Available online at www.scholarsresearchlibrary.com

Scholars research library

Archives of Applied Science Research, 2011, 3 (5):10-16
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0975-508X
CODEN (USA) AASRC9

Landuse Pattern Analysis Using Remote Sensing: A Case Study of Mau District, India

Prafull Singh[1] and Shelendra Singh[2]

[1]Department of Civil Engineering, SAM College of Engineering and Technology, Bhopal, M.P. India
[2]National Institute of Malaria Research (ICMR), New Delhi

ABSTRACT

Land use mapping is fundamental for assessment, managing and protection of natural resources of a region and the information on the existing land use is one of the prime pre-requisites for suggesting better use of terrain. Advances in satellite sensor and their analysis techniques are making remote sensing systems realistic and attractive for use in research and management of natural resources. Land use maps are valuable tools for agricultural and natural resources studies. Due to strength of natural resources, updating these maps is essential. Employing traditional methods through aerial photos interpretation to produce such maps are costly and time consuming. With the growth of population and socio-economic activities, natural land cover is being modified for various development purposes. This has increased the rate of changes on land-use pattern over time and thus, affecting the overall ecosystem health. Land use mapping is an important tool for land management and monitoring. This paper analyzes landuse pattern of a part of Mau district, U.P. India using remotely sensed data and digitized using ERDAS IMAGINE software.The various categories of land use in the area recognized are forest, agriculture, Settlement, Fallow Land, Salt affected land, water bodies and reeds. Agriculture is the major land use categories in the study area due to the one of fertile soil of the world.

Key Words: Remote sensing, landuse pattern, Mau, India.

INTRODUCTION

Landuse refers to man's activities on earth, which are directly related to land, whereas land cover denotes the natural features and artificial constructions covering the land surface. Landuse practices of a region are influenced by a number of parameters namely physical and chemical environments, socio-economic factors and needs of the masses. Ever increasing demand due to rapid growth of population has put heavy pressure on natural resources of the country. The

removal of poverty and unemployment through judicious planning and use of available resources is the hallmark of the development process. Since the adoption of the policy of planned economic development, efforts are being continually made to achieve sustainable rates of growth in all key sectors with a view to attain economic self-sufficiency and resource sustainability. To achieve such a major goal, it is imperative to have information on existing natural resource scenario, their physical/ terrain features, climate parameters, ecological conditions, socio-economic profile of the area, current practices of planning and management, and the contemporary technologies to be used for the sustainability of natural resources.

Uncoordinated development can lead to inefficient and undesirable environmental, social and economic conditions [2]. Land use and Land cover information are important elements for monitoring; evaluating, protecting and planning for earth resources.Remotely sensed multispectral data collected from satellites provide a systematic, synoptic ability to assess conditions over large areas and on a regular basis [5]. Remote sensing has traditionally concentrated on rural or natural areas when looking at land use change. With most image analysis applications, the aim is to produce classified end products through classification methods. The problem with using either of these methods over a time-series of imagery is that the classification errors will propagate over the length of the analysis period. With most image analysis applications, the aim is to produce classified end products through classification methods. Land cover classification refers to matching land cover classes identified particular features within the vicinity. It is a process that allows generating a land-cover map with detailed information about the composition and physiognomy of the area of interest.

A variety of image classification techniques have been developed to generate the process of land cover classification [6, 8].In general, land cover classification is divided into two basic approaches, namely (1) unsupervised and (2) supervised classifications, which depend on *a* priori knowledge regarding the land cover types across the study region.

In recent years geo-spatial information technologies are becoming increasingly important in the development, management and monitoring of various earth resources. Geographic Information Systems (GIS) coupled with satellite data provides decision-makers with a unique view of the landscape, which enables land managers to improve natural resource management[13].The use of geo-spatial information establishes a dialogue linking local knowledge and science, and national development strategies. One general advantage of geospatial data is the capability to increase the accuracy of data gathering and analysis. These technologies have been widely used successfully to manage land resources. Recent studies have revealed widespread application of geo-spatial information technologies in the decision-making process of land use mapping and monitoring for natural resource assessment and management of different locations of the globe [14, 3, 12, 4, 1].Landuse pattern along with geophysical data are also used to find out the groundwater prospect zones in the hard rock terrains [15,16].The present work has been carried out to understand the capability of geospatial techniques in land use land cover mapping in the area.

