Ecosystem Outcomes & Carbon Dynamics in Agrivoltaic Grazing Systems

Taylor Bacon, Department of Soil & Crop Sciences, Colorado State University – Advised by Dr. Keith Paustian

Motivation

Integrating grazing & solar energy generation has many potential benefits, but important questions remain to be answered:

Can we co-optimize **energy generation**, **livestock grazing**, and **ecosystem services** on the same piece of land?

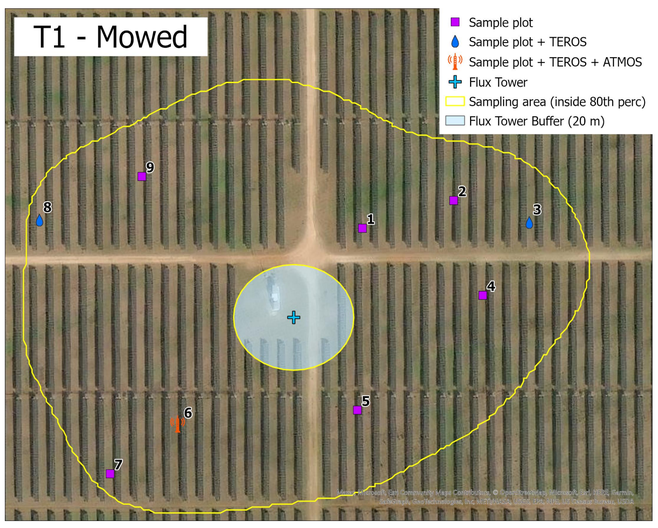
How does the integration of solar energy generation and livestock grazing alter ecosystem outcomes and carbon cycling?

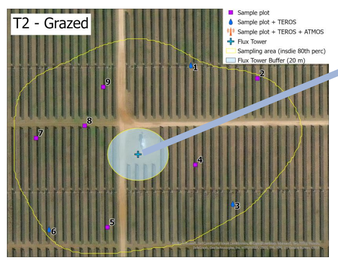
Bluffton, Georgia, USA

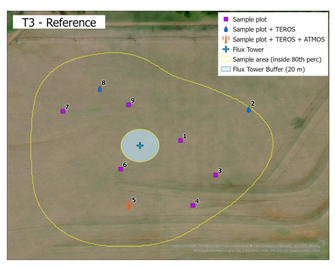
Partnership with ranchers & solar developers to study multi-use land management systems

Experimental Design

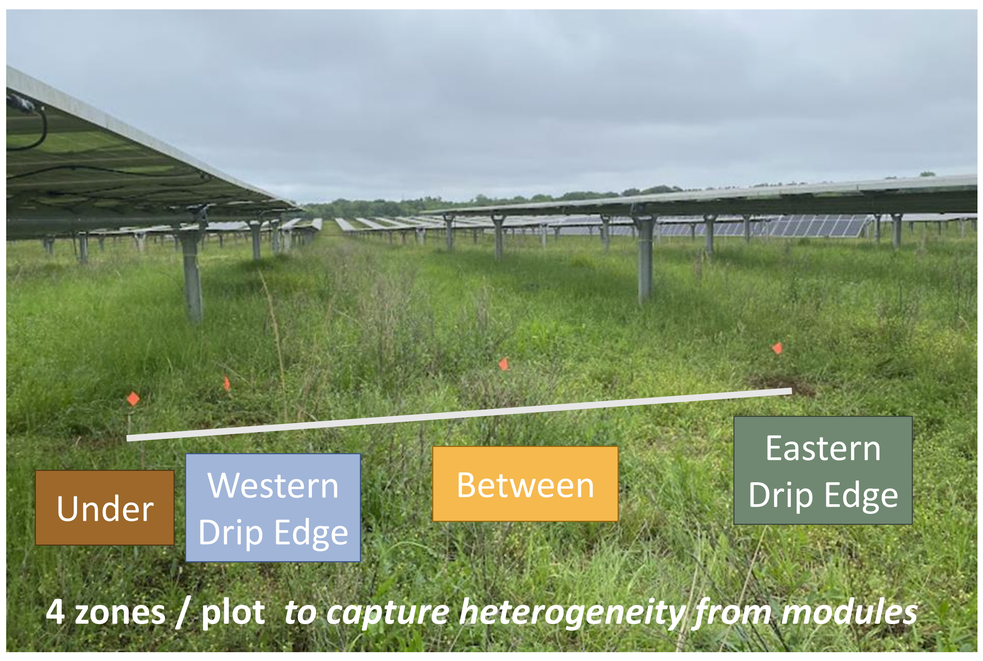
Three treatments of ~ **30 acres** comparing single- vs multi-use land management systems





