COVER CROP TERMINATION TIMING EFFECTS ON SOIL AND COTTON NUTRIENT AVAILABILITY

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ABSTRACT

Depletion of groundwater resources in the Southern High Plains (SHP) of Texas drives a need for more regenerative agricultural practices in semi-arid regions. Here we define regenerative agriculture in the context of the SHP as the *continued capacity of agricultural systems to function in a changing climate that supports soil health, communities, economic output, environmental sustainability, and resiliency to the outside threats of those outcomes*. Within the capacity of this definition, our core values for regenerative agriculture are to 1) *maintain economic viability of the system*, 2) *optimize soil water conservation*, 3) *minimize soil disturbance*, 4) *maintain soil surface coverage*, 5) *incorporate a living root in the soil for as long as possible*, and to 6) *minimize the global climate change effects derived from agricultural practices*. Regenerative practices relevant to the region and associated core values include the implementation of ***cover crops***, crop rotations, conservation tillage, and livestock integration. Cover crop termination timings can have large impacts on the amount of soil coverage, nutrient availability, and stored soil moisture in a system. Producers in semi-arid regions must gamble the possibility of increased soil infiltration and reduced soil water evaporation against the potential of decreased soil moisture; in the SHP, success is dependent on irrigation capacity and precipitation. *Optimizing termination timings for semi-arid regions and in deficit-irrigation/dryland systems is critical for the success of regenerative practices across this large agricultural region.* Small unmanned aerial systems (sUAS) can be used to observe plant physiological parameters across large areas. This data in tandem with ground-truthed soil parameters and plant characteristics can be integrated into crop simulation models to create high-throughput diagnostic tools to determine the sustainability of regenerative agricultural practices in semi-arid regions. sUAS was used to collect field images via multispectral lenses, capturing 6 separate bands of light per photo (RGB, red [630-690 nm], green [510-580 nm], blue [450-510 nm], red edge [670-760 nm], and NIR [700-1,200 nm]). Flights were conducted at or as close to solar noon as permissible with a minimum vertical and horizontal image overlap of 80% to ensure total mapping area coverage. Flights were taken at 8, 6, 4, and 2 weeks from cotton planting and at key cotton growth stages (pinhead square, full bloom, and first cracked boll). Volumetric water content (θ) was determined at soil depth (0-10 cm, 10-30 cm, 30-60 cm, and 60-90 cm) at each 2-week timing interval from cotton planting (8 weeks from cotton planting, 6 weeks, 4 weeks, and 2 weeks) and at cotton planting (0 weeks; 5/16/23). Year one of the study showed no significant differences in cotton lint yield between treatments within irrigation level.