of almost no importance at all (Moss).

In the context of land development for agriculture, the arguments put forth by Moss are valid. In practice his approach may be difficult to apply to countries or areas where there is almost no organized background information about environmental and ecological conditions. Where this is the case, a land-system reconnaissance survey, concentrating on
appropriate data collection, remains a valuable basis for later and more dynamically orientated work. Indeed, the organizations which have been most involved in the development of land-system surveys, have moved in this direction (Bawden). In an earlier study Moss developed the concept of a habitat-site. This he defined as:

A distinct area of the land-surface with a defined range of slope angle and a particular slope position with respect of plant growth possesses limitations with respect to agricultural development (Moss).

This brings the basis for the mapping carried out by Moss very close to that of land-unit mapping as in the land-systems technique. The starting-point for a biocenological survey, (i.e. land use/vegetation patterns) nevertheless, remains somewhat different, and the emphasis by Moss on a recognition of the interaction between ecological and socio-economic systems, of which the land-use pattern is an expression, deserves special mention.

(ii) The site - analysis approach of Dr. R.L. Wright:

Instead of the process of subdividing an area beginning with the general (land systems) and progressing down to the particular (land units) Wright advocated a method whereby details are defined for site units before these are grouped together to form the equivalent of land systems. In this context Wright's site-analysis procedure is based on slope-profiling along transects
chosen so as to include all the variability within the area being investigated. This variability is observed by preliminary air - photo analysis and field reconnaissance. Along the profiles measured, the principal survey stations are spaced 15 - 30 m. apart, with intermediate measurements made to embrace any evident slope discontinuities or micro-relief. The profile is then classified into straight or curved sections identified between marked breaks or changes of slope. Units separated by a uniformly gradational change are defined as one site unless this change is marked by a relative discontinuity in the physical properties of the soil.

On this basis distinct site - types can be identified, each comprising several individuals with closely similar landform, soil, and vegetation characteristics. Recurring members of a few site - types occurring in one area can be grouped, just as land units can be grouped into land systems.

This more precise approach to land classification has been applied in the Fitzroy floodplains and the Daly river basin, Australia; in the Nagarpar Kar peninsula, Pakistan, and in Murcia province, south-east Spain. In each case it provided a useful framework for examining agricultural land use, especially in relationship to defined properties of relief amplitude, gradient, ground shape, and soil texture, depth, and debris cover (Wright).
(C) Land systems and data banks:

With the development of advanced filing methods, especially computerized data banks, land units have become recognized as potentially convenient information in store (Brink et al.). This principle is used in South Africa as the basis for a data bank system, to which additional information is continually added and from which information can be gained when a second project is to cover the same ground as has already mapped for an earlier purpose (Brink and Partridge, H.I.R.R.).

(C) Advantages of the land-systems approach:

Land-systems mapping in a map that is easy to assimilate. It only carries, boundaries and a brief reference code superimposed on a location map. The visual representation of each land system, by means of a block diagram, is both appealing and easy to understand. The table of information concerning each land unit can be problem-orientated, and only information directly relevant to the problem need be measured and recorded. The land-systems concept is applicable on a wide range of scales. If land-systems concept is applicable on a wide range of scales. If land-systems boundaries only are to be shown, small scales are feasible, such as 1:1 million, as used for the land-systems maps of the Alice Springs area (Perry).
and Uganda (Ollier, et al.,). Much of the mapping can be done from aerial photographs and once completed the field work is limited to making sample investigations within examples of each type of land unit. This is therefore, an economical and comparatively rapid method of acquiring information about the land resources of an area.

Whatever the criticisms has been raised against the land-systems approach, it has one paramount advantage too, that is simplicity, over any other method yet devised for relaying terrain information from the field scientist to the client environmental manager, in whatever capacity he may operate. The method of classification and the manner of data presentation can be readily understood by those who need the information for planning and decision-making purposes. Without this, no analysis, however correct, can be usefully applied to land management and the wise use of resources.

