Classification of Agricultural Land's Capability

Reeta Joshi[1], Dr. Rohit Bhati[2], and Jagdish Kandpal[3]

[1]Reeta Joshi, Assistant Professor, Deptt. of Civil Engineering, Quantum University, Roorkee, Uttarakhand, India-247662

[2]Dr. Rohit Bhati, Assistant Professor, Deptt .of Agricultural Studies, Quantum University, Roorkee, Uttarakhand, India-247662

[3]Jagdish Kandpal, Assistant Professor, Deptt. of Mechanical Engineering, R.I.T, Roorkee, Uttarakhand, India-247662

---***---

Abstract - *The agricultural land has a wide range of physical and environmental setup. Therefore, a general grouping of agricultural land is required. Land capability classification is mandatory for optimal planning of agricultural land use. In India SCS classification is generally adopted. For such classification a large data set related to above surface, surface and below surface is indispensable. Data collection by conventional methods is time consuming and uneconomical. Geomantic tools in conjunction with ground surveys forms an efficient method of data collection and further utilization. In the present study agricultural land capability classification for a part of foot hill zone has been done in synergistic manner using remotely sensed data, available topographical map and ground surveys. The classification accuracy with ground truth was found to be about 85% accuracy*

***Key Words*: Capability, Classification, Agricultural, Surface, Land**

1. INTRODUCTION

For sustained development and high returns on a long terms basis, the land should be used only according to its potentiality. Use of land without considering its capability gives lower financial returns and gradually deteriorates the land. Land capability classification is of agricultural land is based on:

- ➢ Inherent soil characteristics
- ➢ External land characteristics
- ➢ Environmental quality that limit the use of land

The land capability classification is a systematic arrangement of the land according to those properties that determine the ability of land to produce on a virtually permanent basis { Lall, Moddie, 1981}.

 Suitability of land for cultivation includes the consideration of use of tillage and harvesting implements and the capacity for at least a moderate yield of one or more crops with suitable treatment and protective measures. The restrictions imposed by natural land characteristics necessarily affect

{a} The number and complexity of the corrective practices to be used.

{b} The productivity of land.

{c} The intensity and manner of land use, for example, the choice of crops on cropland or the amount and season of use of grazing land.

The classification is made and used for practical purpose, which is the selection and application of land uses and treatments that will, while using the land , keep it in condition for long time production. The later will involve control of erosion, conversion of rainfall and maintenance {USDA-SOIL Conservation Manual, 1974}.

1.1 BACKGROUND

As early as 1941, a systematic approach of agricultural land was started in U.S.A {Nation source planning Board, 1941}, to classify the lands according to its inherent characteristics.

The following agricultural land capability classification systems were found:

- ➢ Land classification in terms of inherent qualities or in term of ecological land conditions
- ➢ Land classification in term of present use

➢ Land classification in term of stabilities or in terms of use capabilities. To this category belongs the SCS system of classification.
➢ Land classification in terms of response to management.
➢ Economic land use classification, or land classification in terms of economic and related production variables.
➢ Land classification in terms of recommended use.
➢ Land classification in terms of Programme effectuation.

Here the final decision is made on the intended future land use which the effectuated in a given area, Lewis (1952), gave the following of land classification:

- Soil classification.
- Land capability classification.
- Economic land use classification.
- Mapping of major agricultural regions.

Later, the list extended to include following system of land classification {Stewart, et al. 1968}.

➢ Land System classification (CSIRO).
➢ Land Evaluation for engineering purposes.
➢ Land Evaluation for regional planning.
➢ Land Evaluation for taxation.

In Germany, Ritcher (1965, 1980) developed a land hazard classification on the basis of soil materials, parent materials, coarse fragments and plant cover. Cultivation systems were also added subsequently. Although land use and farming practices may upscale or down scale the land hazard. However, these changes are generally not more than one class up or down. The hazard classes were based on the combined influence of land slope, soil texture, mineral composition and existing land use. In Canada (1967) a land capability classification was proposed for outdoor recreation
Anderson Baker (1971, 1979) proposed a classification scheme for at scales ranging from 1,250,000 to 1, 10,000. The scheme has categories of use of land:

- Agriculture
- Grazing
- Mining and quarrying
- Urban activity
- Transportation communication and utilities.
- Recreational
- Low activity
- Water bodies

Anderson (1976) also gave a modified scheme could be used at a scale of 1,250,000 to 1,100,000 with little ground truth. A combination of erosion effects was presented on maps. The soil erosion types were indicated general symbols against a background indicating lithology and geomorphic forms, slope instability, slope classes and land use shown on separated maps. The end results like present erosion aspects the degree and information about hazard factors were presented the maps. In Sudan, Vander Kevie (1976) developed a rating system relative permanent erosion factors, slope, erodibility and climate. In an ITC survey of erosion hazard of an area in Merida Spain, Bergsma {1980} was prepared an erosion map by qualitative classes. These classes were based on relief classes of the mapping unit, erodibility of soil, length of hill slope, plant cover and cultivation systems.

