The Impact of Variable Soil Water Tension Irrigation Thresholds on Georgia Peanut Production

By Hannah Grubbs, Wesley Porter, and Cris Pilon

Objectives: Previous studies have demonstrated a 45 kPa static soil moisture threshold as the most effective at accumulating yield and maintaining profitability. This study aimed to identify a sequence of variable soil moisture statuses to better match varied in-season crop water requirements. By implementing variable soil water tension irrigation thresholds, we hoped to identify a treatment that maximizes yield, profitability, and irrigation water use efficiency (IWUE).

Methods: The study was conducted at UGA's Stripling Irrigation Research Park near Camilla, GA under a variable rate lateral irrigation system (Valmont Omaha, NE). The research area contained twenty-seven research plots consisting of three replicates of each of the nine treatments. Of the nine treatments, eight were irrigated and the last was a rainfed control. Irrigated treatments were based on simulating wet, optimal, and dry soil conditions at 20 kPa, 45 kPa, and 70 kPa respectively, and soil water tension thresholds were changed at 40 and 110 days after planting correlating to flowering and pod fill growth stages, respectively. Soil moisture was monitored using Watermark soil water tension sensors (Irrometer Riverside, CA) integrated into a probe at 10, 30, and 50 centimeters coupled with Realm5 telemetry (Realmn Lincoln, NE) used for daily irrigation scheduling decisions.

Treatment	0-40 DAP	41-110 DAP	111- Harvest
1	45 kPa	45 kPa	45 kPa
2	70 kPa	45 kPa	70 kPa
3	70 kPa	45 kPa	45 kPa
4	70 kPa	45 kPa	20 kPa
5	45 kPa	45 kPa	70 kPa
6	70 kPa	20 kPa	45 kPa
7	20 kPa	70 kPa	45 kPa
8	45 kPa	70 kPa	70 kPa
9	Rainfed		

Results:

Treatment	Yield (kg/ha)	IWUE (kg/mm)	Profit/E ($/ha)	Profit/D ($/ha)
45/45/45 kPa	7172.9^{A}	6.9^{AB}	3959.8^{A}	3896.8^{A}
70/45/70 kPa	6808.3^{A}	4.8^{AB}	3732.2^{AB}	3663.7^{AB}
70/45/45 kPa	6824.4^{A}	4.0^{AB}	3698.0^{AB}	3615.0^{AB}
70/45/20 kPa	6985.7^{A}	4.3^{AB}	3774.3^{AB}	3686.3^{AB}
45/45/70 kPa	6840.5^{A}	5.1^{AB}	3757.3^{AB}	3691.3^{AB}
70/20/45 kPa	6598.5^{AB}	3.0^{B}	3550.3^{AB}	3462.2^{AB}
20/70/45 kPa	6776.0^{A}	6.1^{AB}	37640.0^{AB}	3712.0^{AB}
45/70/70 kPa	6818.0^{A}	8.1^{A}	3821.3^{AB}	3780.3^{AB}
Rainfed	5678.9^{B}		3269.3^{B}	3264.3^{B}

In 2025, there were no significant differences in yield between any of the irrigated treatments. However, the irrigated treatments all yielded significantly better than the rainfed control with the exception of treatment six (70/20/45 kPa). Irrigation water use efficiency performed statistically similarly overall with the only significant difference being between treatment six (70/20/45 kPa) and treatment eight (45/70/70 kPa). Profitability of both diesel and electric irrigation systems show similar performance amongst all treatments with the only significant difference being between treatment one (45/45/45 kPa) and the rainfed control. Although in most categories it is not a significant difference, treatment one (45/45/45 kPa) numerically outperformed other treatments in yield and profitability of both diesel and electric systems and had the second highest irrigation water use efficiency of irrigated treatments. Based on these results the static 45 kPa season-long trigger remains the best numerically for yield accumulation and profitability, although not statistically significantly different than other irrigated treatments.