Assessment of Biomass in Magra and Dhanaulti reserve Forest (Missouri Forest) using Remote Sensing and GIS

Mohamed Ghabi[1], K.K.Das[2]

[1]*Center of space techniques, Arzew Oran, Algérie ghabi.inde@gmail.com*
[2]*Indian Institute of Remote Sensing, Dehradun, India.KKdas@iirs.gov.in*

Abstract. The study aims at forest cover type and canopy density mapping woody biomass assessment the study area of Magra and Danhaulti reserve forest between78º 09` 08`` to 78º 14` 25`` E and 30º 25` 57`` to 30º 29` 23`` N. qualification of growing stock is necessary for better management and planning of forest resources .in recent years satellite remote sensing has been emerged as one of the powerful technology for generation of spatial information remote sensing coupled with GIS and GPS has completely revolutionized the forest natural resource mapping and quantification for planning and management of forest resources .in the present study LissVI and land sat data has been digitally interpreted into different forest cover type and canopy density classes. Stratified random sampling method has been used determination of number of sampling units for ground inventory data collection. The volume and biomass of each tree were calculated by using the regression equations and specific gravity .Forest cover type, Forest stratum and density class wise growing stock and biomass were obtained by adding and extrapolation with the area obtained from the map prepared in the GIS domain Result of the study exhibit that remote sensing and GIS can be utilized effectively for forest cover type mapping, growing stock and biomass estimation.

Keywords. Growing stock, LIS VI, Land Sat, Sampling, Woody Biomass.

1. Introduction.

One of the issues of major global concern today is the increase in atmospheric carbon and its potential to change the world climate. An accurate and precise estimation of the biomass and carbon stored and sequestered in forest have gained importance as a result of the united nation framework convention on climate change and the Kyoto protocol [1]Remote sensing provide a good opportunity to inventory the surface resources of earth in a systematic repetitive manner[2].The latest remote sensing technology with a limited ground truth /ground based studies can make it possible to carry out detailed forest inventories and monitoring of natural vegetation cover. Biomass density can be estimated in several ways, these estimate based on destructive sampling cover only a small area and are generally no randomly selected [3].

2. Materiel and method

2.1. Study areas

The major species are: chirpine (Pinus roxburghii), kadam (Prunus cerasoides), deodar (Cedrus deodara), oak (Quercus lecotricophora). Oak and chirpine are two dominant species inhabiting in the study area. Upper reaches of the mountainous area are inhabited by oak and deodar in the cooler aspect and lower level (1200m - 1700m) by chirpine mostly in southern and eastern aspects.

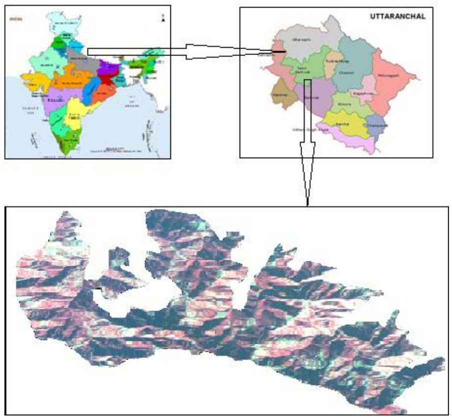

Figure1. study areas

2.2. Biomass estimation.

The biomass of study area was obtained by ground sampling and using the specific gravity [4] method biomass per plots of 1 ha was obtained. As per the value and equation mentioned above. In the present study 17 sample plots of 0.1 ha were selected on the basis of stratified random sampling method was used and Chako`s formula[5] to find out the number of sample plot and the plots are located on the pre-field map for collection /measuring the data. The forested area was digitally classified using Maximum Likelihood Classifier technique. The forest area is classified into four density and six forest type classes.