1.2 Land Capability Classification and Remote Sensing:-

The techniques of remote sensing play a distinctive role in collection of information on land resources. Remote sensing from space, in conjunction with aerial and ground observations, form a major part of the resources management efforts enabling optimal utilization of the Earth's fast dwindling resources considering that only one-fifth of the earth's surface is land and that a population exceeding four billion has to live on it, the importance of planning intelligently the use of land for housing, industry, forming and recreation needs hardly any emphasis. Obviously, a major element of mankind's endeavor in the coming decades to make this planet a better place to live is likely to emerge from the continuous sensing of earth and its environment.

Remote sensing has applicability to land capability studies for some- basic reasons as:

- It presents a large area of the earth's surface from a perspective and in a format which facilitates the study of objects and their relationships.
- Characteristics of objects not visible to human eye, can be transformed into image form.
- It provides the observer with a permanent representation of objects, phenomenon and relationships as they exist at a given time.
- The aerial photographs may be viewed stereoscopically to study the topography of the terrain.
- The imagery as also be aerial photographs may be studied for landscape , geology and vegetative cover of the terrain.

2. Study Area

The study area lies between 24*45' N to 30*20' N latitude and 77* 10' E to 78*10' E longitude. The study area is a part of Saharanpur and Hardwar district of Uttar Pradesh and Uttarakhand . Lower Siwalik range, Yamuna and Ganga rivers form the northern, western and eastern boundaries respectively. The annual rainfall lies between 1000mm. The whole area under study is recent alluvium. The alluvium is younger to the Siwalik.

Data and Instruments/Equipment Used:

In the present study following data has been used:

- ❖ Topographic map of the area.
- ❖ Landsat thematic mapper F.C.C. at 1:250,000 and 1:50,000
- ❖ Mirror stereoscope.
- ❖ Tracing table.
- ❖ Optical reflecting projector.
- ❖ SEG rectifier.

Land Capability CLASSIFICATION:

The agricultural land classification was carried out as detailed below:

Details	Remarks
Define the objectives and collection of all available data:	Land sat MSS, landsat T.M. aerial photographs, reports, scale time season:
Visual interpretation of land sat T.M. FCC at 1:250,000, with an objective to identify and delineate various land scope features.[minimum size of the area = 4 sq.mm at 1:250,000, equivalent to 25 hectare on the ground]	Accuracy of the interpretation depends upon quality, seasonality as well as interpreter's reference level. Geomorphological geological and land cover maps were prepared.
Consolidation and synthesis of the natural phenomena was formulated and accordingly field work was planned.	Table was used as a guide for capability classification.
Detailed interpretation of TM FCC blow up at 1:50,000 scale in selected areas [minimum area 4 sq.mm. on paper]	For collection of additional data concerning soil, topography and hydrology.
Field survey at selected points were carried out with an objective to verify the interpretation	Checking the overall accuracy of the work.
Synthesis of interpreted and field surveys Final description of the findings.	Agricultural land capability map is evolved

3. CONCLUSION

The agricultural land capability classification can be carried as described in the paper. Thematic mapper FCC at 1:250,000 scale is sufficient data required for such classification. However, selected surveys are essential for evaluating the efficiency of interpretation work. In the present study only soil and topographical parameters have been used as basic data for capability classification. The interpretation gives about 85% accurate results. Accuracy of the interpretation can be improved by many more parameters, accommodating irrigation ability, various land problems and selecting ground survey sites by simplified random sampling.

REFERENCES

1. Beek ,J., Bennema and Camargo ,M.(1964)First draft ,soil survey interpretation in Brazil .A system of land capability classification for reconnaissance survey. DFFS-FAO-STIBOKA,

2. Beek , K.J. (1975) Land utilization types in land evaluation in :land evaluation in Europe .soil a bulletin 29,FAO

3. X Klingebiel,A.A.amd Montgomery, P.H.(1961) land capability classification .agricultural handbook210,soil conservation service .U.S. Govt. Washington.D.C.

4. Kostrowichi.J. (1974) Typology of world agriculture, principle, methods and model type International Geographical Union. Commission on agricultural Typology .Warsaw

5. Luning .H.A.(1973)Land utilization types of medium- potential areas of Eastern Province. Kenya Soil Survey Project , Nat. Agric. Labaratories .Nairobi Young ,A.(1976) Tropical Soil and Soil Survey .Cambridge University Press. Cambridge

6. Lall, Moddie, 1981}. land capability classification is a systematic arrangement of the land

7. Ritcher (1965, 1980) developed a land hazard classification on the basis of soil materials, in Germany