Mitigation of climate change through carbon sequestration of coffee production systems in Cundinamarca, Colombia

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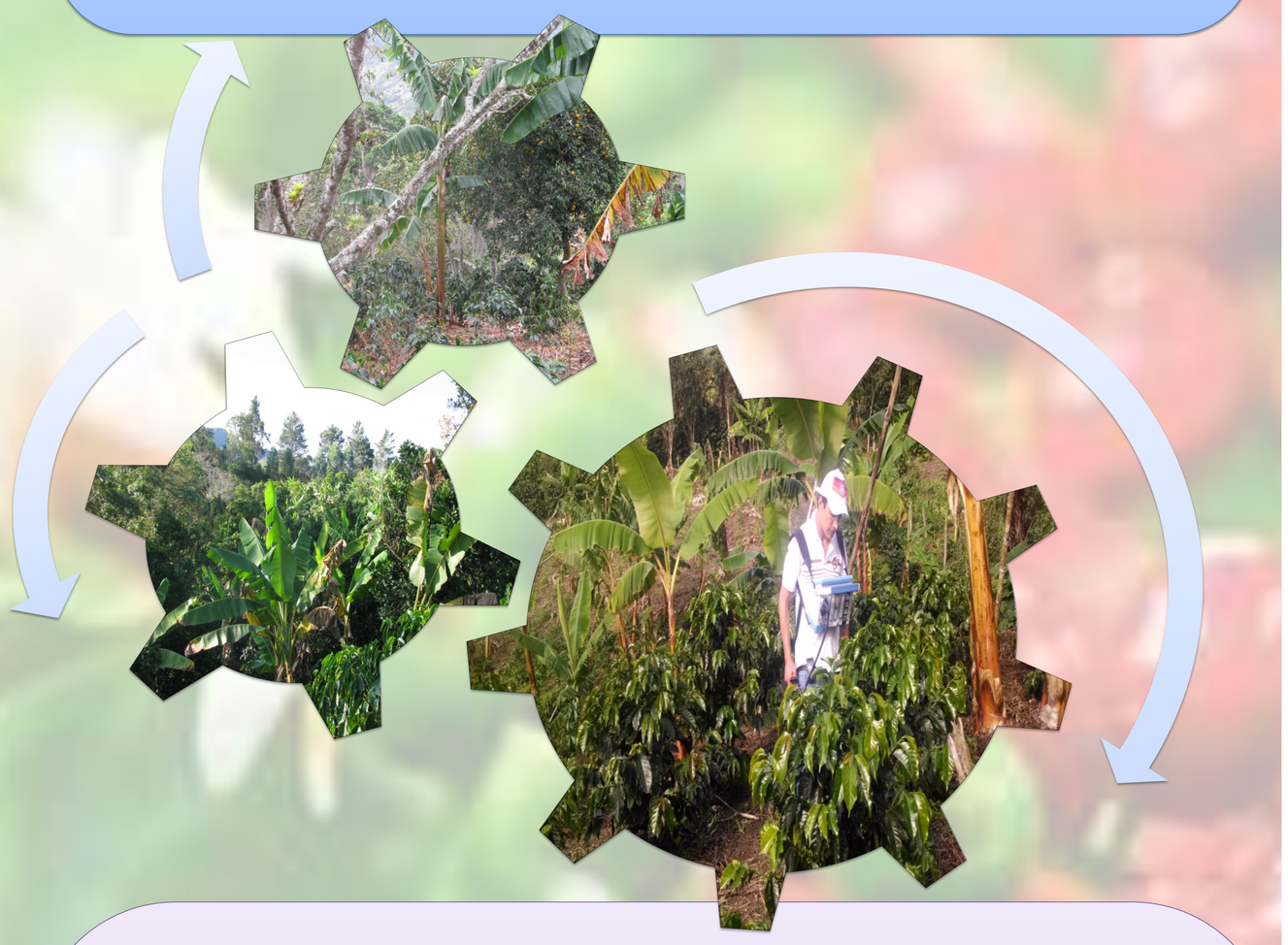
Introduction

Production systems with woody perennial plants, ideally timber trees, are technologies accepted in carbon projects to mitigate climate change through carbon sequestration. This research estimated C storage and fixation in coffee production systems in Cundinamarca, Colombia.



Materials and methods

Carbon in biomass, necromass and soil were estimated in systems with three different shade levels (low, medium and high) in three municipalities (Pacho, San Juan de Rioseco and Tibacuy) using IPCC´s recommendations (2006). Biomass was estimated with allometric equations, being some of them specific. Belowground biomass was estimated with a general model recommended by IPCC. Soil organic carbon was estimated at a 0-30 cm depth, considering the gross fragments. Variance analyses were carried out using the completely randomized design with three treatments (shade levels) and five repetitions per municipality.