Study Area

The Ganges river basin originates in Himalayan glaciers named Gangotri about 14,000 feet above sea level. It is one of the most fertile and has very high population density of about 530

persons per square kilometers. The Ganga also serves as one of India‘s holiest rivers whose cultural and spiritual significance transcends the boundaries of the basin.

MAU district is situated eastern part of the state on one of the fertile planes of Ganga basin and study area lies between the latitude of 26º 0' and 26º15' N and longitude of 83º15' and 83º30' E. The area is plain with gentle undulations from north-west to south-east. The Ghaghra and the Gandak Rivers is the major tributary of Ganga lies within the area.

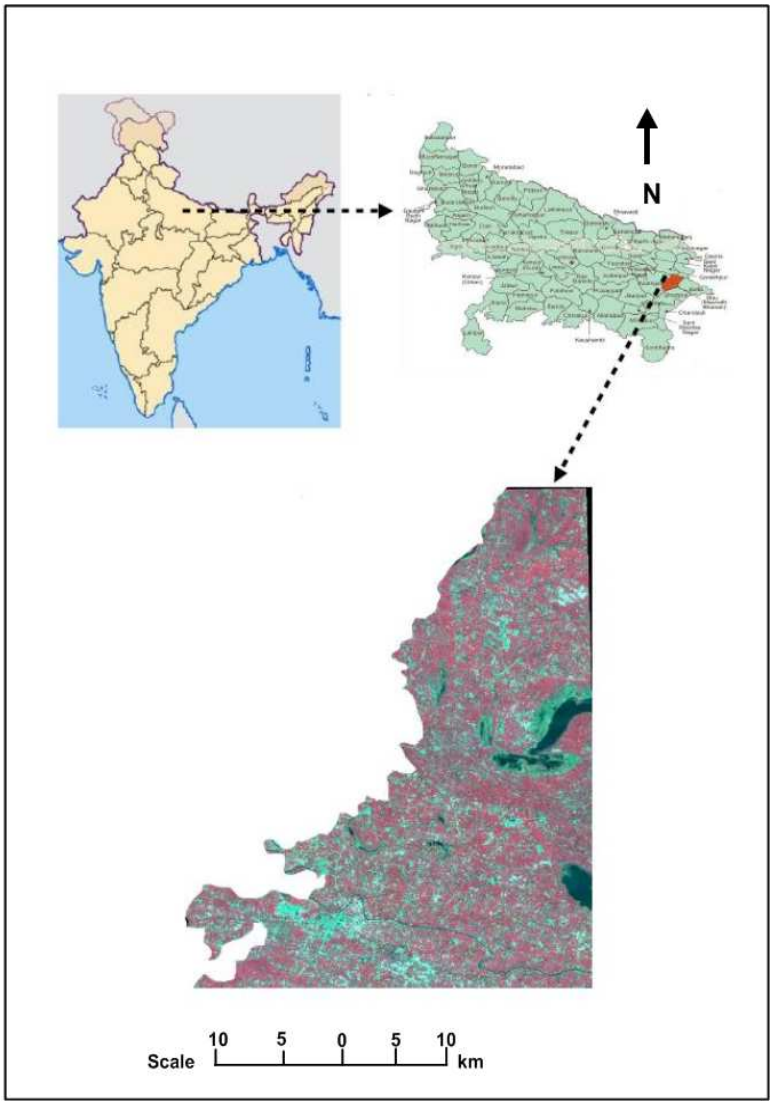

Fig 1: Location Map of the part of Mau District U.P

MATERIALS AND METHODS

Image interpretation can be carried out in two most popular ways e.g. digital analysis and visual interpretation. In the digital classification process, training areas for different classes are defined on to the satellite imagery on spectral response pattern in different spectral bands. Based on these

training areas satellite imagery is classified into different classes using parametric or non parametric classifiers. Digital analysis is fast and output image is raster, which is simpler in structure but big in size. Masks are often used for improving the classification of known areas (LU et al., 2007).

