COMPARISON OF THE AMOUNT OF CARBON SEQUESTERED IN DIFFERENT LAND USE IN THE AMAZON HIGHLAND, PERU

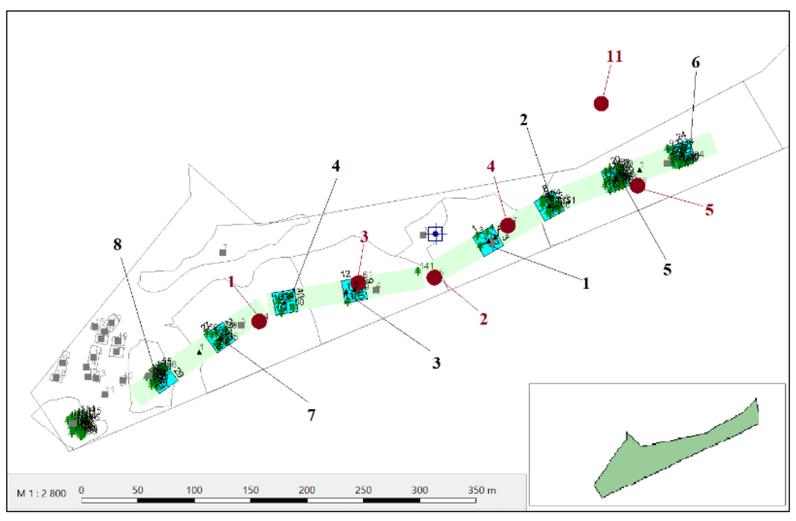
Chalupová Karolína[1], Hernández Castán Jesus[2], Kučera Aleš[1], Kostka Matěj[1], Neubauer Štěpán[1], Mattos Olavarría Jorge[2], Volánek Jiří[1], Volařík Daniel[1], Ehrenbergerová Lenka[1]

[1] Mendel University in Brno
[2] GITEC-IGIP Consulting Group

INTRODUCTION

The Andean tropical mountain forest includes a variety of ecosystems, each possessing some capacity for carbon sequestration. With ongoing climate change, a more comprehensive understanding of the global carbon cycle is crucial. This study aims at evaluate carbon stocks in different types of land use (coffee agroforestry systems, tropical cloud forests, and pastures) in the Peruvian Amazon highland at an altitude of 1760–2470 meters above sea level. From coffee agroforestry systems (CAS), three smallholders with *Coffea arabica* and different shading trees (*Pinus tecunumannii*, *P. oocarpa*, *P. patula* and *Inga* spp.) were selected. These agroforestry plantations were compared to secondary grown sparce forest stands, which represent the regional vegetation of the studied area and pasturelands dominated by *Setaria* spp. and *Cynodon nlemfuensis*.

The findings can help not only to understand the global carbon cycle and establish trade related to it, but also to comprehend the dynamics of local governments in deciding on the most appropriate strategies for setting carbon emission reductions.



Transect 1, Finca San Alberto, Oxapampa

MATERIAL AND METHODS

The study was carried out around the Oxapampa city, the Pasco region; located at 10.574° S, 75.405° W in the vicinity of the National Park Yanachaga Chemillen. In total, 53 study plots (400 m^2) were measured across 7 transects.

All completed transects had a width of 20 meters, extending to a total length of 560 meters, traced in a straight line northward. Tree location, total height, and diameter at breast height (DBH ≥ 5 cm; measured at 1,3 m) were recorded. In total, 16 study plots (100 m^2) were established to monitor coffee plants. The height and diameter at 5 cm above ground level were measured.

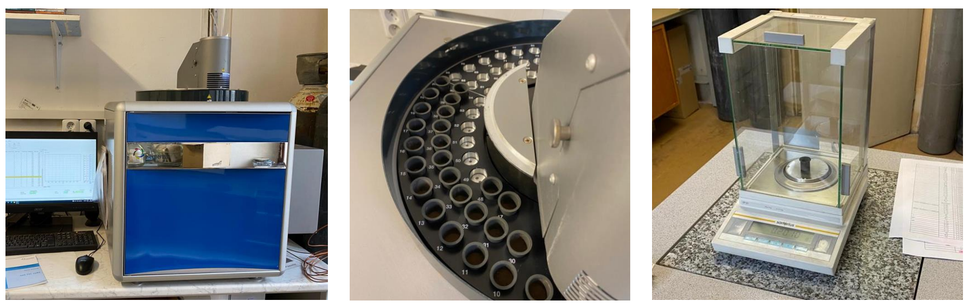
To estimate aboveground biomass, allometric equations by Chave et al. (2014) and Segura et al. (2006) were used. Root biomass was estimated with an equation by Cairns et al. (1997). Aboveground biomass of coffee plants was estimated based on the equation by Segura et al. (2006). The carbon quantity was estimated with a conversion factor of 0,5 (Brown, 2002; Birdsey, 1992; Peterson, 2012), which assumes that carbon content is 50 % of total biomass.