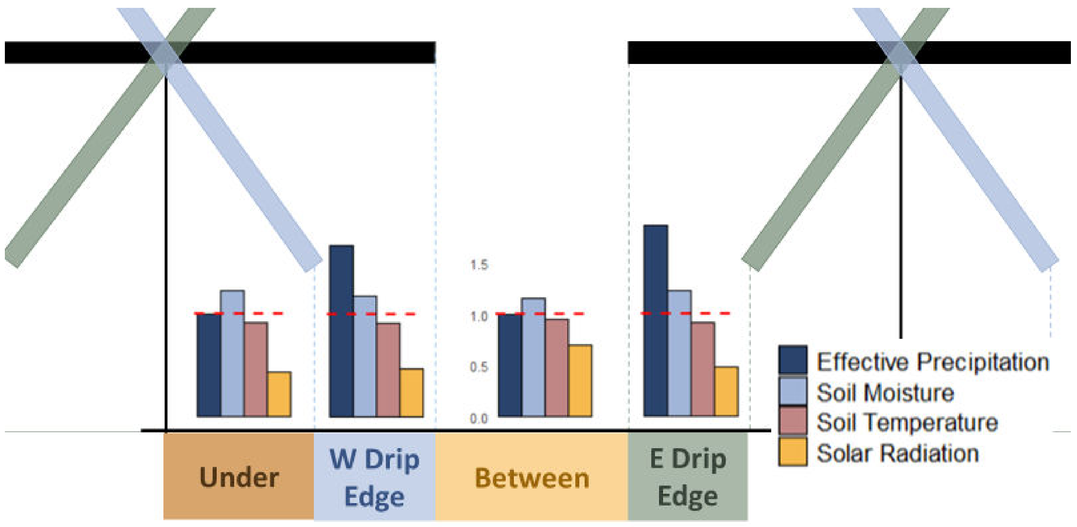


9 plots / treatment

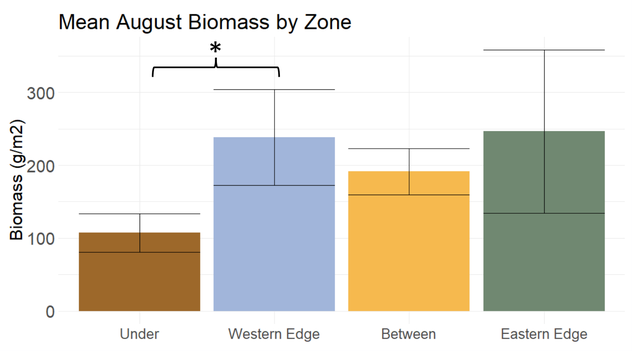


Preliminary Results – Summer 2023

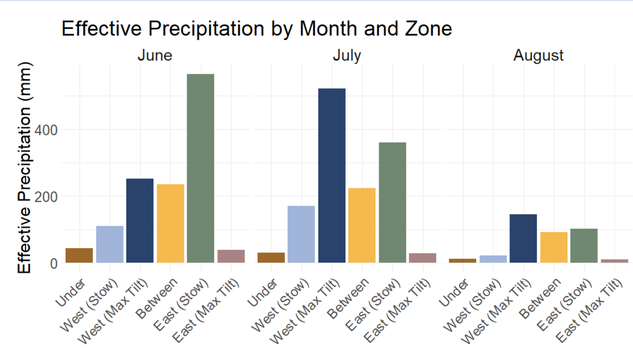
Microclimate data from summer (June - August) 2023, normalized to reference conditions



