Impact of Sugarcane Cultivation on C Cycling in Southeastern United States Following Conversion From Grazed Pastures

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Background/Objective

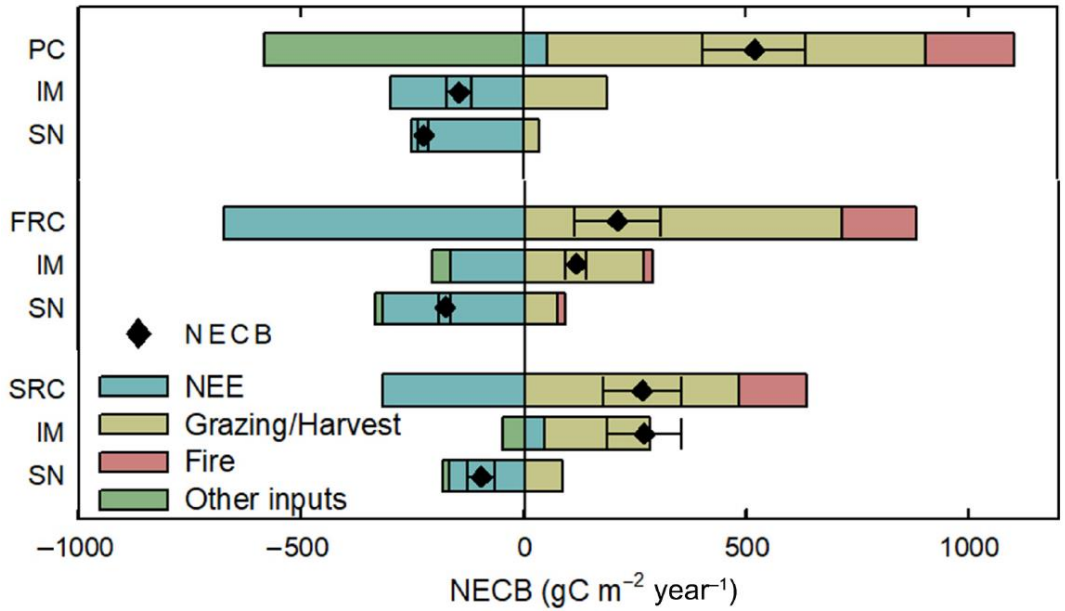
- The expansion of sugarcane is likely to reshape the bioenergy landscape in the southeastern U.S (SE US).
- Cane sustainability as it displaces pastures, a current dominant land use, is uncertain.
- We investigated how pasture conversion to sugarcane in subtropical Florida impacts net ecosystem CO_2 exchange (NEE) and net ecosystem carbon (C) balance (NECB).

Approach

From 2019 to 2022, measurements were made over three full growth cycles in sugarcane: plant cane (PC), first ratoon cane (FRC), and second ratoon cane (SRC); and in improved (IM) and seminative (SN) pastures at Archbold Biological Station (FL, USA). Measurements included biometric and eddy covariance methods. Cane was burned prior to harvest in keeping with common practices.

Results

Cane was a stronger annual net sink of CO_2 (NEE) than pastures. However, accounting for all C gains and losses (NECB), sugarcane was a sustained net C source. Time since conversion reduced C losses from cane, and the NECB of SRC was similar to that of IM pasture but lower than that of SN pasture, indicating a rapid shift in the NECB of cane. Findings suggest that: 1) the overall impact of cane cultivation on C storage will depend on the amount of IM and SN pasture converted; and 2) no-burn harvest management will be critical to the development of a sustainable bioenergy landscape in SE US.



Negative values indicate C uptake and positive values indicate C loss. NECB values show overall C balance of the system, with negative values indicating a net sink and positive values a net source.

Significance/Impacts

Given that bioenergy from sugarcane production is considered a key mitigation strategy for climate change, future work should focus on optimizing management and breeding strategies to enhance the environmental sustainability of sugarcane.

Gomez-Casanovas, et al. 2024. "Impact of Sugarcane Cultivation on C Cycling in Southeastern United States Following Conversion From Grazed Pastures." *GCB Bioenergy*. DOI: 10.1111/gcbb.70003.