15.0. Conclusion

In the present work different aspects of forest have been highlighted, Forest studies require inventories which is labor intensive. They require advanced technologies to reduce cost time and to produce information at different levels as per requirement of forest planner and manager. This information includes different structural properties, estimates of existence and growth, diagnosis of the health status of forest and land use and the changes in forested areas. It also requires information regarding the diversity of the forest ecosystem. Hence, these areas have become a priority for forest research.

Several measures of species diversity have been recommended to assess biodiversity. Such evaluation of diversity is an enormous task, and any methods that can be adopted to reduce the amount of time spent collecting this data are therefore of interest. Remote sensing represents such method, which has been utilized in the studies of forest diversity assessment of Dediapada Taluka.

Further, a successful attempt was made to generate a detail information about tree structural parameters and their relationship with each other. This helps in generating the regression model, which can be used for further predication. In order to aid foresters, in action recovery program of forest, detail tree damage assessment was carried out which gave an idea of the health of five dominant tree species *Tectona grandis, Butea monosperma, Dalbergia sissoo, Terminalia crenulata, Madhuca indica.* The understanding of phenological changes in recent year of climate change gave a brief idea about the shift in phenological patterns in relation to the abiotic factor, temperature, and rainfall.

This study also demonstrated the utility of both optical and microwave remote sensing data in generating a huge amount of forest information related to biomass, forest condition, phenology along with the precise information on tree structural parameters. The use of polarimetric Radarsat -2 and ENVISAT-ASAR data are more practical for forest monitoring due to their mapping results specifically due to its all time weather acquisition capability, but fusion techniques seem to be better. The fusion Techniques such as Brovey, MIHS, and Ehler's have also proved their potential in forest classification accuracy.

Polarimetric decomposition can be used to study and interpret fully polarimetric data for forest applications. It is shown that the Cloude-Pottier decomposition offers a meaningful way to describe characteristics of land cover classes. In the case of forest degradation, the Entropy parameter was influential for discriminating different levels of forest disturbance. Healthy forests have high value of Entropy, indicating a strong contribution of a volume scattering mechanism. As the degree of disturbance increases, the Entropy declines. It shows a decrease of depolarizing agents (vegetation canopy) and increasing single scattering mechanism (in this case, double bounce process). The effect of stronger penetration of C-band on a canopy was indicated in understanding the health status of forest.

To be precise the study has brought out the utility of both optical and microwave remote sensing data in understanding the forest parameter of Dediapada Taluka.

Remote sensing data can effectively provide a synoptic view over the large areas and greatly increase efficiency and usefulness of limited conventional methods. So it can be used as a tool in AGB (aboveground biomass) estimation. Therefore, remote sensing

based AGB estimation has increasingly attracted scientific interest. Biomass estimation using optical remote sensing data is usually realized by revealing the correlation between biomass and spectral responses and vegetation indices derived from multispectral images. Biomass map using ENVISAT-ASAR data was generated utilizing Multiple linear regression model.

The ENVISAT-ASAR and the Radarsat-2 data were used to derive backscatter information, which was used to determine for further characteristic of forest. The C-band showed the surface characteristic of forest. Phenology of tree species was also correlated with the backscatter. Microwave signatures of various forests show the influence of these parameters on radar signal strength. Estimation of these parameters requires a detailed knowledge of the ground survey along with microwave data. The vegetation index retrieved which is an indicator of forest health showed slight decrease in forest health; the vegetation water Index also supports this. The Vegetation indices were also correlated with different biochemical and biophysical parameters which helped us in knowing the health status of forest. It was seen that the trees in the protected areas were in much better condition than those that were presented in non-protected areas.

Optical remote sensing data and microwave remote sensing data are complementary to each other. The classification results indicated that the possibility of extracting more and accurate information from fused images and it proves to be of great benefit to forest management. It helps to reduce the effect of cloud cover and supply more information about multi-storied forest canopy and can therefore directly contribute to sustainable forest management. Hence, the fusion of these data would help in improving the classification accuracy.