Quantifying Tree Biomass Carbon and Carbon Credit Potential in a Tropical Golf Course under the T-VER Scheme: Evidence from Summit Green Valley Chiang Mai Country Club

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Abstract

Golf courses are an important land use in urban and peri-urban areas, and their carbon sequestration and involvement in carbon markets are underresearched. Using the case study of Summit Green Valley Chiang Mai Country Club (≈350 rai; 56 ha) in the northern part of Thailand, this study aims to draw guidelines for the assessment of carbon stock in trees for the purpose of carbon credit management in the golf course. In all 18 holes, the species, diameter at breast height (DBH; 1.3 m) and total height of the trees were recorded. The biomass was estimated by species appropriate equations and the carbon stock was calculated using the Thailand Greenhouse Gas Management Organization (TGO) Thailand Voluntary Emission Reduction (T-VER) Programme tools: T-VER-TOOL-FOR/AGR-01 (Version 04) according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4). A total of 3628 trees of 62 species belonging to 60 genera and 23 families were inventoried with the largest family being Arecaceae (65.71%) and the most abundant species being coconut (*Cocos nucifera*) (27.34%). Total carbon stock across 18 holes was 3,654.84 tC, equivalent to about 13,406 tCO_2e, with hole-level stocks ranging from 36.86 tC (Hole 2) to 444.48 tC (Hole 10). Carbon storage was mainly driven by the abundance of broadleaf species with high wood density, even though these species were not common, such as sacred fig (*Ficus religiosa*), cotton tree (*Bombax ceiba*), rain tree (*Samanea saman*) and Siamese rosewood (*Dalbergia cochinchinensis*). The gross monetary value of the tree carbon pool is estimated at USD 115,017.81 (THB 3,887,601.98) at the price of carbon allowances in California (USD 31.47 tCO_2e^{-1}) and the Bank of Thailand exchange rate (THB 33.80 USD^{-1}). The results suggest that a large carbon pool can exist in an intensive managed golf landscape even with the inclusion of broadleaf, high density species in the ornamental palm matrix. The proposed guideline which combines field census, GIS-based geolocation, IPCC/T-VER quantification and species-specific management recommendations offers a replicable framework for golf-course operators in tropical Asia when attempting to get T-VER certified and become involved in carbon markets.

Keywords: Carbon Sequestration; Carbon Credit; Golf Course; T-VER; Tropical Urban Forestry; Allometric Equations; Summit Green Valley; Sustainable Landscape Management