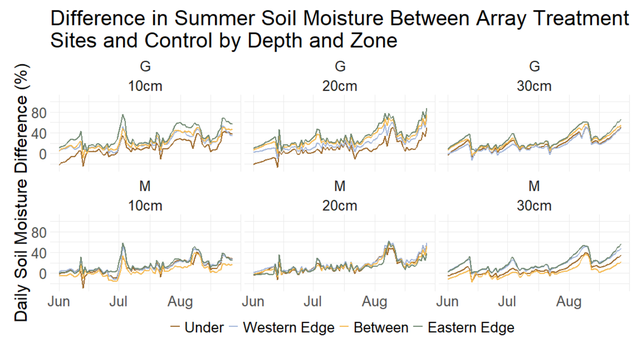
Despite variability in solar radiation and amount and timing of precipitation, there is no significant difference in biomass across the Drip Edges and the Between zone.



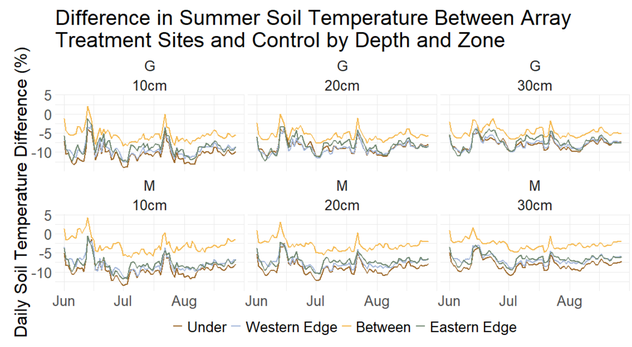
Effective precipitation varies significantly across zones, with the Drip Edges receiving substantially more moisture. The East Drip Edge is favored in June, while the West Drip Edge is favored in July.

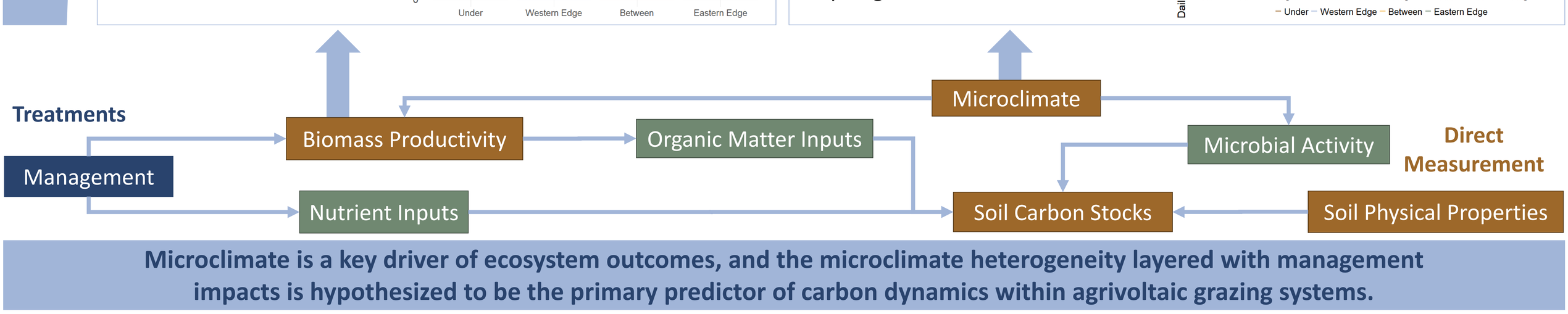


Soil moisture can be over 60% higher in the array compared to an open pasture, with the greatest differences observed at the Drip Edges.



Soil temperature can be over 10% lower in the array compared to a pasture reference site, with the most notable differences directly Under the modules and within the Drip Edges.





Microclimate is a key driver of ecosystem outcomes, and the microclimate heterogeneity layered with management impacts is hypothesized to be the primary predictor of carbon dynamics within agrivoltaic grazing systems.

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For additional information, contact tbacon@colostate.edu or visit *siliconranch.com/cattletracker*