

- The present study showing that above-ground biomass (AGB) and soil organic carbon (SOC) are linked together, shows curvy-linear relationship across tropical forest covers of Gujarat.
- Results from the present study highlight that mean annual precipitation (MAP), spatial variability strongly dominate modes of carbon variability across space, further balanced by the role of vegetation cover, plantations, and *Prosopis*.
- Parameters like MAP, AGB, SOC, and microbial biomass carbon (MBC) are significantly different across the study area. Further the interdependency of these parameters is varied across RFZs 1–4 showing strong impact of climatic variable rainfall on the relationship and variability in values of these parameters.
- It has been observed that MAP has a significant positive impact on AGB and SOC of the studied tropical covers of Gujarat.
- It was found that AGB values dependent on tree species, biophysical parameters and MAP received by the land cover.
- SOC values differed significantly across different depths up to 25 cm depth in soil. The values further significantly different from each other across RFZs 1–4 showing impact of rainfall. Higher values of SOC in the top layer of soil (0–5 cm) showed significance of fresh carbon input through plant litter to top layer of soil. This inference was supported by the litter decomposition experiment in the present study.
- Positive correlation was found between SOC and MBC (no correlation between AGB and MBC) indicated that MBC is more regulated by SOC.
- Climate projections of drier conditions (e.g. from RFZ–2 to RFZ–1) would lead to shift in species dominance to those found in RFZ-1, with lower

species diversity, biomass, and height, leading to decline in litter input, and eventually decreases in total SOC and MBC. This effect may be hastened by the spread of invasive species, such as *Prosopis*.

- AGB and SOC values were found to be proportional to species diversity at RFZs – 2 to 4.
- Management activities (plantation by forest department) observed across the zones revealed its importance in lessening the negative impact of LULC alterations.
- In cases of previous severe human disturbance (deforestation), plantation of suitable tree species acclimatized to a rainfall zone is likely to have an ameliorating effect on AGB of the region. This again requires further research.
- Because of the greater adaptability, introduced species, *Prosopis* contributed sizeably to AGB and SOC at RFZ – 1.
- Through the litter decomposition experiments, it has been shown that SLA, leaf chemistry, LCI are important leaf characteristics having significant impact on litter decomposition.
- From the results of this study, an inference can be drawn about the short term differences in  $k$  values having minimal impact on long term dynamics of SOC.