Chapter 6
6. Summary and Conclusion

It can be concluded from the study that fire has a varying degree of impact on tree species diversity, regeneration, biomass and soil properties. Different fire frequencies affect these properties very differently ranging from beneficial to devastating impact on tree species and soil properties.

Fire frequencies were ranged from 0-6 in 15 years of study period with maximum fires recorded in the months of February and March. The annual rate of burning in MTR was 9.78% during the study period. The annual rate of area burned was significantly reduced (9.78%) compared to an earlier study of Kodandapani et al. (2004), who reported three times higher rate (30%) of burning between 1989 and 2002. Most of these fire incidences were recorded in dry deciduous forest and least in the moist deciduous forest. Fire occurrence was mostly associated with roads and footpaths and least with settlements.

Totally, 50 species in 41 genera and 26 families were found. *Tectona grandis*, *Terminalia crenulata* and *Anogeissus latifolia* were the most dominant species. Diversity decreased and dominance increased after single fire. The number of small stem size increased after single fire. The number of seedlings increased immediately after fire but saplings and trees initially decreased but increased after five years. Diversity decreased and dominance increased uniformly with increasing fire frequencies. Number of small stem size increased with fire frequencies and stem density decreased. Low frequency of fire (B1, B2) has enhanced seedling, sapling and tree density. Mid frequency of fire (B3, B4) has affected seedlings but not trees. High frequency of fire (B5, B6) has significantly affected stem density and regeneration negatively. All fire frequencies (B1–B6) have shown a negative impact on the diversity of tree species.

AGB decreased both in single as well as in multiple fires. AGB of *Tectona grandis* and *Terminalia crenulata* increased initially with increasing fire frequencies but decreased with high fire frequencies.

Single fire does not impact pH, Bulk Density, WHC but EC decreases initially after fire. Soil organic carbon decreases after single fire and could not recover
to the level of control even in 15 years. Total N, available P and extractable K decreases after fire but are higher than control after 15 years. While available nitrogen (NO$_3^-$ and NH$_4^+$) remain unchanged or higher than control after single fire pH, EC, WHC decreases after multiple fires while bulk density increases. Organic Carbon, total N and available P decrease with increasing fire frequencies whereas extractable K initially increases but decreases with very high frequency of fires. In available nitrogen forms, NO$_3^-$-N slightly decreases with high fire frequencies but NH$_4^+$-N decreases significantly with increasing fire frequency.

These results provide a new insight regarding the influence of fire on trees and soil that will be valuable to understand the effect of fire on recovery of soils and plants.

Further studies are required to understand:

- Future responses to post-fire changes and to build a predictive model for different burned forest environments.
- Studies to prepare runoff and erosion models for burned forest environments are required.
- Mapping of burn severity and better characterization of post-fire soil water repellency.
- Plant species, which are highly affected by fire, should be studied in different fire regimes.
- Studies are also required to understand impact of fire on soil microbes.