

Estimation of Aboveground Biomass in Cocoa Cultivation using Remote Sensing of Tolima, Colombia

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Abstract

The increase in greenhouse gases is linked to climate change, with carbon dioxide being one of the most abundant. Agroforestry systems and forests are the main carbon reservoirs in their aboveground biomass. Remote sensing is a source of data for the indirect assessment of aboveground biomass and carbon. In this study, biomass was estimated using remote sensing and field data from cacao agroforestry systems in the Tolima region of Colombia and The total carbon content was determined based on the Greenhouse Gas Protocol (GHG). Thirteen farms distributed across the northern, central, and southern areas of the department were included in the study. Field data was collected, including diameter at breast height (DBH) ≥ 30 cm for cocoa cultivation. The actual aboveground biomass was estimated using an allometric equation and these were correlated using three vegetation indices (NDVI, SAVI, and EVI) obtained from LANDSAT 7, 8, and 9 satellite images from January 2017 to December 2020; Thirteen interviews were conducted with farm managers to identify GHG variables. A mathematical model was developed that defined the relationship between aboveground biomass and the amount of carbon stored, resulting in two equations with affinity to the EVI vegetation index, with R^2 values of 0.53 and 0.73 for the northern and southern zones, respectively. This work reaffirms the use of remote sensing data as a fundamental resource for monitoring forest ecosystems and will serve as a reference for future research involving satellite monitoring.

Keywords

Allometric equations, Biomass, Remote sensing; Vegetation indices.