Exploring the Relationship Between Community Biomass and Net Ecosystem Exchange (NEE) in a Montane Cloud Forest

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The forest ecosystem is Taiwan's most predominant ecological system, contributing not only habitats to sustain biodiversity but also possessing a robust carbon sequestration capacity, making it a focal point of concern and research in the face of climate change. This study is situated in the cloud-covered forests of the northeastern mountainous region of Taiwan. These forests are consistently enveloped in fog or cloud, affecting their ecological dynamics. Previous literature, through the collection and analysis of flux tower data, has indicated a decline in net ecosystem exchange over a decade in the Chilan cloud forest (Yu, J.C., 2023). Several potential factors influencing this decline in net ecosystem exchange have been mentioned, including a reduction in annual shortwave radiation, decreased efficiency of photosynthesis due to forest aging, and declining yearly temperatures, among others. However, the relationship between community biomass and net ecosystem exchange was not considered in the literature.

In theory, when the community biomass within an ecosystem decreases, it leads to a reduction in overall biological respiration, indirectly causing a decline in net ecosystem exchange. To further explore the relationship between community biomass and net ecosystem exchange in the Chilan cloud forest, this study employs the Enhanced Vegetation Index (EVI) calculated from MODIS satellite data as an indicator of community biomass. The study examines EVI at two time scales: 16-day intervals and annual averages, to investigate whether there is a seasonal decline in EVI. The results reveal a descending trend in both cases. However, during data processing, it was discovered that cloud formation interferes with EVI, leading to lower values. Therefore, subsequent research will involve recalculating EVI after appropriate processing to ascertain whether the decline in net ecosystem exchange in the Chilan cloud forest is indeed attributable to the reduction in community biomass.