

A brief note on forest survey in Nepal

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The forest coverage in the Terai (the plain area of the country) as obtained through the remote sensing and GIS tools seems to be declining at the rate of 15 percentage within 12 years during the period of 1978/79 to 1990/91.

One way of assessing the forest resources is by carrying out forest inventory in the field in a conventional way which needs a lot of technical man power, time, money and material. The other way of monitoring the forest resources in a quick manner is with the help of advanced technologies such as GIS and remote sensing.

The methods used in the Terai can not be used in the hills of the country due to the slopes. However, remote sensing and GIS tools are being used for the preparation of woody vegetation maps of the hilly areas of the country as both the forest areas as well as the areas under shrub/grass can be shown together.

The information on forest resources of the country obtained through the use of remote sensing and GIS tools could be used by the planners and to some extent, by the decision makers.

Forests which play a significant role for the development of the country should be managed in a scientific way and the data on forestry resources are the prerequisite for it. Remote sensing and GIS technologies enable collecting a reliable data of the forest resources. Such tools have been used successfully for studying the change in the forest resources in Nepal since the early 1980s. Since 1990, the Forest Survey Division (the then Forest Survey and Statistics Division under the Ministry of Forests and Soil Conservation) of the Forest Research and Survey Centre (FORESC) has been carrying out forest inventories at the district and national levels using the latest aerial photographs and remotely sensed data together with the available topographic and landuse maps. The Forest

Resources Information System (FRIS) Project funded by the Finnish Government has supported such inventories.

Forest resources of the country

The country was said to have a vast forest resources during 1960s, but no authentic records were available before that period. The forest areas were being clear felled for new settlement, and consequently, the area covered by forest started declining. Also, no scientific management of forests existed. The area under forest as indicated in the Master Plan for the Forestry Sector 1988 is 5,518,000 ha which is about 37 percent of the total land area of the country (MFSC 1988). In a mountainous country like Nepal, where most of the people depend on agriculture, forests play a vital role in maintaining the socio-economic condition and environmental conservation. More than 90 percent people who live in villages depend on forests for fuelwood, fodder, timber and other non-timber forest products. For the lack of alternatives, and other income generating activities, people have to depend on forests, thereby, causing the latter to deplete in an alarming rate. The forests of the country must therefore, be managed in a scientific manner in order to meet the ever increasing demand of fuel-wood, fodder and construction wood, especially of the rural people. Knowing the present coverage of the forest area and also the growing stock has, therefore, becomes very necessary for applying the appropriate management strategies.

Organisational history

It was only in the beginning of the 1960s, His Majesty's Government of Nepal (HMG/N) thought of monitoring forest resources of the country for management. Considering this, the HMG/N started carrying out national forest inventory with the cooperation of USAID. New aerial photographs covering almost all parts of the

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country were taken, and were used for the preparation of the forest maps as well as for carrying out the forest inventory in the field. Application of more advanced technique of forest resources monitoring was initiated only in the late seventies. As a result, National Remote Sensing Centre (NRSC) was established in 1981 with the joint collaboration of USAID and the Department of Soil and Watershed Management. All were aimed to study the status of various natural resources of the country. The entire forest maps of the country were prepared with the help of the aerial photographs taken in 1972, the remotely sensed data and the field data. In 1988/89, after the termination of the USAID Project, the Centre was put as a new section of the then Forest Survey and Statistics Division of the Ministry of Forests and Soil Conservation (MFSC). The section is now under the umbrella of the Forest Survey Division (then Forest Survey and Statistics Division, MFSC) of the Forest Research and Survey Centre. Since 1990, the Finnish Government has been supporting HMG/N to monitor the forest resources of the country and to assess their prevailing stock.

images were superimposed using GIS tools and the change was noticed. In 12 years (from 1978/79 to 1990/91), the total forest area in the plains seems decreased by 15% (99,000 ha) or at the rate of 1.3% per year during that period (Table 1).

The methods used in the Terai can not be used in the hilly area of the country due to the slopes and shades and also due to the inaccuracy of the available data. However, remote sensing and GIS tools are being used for the preparation of woody vegetation maps of the hilly areas of the country as both the forest areas as well as the areas under shrub/grass can be shown together.

The various softwares being used to study the change in the forest resources of the country and for preparing various forest maps at the Forest Survey Division are TOPOS (a Finnish software), PC ARC/INFO and PC ERDAS.

Reliability of the results

The result of the satellite imagery analysis of the Terai seems to be quite satisfactory if the forest

Table 1 : Change in forest areas of twenty Terai districts

Districts	1978/79	1990/91	change (ha)	change (%)
20	645,300	545,900	-99,400	-15

Source: Deforestation in the Terai Districts 1978/79 - 1990/91.

Survey methods used in the Terai

While analysing deforestation in the Terai, the Landsat TM (Thematic Mapper) data taken in November-December 1990 and 1991 were used. The maps of LRMP (Land Resources Mapping Project) (at the scale 1:50,000) based on the aerial photos of the year 1978/79 were referred to digitising the boundary of the study area and for calculating the forest area. The boundaries of the former were digitised directly from the LRMP land use maps, and then other details were added into it by using maps such as Indian Topographic maps of the scale 1: 63,360. Normalised Difference Vegetation Index (NDVI) thresholding was applied for separating forested land from non-forested land in the satellite imageries. NDVI was shown elsewhere to be highly correlated with green biomass in order to make it a viable tool for the identification of forest. Rectification and cloud correction were done in the satellite imageries with the help of the LRMP land use maps. Change in forest areas of the plains were obtained by comparing the forest area obtained from satellite imageries with that of the digital LRMP land use maps. For this, the two digital

areas calculated using the satellite imageries of some Terai districts are compared with those using the aerial photographs of the same districts (Table 2).

Table 2 : Comparison of forest area in the plains between satellite imagery and aerial photography technique

District	Forest area (ha)		Difference area (ha)%	
	satellite imagery	aerial photography		
Kapilbastu	46,587	49,640	-3053	-6.2
Rupandehi	15,975	16,489	-514	-3.1
Nawalparasi	25,552	29,616	-4064	-13.7
Bara	35,387	34,868	+519	+1.5

Source: Deforestation in the Terai Districts 1978/79 - 1990/91.

The information acquired using these technologies could be used by the planners to make any decision in forest management of the country.

References

- MFSC 1988. Master Plan for the Forestry Sector. Main Report 1988. MFSC, Kathmandu, Nepal.