Accurate registration of multi-spectral remote sensing data is essential for analyzing land use and land cover conditions of a particular geographic location. In this study, geometric correction of remote sensing data is done for the distortions and degradations caused by the errors due to variation in altitude, velocity of the sensor platform, variations in scan speed and in the sweep of the sensors field of view, earth curvature and relief displacement. The satellite data (IRS LISS III) has been geometrically corrected and geocoded to the Universal Transverse Mercator (UTM) coordinate system by using a reference image of SOI toposheets. A minimum of 25 regularly distributed ground control points were selected from the images. The information provided by the satellites in combination with other sources to quantify the various parameters of land use of the basin has been evaluated by applying various image processing steps through the use of ERDAS Imagine and ARC GIS software.

Landuse-land cover (LU/LC) classification is based on the scheme developed by National Remote Sensing Agency **(**NRSA, 1995**).** A supervise classification scheme for remote sensing data have been reported by many previous studies for land-cover classification using the maximum likelihood classifier.

RESULTS AND DISCUSSION

Land is one of the most vital accepted natural resource. The landuse pattern and its spatial distribution are the major rudiments for the foundation of a successful landuse strategy required for the appropriate development and organization of any area. The land use map prepared through remote sensing data and their spatial distribution is shown in figure 3 and their area is given in table 1. Land cover mapping serves as a basic inventory of land resources for all levels of organization, environmental agencies and private industry throughout the world. The various land use patterns are depicted in the study area using the onscreen visual interpretation of the satellite imagery of IRS ID.

Table 1. Areal extend of different land use/land cover features.

S.No.	Class	Area (Sq.km)
1	Agriculture Land	293
2	Fallow Land	242
3	Settlement	22
4	Salt affected Land	36
5	Water body	38
6	Marshy land (Reeds)	32
	Total Area	**663**

A mixture of land use / land cover classes like agriculture, settlement, fallow land, Salt affected Land , Water body and marshy land etc. were identified and mapped using visual interpretation keys such as color, tone, texture, pattern, size and shape. Based on the ground truth data, land use/land cover map of part of Mau district were corrected and finalized.

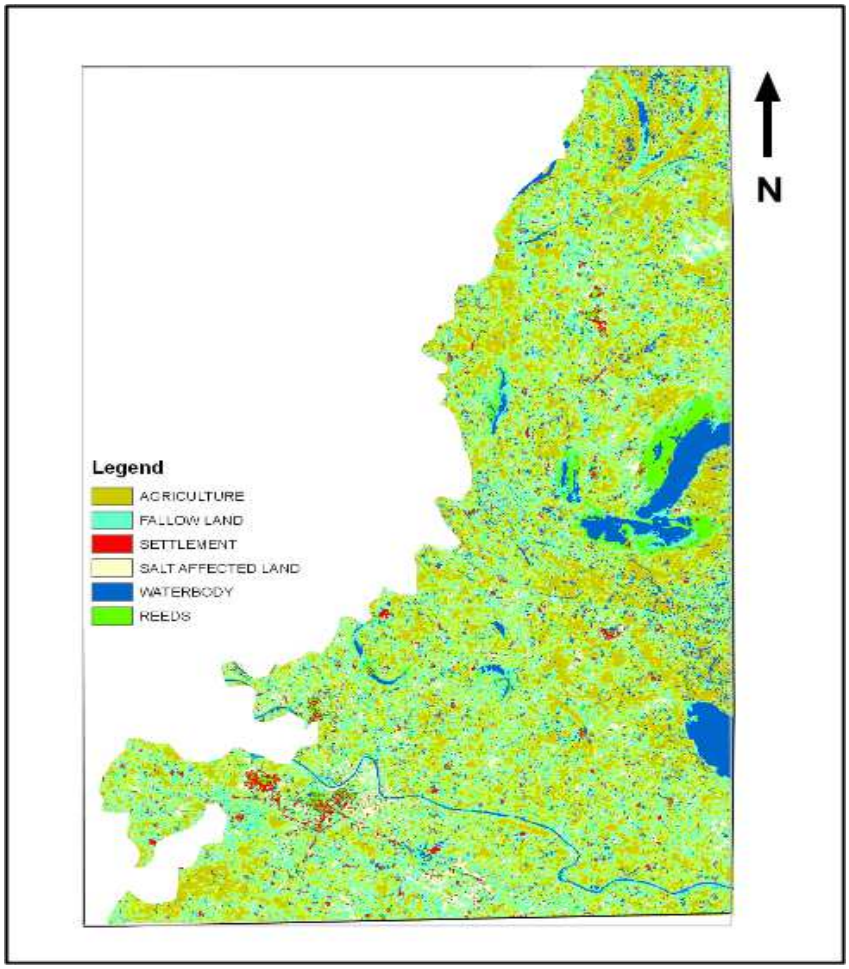

Fig. 2: Land use pattern map of the part of Mau District U.P.