	Equation	Explanations	Author
1	$AGB = 0,0673\ x\ (\rho D^2 H)^{0,976}$	AGB – above-ground biomass (kg); D – diameter at breast height (cm); ρ – specific density (g.cm-3); H – total height of the tree (m).	Chave et al. 2014
2	$Log_{10}Y = a + b \times Log_{10}dbh$	Y – bellow-ground biomass (kg) a – specified coefficient (-0,834); b – specified coefficient (2,223); DBH – diameter at breast height.	Segura et al. 2006
3	$Y(RBD) = [\exp(-1,0850 + 0,9256\ (lnA)]$	Y (RBD) – root biomass (Mg/ha) A – density of above-ground biomass	Cairns et al. 1997
4	$Log_{10}(BC) = -0,779 + 2,338 * Log_{10}(H)$	BC – biomass of coffee plants H – height of coffee shrubs	Segura et al. 2006

Destructive sampling (25 x 25 cm plots) was used to estimate grass biomass in the pasturelands. In each plot, all grass was cut at ground level, weighed fresh in the field and subsequently dried in a forced-air-circulation oven at 60 °C for 48 hours to determine dry matter content. Grass root biomass was collected by excavation to a depth of 30 cm (Lopez-Santiago et al., 2019). Roots were separated from the soil in the water and dried until a constant weight. Final weights were extrapolated to the entire area and a conversion factor of 0,5 (Brown, 2002; Birdsey, 1992; Peterson, 2012) was applied to estimate carbon content.

Types of study landuses

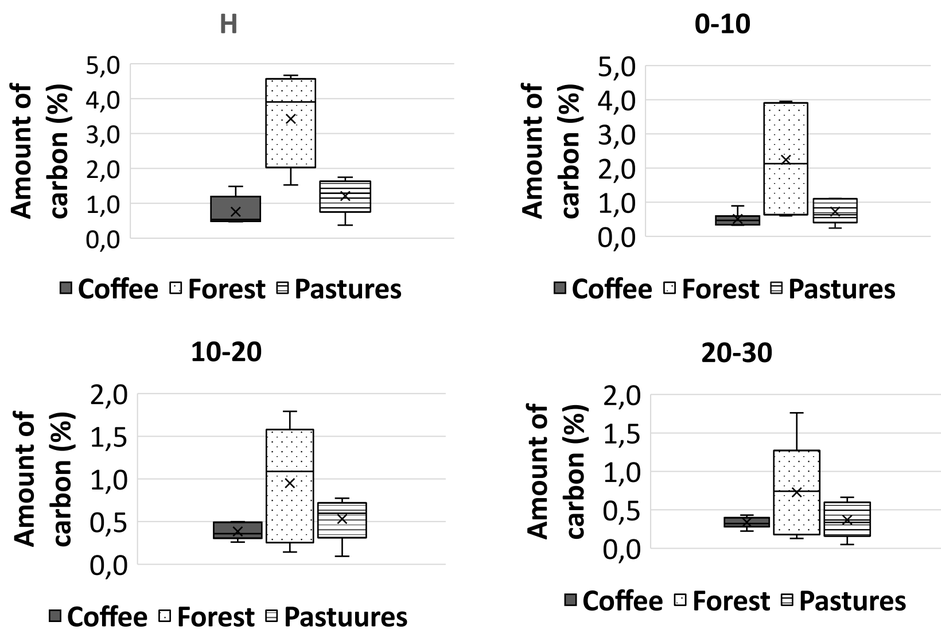
The evaluation of soil carbon stocks (within the depth of 30 cm) was determined based on soil analysis using a Soli-TOC device (Elementar, Langenselbold Germany), where carbon (TOC) was determined by thermal differentiation (DIN19539 method).



Soli-TOC device (Elementar, Langenselbold Germany)

PRELIMINARY RESULTS

Soil carbon values (%) were highest in forest stands in the upper soil layers (34,2 ± 12). At lower depths (20–30 cm) the difference between the studied ecosystems was no longer registered (forest stands: 7,3 ± 3,3; pastures: 3,7 ± 2,1; coffee agroforestry systém: 3,4 ± 0,7) .



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