APPLICATION OF REMOTE SENSING IN FOREST COVER MONITORING IN VADODARA DISTRICT

SUMMARY
OF
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Summary

1. IRS 1C LISS III satellite data proved to have potential for forest cover studies in this area.

2. The satellite data of the November/December months were found to be suitable for forest cover analysis of this area. This period corresponds to the phenology of full foliage stage of different tree species in the present study area.

3. Eight forest classes i.e. Closed Teak Forest, Closed Mixed Forest, Open Mixed Forest, Degraded Forest, Scrub, Scrub with Coppice Forest, Sparse Tree Cover and Sparse Tree Cover with Agriculture were delineated, based on tonal variation.

4. Of the three rounds viz. Sajwa and Kalarani round in Pavijetpur range and Boriad round in Boriad range, forest cover of Sajwa round covered 27.1% of the geographical area when compared with Kalarani and Boriad rounds which had forest cover of 12.28% and 14.3% respectively.

5. The mapping of forest cover carried out was shown to be very accurate in these rounds. The overall classification accuracy in these rounds varied from 91.67-95.63% whereas the overall mapping accuracy ranged between 85-92%. The Kappa coefficients varied from 0.89-0.95.

6. Village-wise forest cover statistics generated for the year 1999 highlighted the villages, which require immediate attention in terms of vegetation regeneration.

7. Land use classification classes showed agriculture occupying a maximum area in all the three rounds i.e. greater than 65% of the geographical area of each round.

8. Soils of all the forest classes had a higher nutrient status (both macro and micro) in their topsoil. Some exceptions have been observed where the concentration of micronutrient like Mn, Fe and Cu and macro nutrient like N, P and K increased in bottom soils. Fe and N in closed mixed forest and degraded forest, Cu and Fe in degraded and scrub forest and P and K in open mixed forest increased in bottom soils.

9. *Holarrhena antidysentrica* was the dominant species in closed teak forests of Panchpadha and Phenaimata and closed mixed forest of Degala RF classes.

10. Open Mixed Forest of Kalarani RF also showed the dominance of *Holarrhena*, but also had *Azadirachta*, *Diospyros* and other grass species equally dominating.

11. Degraded Forests and Scrubs showed preponderance of grass species.

12. When compared with the other digital enhancements techniques, contrast enhancement viz. histogram equalization proved better.

13. Though NDVI and PC2 yield good result improved enhancement could be achieved only in the combined image of R, NIR, NDVI and PC2.

14. Supervised classification of the image proved to be the best and an efficient method for distinguishing forest classes.

15. All the four bands, 1,2,3 and 4 i.e. green, red, near infrared and short wave infra red contributed in distinguishing the forest classes and major land use categories.

16. Forest classes had distinct spectral features and this could be attributed to different parameters like crown density and plant characteristics.

17. Monitoring of forest cover showed the changes in the forests area of each round.
    a. Sajwa round forest cover in 1970 was 4958 ha. In 1999 it got reduced to 4496 ha.
    b. Kalarani round had 2,358 ha of forest cover area in 1970. It decreased to 1,965 ha in 1989 but in 1999 it increased slightly and covered 2,055 ha.
    c. Boriad round showed a decrease in forest cover from 1970 to 1999. It had 2,412 ha of land under forest in 1970, 2,357 ha in 1989 and 2,297 ha in 1999.

18. Sajwa, Kalarani and Boriad rounds had forest cover of 0.095, 0.05 and 0.1 ha/capita respectively according to FSI criteria and 0.06, 0.024 and nill ha/capita respectively according to criteria laid down by NRSA

19. Precise criteria's like factors of soil erosion, slope, nearness to roads, soil and other affecting the forest cover when incorporated in GIS mode along with spatial data from remote sensing provided suggestions to existing working plan. Thus RS-GIS approach was able to overcome the limitations of working plan.

20. It has been suggested that the existing working circles viz. main, protection and afforestation working circles in the entire study area should be changed to improvement, preservation, afforestation and grass working circles.

21. The Sajwa round had main, protection and afforestation working circles whereas according to the suggested plan produced, these circles should be changed to improvement, afforestation, grass and preservation working circles. Afforestation has been suggested in more than 30 % of forest area of this round.

22. The Kalarani round had afforestation and preservation working circles. The suggested working circles have alloted more than 60% of the area under preservation working circle. As soils of most of the forests classes are prone to soil erosion, immediate soil and moisture conservation measures are needed for this

area. The remaining forest area therefore has been allocated to grass, afforestation and improvement working circles.

23. The Boriad round which did not have any working circle need immediate implementation of three working circles i.e. afforestation, grass and preservation working circles and that afforestation working circle should constitute a major portion i.e. 53.11%.

24. Remote sensing and GIS technique has proved to be cost effective and accurate when compared with conventional methods for forest monitoring. An amount of Rs. 7,02,410/- can be saved for an area of app. 545 sq.km. by adopting this advanced technique.

Conclusion

Forest cover in this study area represents a typical scene where population pressure and the resultant demand from the rural and tribal populations have changed forest and landuse status drastically. The destruction and degradation of forests in this area has raised one of the greatest environmental threats wherein quantity and quality of the forest is diminishing. Due to the changed scenario it is high time that this vital resource is properly evaluated for its sound planning and management. A concrete action plan is therefore needed to reverse the process of deterioration of forests.

This study has shown that remote sensing and GIS approach can aid in generating such a plan. It can meet many of the

information needs for forest management in a short time at a low cost and in the format desired by the forest department. Thus all plans regarding this resource should aim at sustainable development and this can be achieved only through eco-friendly development of forest stock with an RS-GIS approach.

The established relationship of forests as well as other attributes information in a GIS mode as applied in this study, will prove useful for resource inventory, for microlevel planning or while revising the existing working plan in this area (Annexure I)

Re-allotment of the existing working circles as suggested in this study is imperative for solving the problems involved in maintaining a sustained supply of natural resources and for the contemporary needs and futuristic projections of demands of the people of this area.

Statistics of the forest cover area generated from the spatial data during this study has emphasized the fact that, future exploitation of the forest as a source of revenue has to be reduced to a bare minimum as it will lead to an enormous increase in non-tangible benefits of the forest. If this is not done the result will be a virtual point of no return from the forest ecosystem of this area. There will be nothing left for posterity.