The present study revealed that nearly 293 sq.km. of the area was covered by agricultural activities, Built-up land is an area of human habitation, which has a cover of buildings and network of transport, and other civic amenities with 22 sq.km. of the area covered with settlement with plantations. Salt affected land is generally characterized as land that has adverse effects on growth of most plants due to the action or presence of excess soluble salts (saline) which is general considered as the limit between normal and alkali soils which is generally found in alluvial areas. Salt affected land in the study area is covered about 36 sq.km where as water body and marshy land occupies 38 and 32 sq.km.The classified map of the study area of Mau showed that most of the lands were used for agricultural purposes. On the basis of mapping of various landuse pattern within the study area better land use planning can be prepared through suitability analysis of various land use categories for particular development and planning for

better management of the land resources.

CONCLUSION

The present study revealed that remote sensing and GIS techniques can be effectively used for development of land use/land cover plan map. The present study also found that remote sensing coupled with GIS can be effectively used for real time and long term monitoring of the environment. The baseline information generated on land use/land cover pattern of the area would be of immense help in formulation of policies and programmes required for developmental planning of the area.

Land use/land cover mapping and changes are depending on the physical conditions, which are mainly driven by socio-economic factors. They can be mainly characterized by the changes of cultivated land and construction land, which are strongly inter-related with human construction behavior.

Acknowledgement
The authors are thankful to the Chairman SAM College of Engineering & Technology Bhopal, Dr. S. N. Mohapatra School of Studies in Earth Science, Jiwaji University, Gwalior M.P and Dr. B.N.Nagpal National Institute of Malaria Research (ICMR), New Delhi for providing necessary facilities and constant encouragement. Thanks are also due to the anonymous reviewers for their many helpful suggestions.

REFERENCES

[1] Balak, Ram,. and Kolarkar, A.S., *International Journal of Remote Sensing*, 14, 3191-3200, (**1993**).
[2]Campbell, J.B., Introduction to Remote Sensing, Guilford Press, New York, USA, (**1996**).
[3] Chaudhary, B.S., Saroha, G.P. and Yadav, Manoj, *Journal of Human Ecology*, 23, 243 – 252,(**2008**).
[4] Chaurasia,R. and Sharma,P.K., *Journal of Indian Society of Remote Sensing*, 27, 115-121, (**1999**).
[5]Jakubauskas, M.E. and K.P., *Photogrammetric Engineering & Remote Sensing*, 63,1375-1381, (**1997**).
[6] Jensen J.R., Introductory digital image processing. A remote sensing perspective, 2nd edition. Prentice Hall, Inc, Upper Sadle River – USA (**1996**)
[7] Jensen J.R., Remote Sensing of the Environment: An Earth Resource Perspective. 2nd Edition. Prentice Hall, (**2007**).
[8] Lu, D. and Weng, Q., *International Journal of Remote Sensing* 28, 823-870, (**2007**).
[9] National Remote Sensing Agency, (**1995**) IMSD Technical Guidelines. National Remote Sensing Agency.
[10] Navalgund, R.R., Jayaraman, V.and Roy, P.S., *Curr. Sci*, 93, 1747–1766, (**2007**).
[12] Saha, A.K., Arora, M.K., Csaplovics, E., and Gupta, P.K, *Geocarto International*, 20: 33-40, (**2005**) .

[13] Singh, Prafull., Thakur, J.K.,Kumar,S. and Singh U.C., Assessment of land use/land cover using Geospatial Techniques in a semi arid region of Madhya Pradesh, India.Geospatial Techniques for Managing Environmental Resources, Springer, Heidelberg. Germany, (**2011**).
[14] Singh, P.K., and Singh, U.C., *E-journal of Earth Science India*, 2, 174-186, (**2009**).
[15]Punithavathi, J.,Tamillenthi,S.,and Baskara, R., *Archives of Applied Science Research*, 3 (3): 358-366, (**2011**).
[16] Ahilan J. and G. R. Senthil Kumar., *Archives of Applied Science Research*, 3 (2): 414-421, (**2011**)