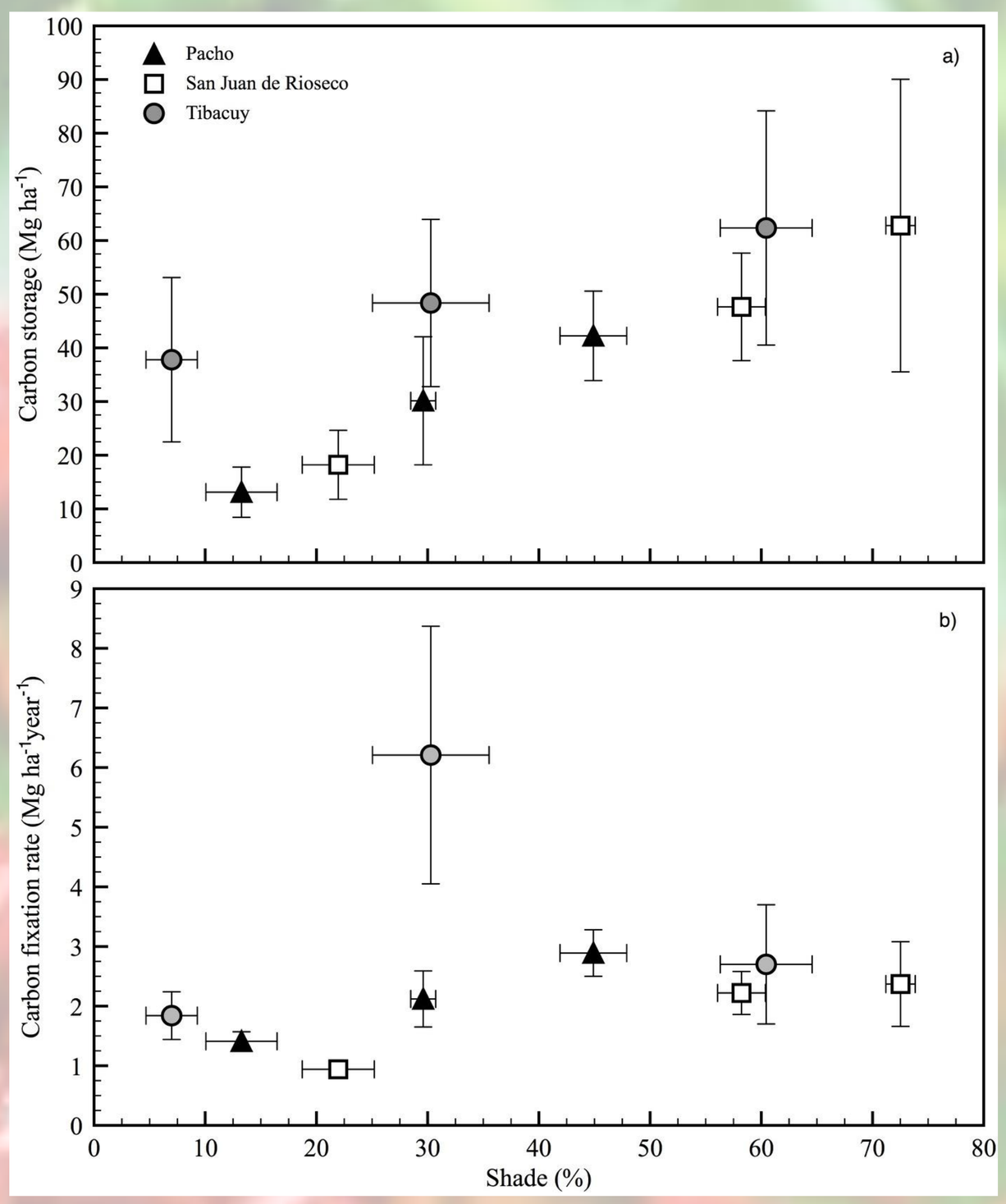


Figure 1. Impact of shade in carbon storage in total biomass and necromass (a) and fixation rate in total biomass (b) in coffee plantations in three municipalities of Cundinamarca, Colombia. Error bars correspond to standard error.

Conclusions

These coffee plantations fixed a mean of 2.3 Mg C ha -1 year -1 , with a maximum value of ~7.1 Mg CO 2 ha -1 year -1 under a shade of 30-40% (Figure 1b). Coffee plantations, especially with high shade, have a high potential of C fixation and mitigate climate change.

Results

Soil stored 75% of the total C (93.9-137.7 Mg C ha -1), followed by trees (19%). Carbon increases with a rise in shade (55.8 vs 42.0 vs 23.0 Mg C ha -1 for high, medium and low shade, respectively) (Figure 1a). Coffee bushes contributed just with 6% of total C in biomass and necromass; whereas necromass was the less important component (1-6%).

References

Intergovernmental Panel on Climate Change (IPCC). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Tokio: IGES; 2006.