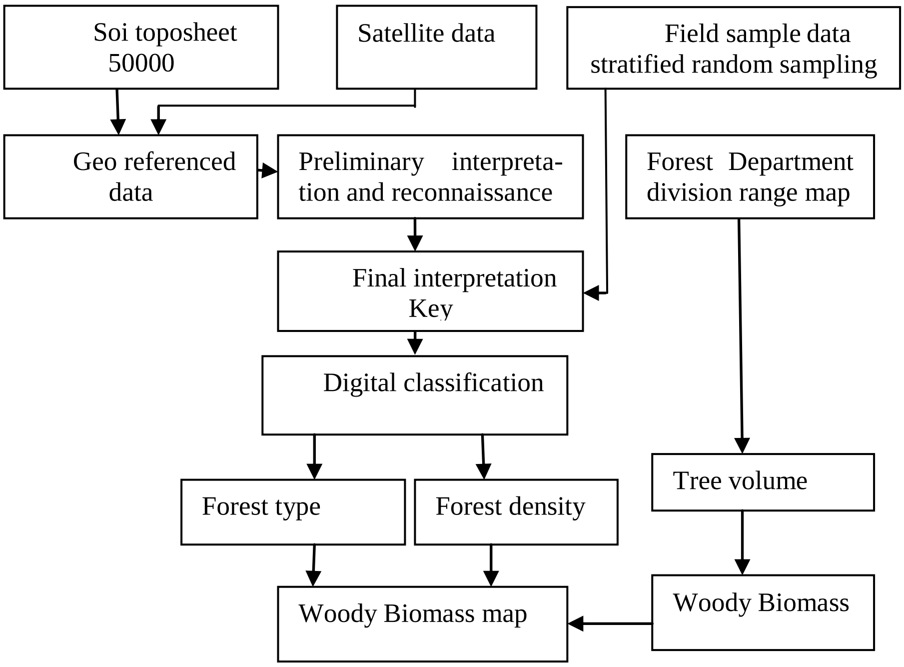

Figure 2. Flow diagram of methodology

3. Results

3.1. Establishing correlation between observed biomass and satellite derived parameters.

Indirect estimation of biomass through some form of equation between satellite derived parameter like band ratio indices and direct reflectance values per pixel or digital numbers per pixel with direct measures of biomass .In this research of woody biomass correlation was established between biomass obtain from ground observation and the corresponding NDVI value and reflectance values of different bands, different regression equation were tried out between by pixel biomass and NDVI value and reflectance value of different band out of which best correlation value R^2 the next figure showed the correlation value .

It is well documented that certain band ratio (NIR and NDVI) have strong correlation for biomass which in turn has direct relation with the amount of carbon [6] stated that the multilayer absorption of the long crown and small clumped needles of coniferous trees decreases the reflectance as the vertical dimension of the canopy increases. The reflectance saturates when the incoming radiation is almost completely absorbed with the canopy and the observed.

Different regression equations were tried out between per pixel biomass and NDVI values and different band values. Out of which best correlation value (R^2) in logarithmic relationship was obtained. The basal area in Magra - Dhanaulti forests varies from 5.51 to 48.19 (m^2) and biomass varies from 10.41 to 260.88 (tones/ha). Correlation of biomass and basal area in the study area is down in Figure 3 and termination of coefficient is R^2=0.9, reflectance value chewed in fig 4 to 8.