(E) Land complex and its mapping by Dr. N.K. De:

The technique has been widely accepted by the European countries, Russia, Canada, Africa, etc. The Ministry of Overseas Development, England especially uses the method in its "Assistance programme to Developing countries of the world in planning the use of land Resources". Investigation on these lines as to test not only the value of the method but also its validity in a diversified terrain is desirable in India.
The application of this geomorphological technique (land complex mapping) enables large areas to be mapped in detail within the time available. Maximum benefit at minimum cost is the basic idea of the geomorphological technique referred to here. The data derived out of this technique is not only scientific but also accurate and can be used in different studies. Though the initial cost is a bit higher in conducting the necessary field work (especially in the case of poor and under developed/developing countries), it becomes cheaper comparing its wide application in various studies. The map once produced by the land complex mapping technique which is more or less similar to land systems technique can be used in a variety of ways by other authorities and can serve as a very satisfactory framework for systematic sampling and correlation especially in geographic and economic studies or in other words the natural divisions of landscape provide a common basic for a wide range of studies. The techniques used in this type of study can safely and satisfactorily be applied to all kinds of ecological studies including soil surveys, vegetation surveys, geological surveys, hydrological surveys, anthropological surveys, land use surveys etc.

(F) Wide application of geomorphological Techniques:

R. Galon has produced a detailed hydrological map of Poland using geomorphological techniques. In this words, "the purpose of the map is to establish the structure of the water circulation within the individual river basins on the basis of
and in combination with the other elements of the geographic environments". According to him "water balance is a dynamic phenomenon - variable and complex". And it is more important as it is increasingly ceasing to be an entirely natural phenomena because of man's activity.

G.A. Hills has classified Northern Ontario lands on the basis of their potentiality for agricultural production by the application of geomorphological techniques.

Similarly the Catena concept of soil formation has been formulated in Africa by Lilne on the basis of geomorphological analysis. A soil map produced by geomorphological analysis becomes similar and identical with that of the map produced by other methods based on plot-to-plot survey and laboratory examination of soil samples.

Another illustration is natural vegetation. Natural vegetation of an area is very very complex. Modern statistical studies are establishing that in many areas vegetation forms a part of a continuation. Geomorphological approach to the study of a very complex vegetation is meaningful ecologically because it is closely related to geomorphic environment. D. Brown has advocated the geomorphological technique in measuring vegetation.

(C) Land-Complex Map Vs. Other studies:

The land complex map (based on geomorphological considerations, as per Dr. N.K. De) and its tabular description
have facilitated other studies as analysed earlier. With the knowledge gained during traverse of the area, field sampling along with the recording of the quantitative information with respect to landforms, geology, soils, vegetation coupled with their laboratory analyses, and the use of air photographs/modern air photo interpretation techniques the following maps emerged which are not only scientific but also accurate.

(1) Geology Map;
(11) Geomorphic Region Map;
(iii) Soil Map
(iv) Land use Map.

Based on the land complex map and the tabular description of the ecological factors including the nature and properties of soils, vegetation and other land use characteristics of each land complex in general and the different land units of the land complex in particular Dr. N.K. De has produced of the above geology, soil, land use and geomorphic region maps of a portion of South Italy.

It is interesting to note that the land complex map of Dr. De here closely coincides with the geology map, the geomorphic region map, the soil map and the land use map. This is because of the fact that the identification and analysis of landforms which are directly influenced by environment and indirectly gives an idea of the environmental factors are the bases of all considerations referred to here.
The classification of land into land units and land complexes permits the systematic planning of where further information is to be sought. The identification and recognition of the land unit enables a complex region to be analysed into all its component areas of different character or potentiality and the land complex enables areas large enough to be mapped at the scale of working.

As these units are flexible and can be adjusted to the degree of complexity at any scale of working, the technique has an advantage.

Correlation between land complex map and soil maps has been well illustrated and established by Dr. N.K. De, by his works on South Italy (Dr. N.K. De) entitled "Land complex Map and its uses in Economic studies"92.