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Estimation of Carbon Stock from Volume and Biomass Equations in a Cloud Forest Ecosystem in Northeastern, Mexico

Javier Jiménez Pérez, Oscar Alberto Aguirre Calderon, Marco Aurelio Gonzalez Tagle, Regina Perez-Dominguez, Eduardo Javier Treviño Garza

University of Nuevo Leon, Departement of Silviculture, Mexico

Abstract

An indicator of climate change is the global warming, produced by the increment of different greenhouse gases concentration in the atmosphere such as the carbon dioxide (CO_2), the methane (CH_4), the oxidise nitrous (N_2O), the sulfur dioxide (SO_2) and the chlorofluorocarbons (CFC), being the CO_2 responsible for the greenhouse effect. The use of fossil fuels and the change of soil use are considered as the two main sources of CO_2 in the atmosphere. The atmospheric CO_2 is incorporated to the metabolic processes of the plants by the photosynthesis and participates in the composition of all the necessary structures so the tree can be developed like the foliage, branches, crown, roots and the stem. This investigation was developed in the Biosphere Reserve El Cielo, which is located in northeastern Mexico and it is located in the Sierra Madre Oriental, with 19,946 hectares. The main objective of this study was the estimation of carbon stock in the cloud forest ecosystem (*Liquidambar styracyflua*, *Quercus sartorii*, *Q. germana*, *Magnolia schiedanea* and *Podocarpus reichei*). Sample plots were taken randomly (1000 m^2), in places that did not present disturbance indicator plants and with a high tree species diversity with different diametric categories. With the field data the volume and biomass determination was carried out for different species. To estimate the tree volume the following models were used V=a0*(d) a1 (hardwood) and V=a0 + a1 *d2 + a2*h + a3*d2*h (softwood). To determine the biomass was applied the equation b=a0+(d), and the best carbon equation was C=0.69322*d(2.3427), where V is the tree volume, b is the biomass dry weight (kg), C is carbon stock (kg), d is the diameter (1.3 m). This model had the best adjustment in the tree species of the cloud forest (r^2=0.95). Subsequently the carbon stock was estimated in the tree stems obtaining 56.7 Mg C ha^{-1} for this forest ecosystem. With this procedure we can evaluate the carbon stock in different cloud forest ecosystems in northeastern Mexico.

Keywords: Biomass equation, carbon equation, carbon stock, cloud forest ecosystem

Contact Address: Javier Jiménez Pérez, University of Nuevo Leon, Departement of Silviculture, Mandarinos 1210, 67700 Linares, Mexico, e-mail: jjimenez@fcf.uanl.mx