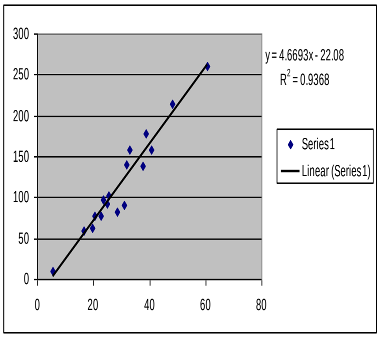

Figure 3. Correlation of biomass and basal area

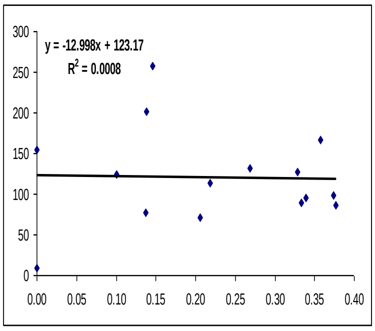

Figure 4. Reflectance value NDVI

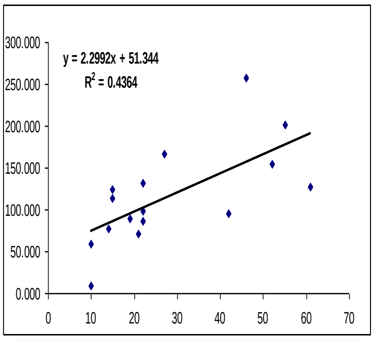

Figure 5. Reflectance value B5

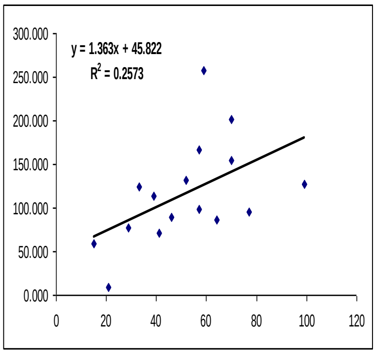

Figure 6. Reflectance value B3

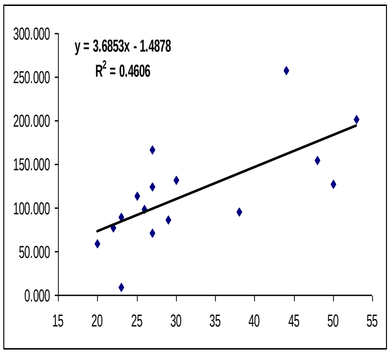

Figure 7. Reflectance value B4

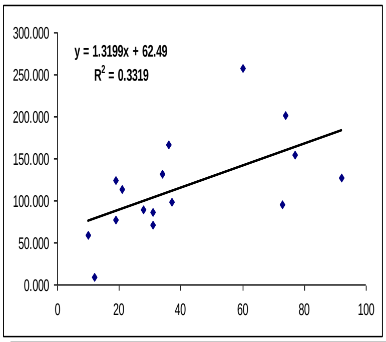

Figure 8. Reflectance value B6

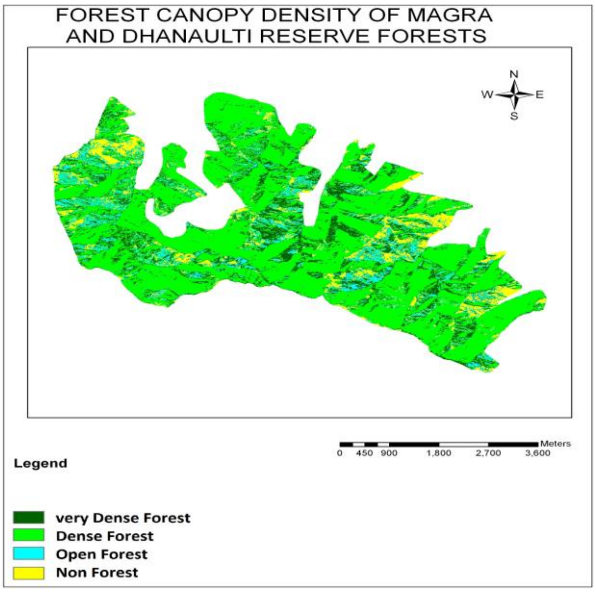

Figure 9. forest canopy density

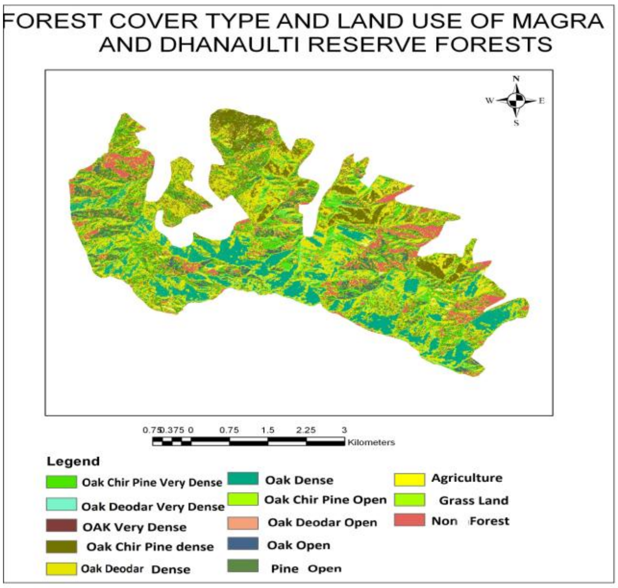

Figure 10. forest cover type and land use

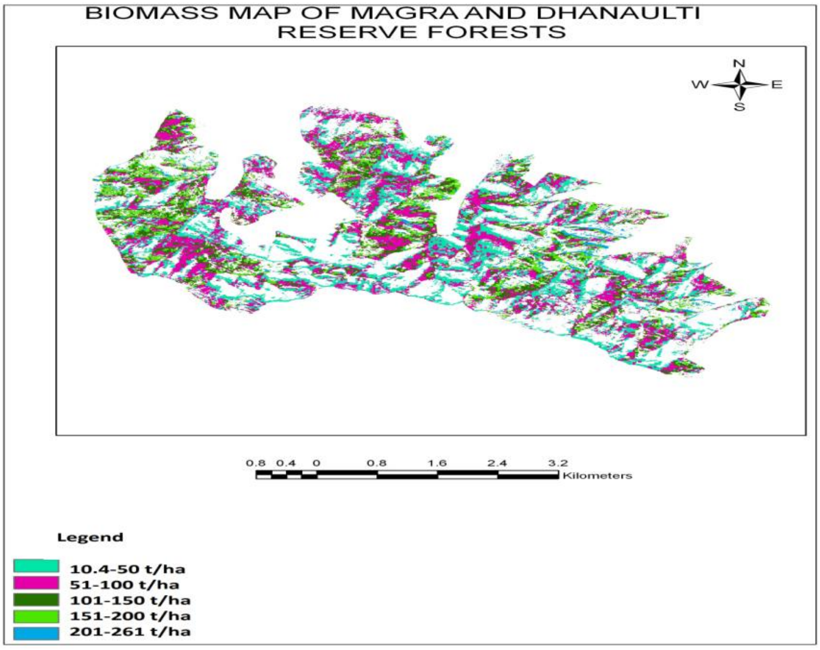

Figure 11. Biomass map of magra and dhanaulti forest

4. Conclusion.

The study demonstrated that LISS IV and land sat could be effectively used for discrimination of the forest cover type and land use ,GIS has been used as a powerful tool for preparation of spatially accurate type map ,density map ,and forest stratified map ,tree volume map ,woody biomass map at faster speed while interpreting results of accuracy assessment ,it is important to bear in mind that differences between the map and control data may be attributed to many reasons ,besides actual error in mapping .The remote sensing systems have their own limitations ,whereby radiometric and geometric errors creep in and reduce the quality of remotely sensed data .the radiometric errors can arise due to random variations in the functioning of the sensor or by the intervening atmosphere between the terrain and remote sensing system ,the radiant flux reflected by the terrain may not resemble the energy recorded by the sensor .There are many options for establishing the control data in case of wall to wall mapping ,ideally the sampling units could be randomly distributed over the whole assessment area. However, there are certain limitations in this approach ,firstly ,it is difficult to collect data physically spread over a large area ,as it would require massive manpower ,time and cost secondly ,there is a time lag between the date of satellite data used and the ground and that on image datasets.

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