Report for 2022 project

"Impact of Seed Rate on Peanut Water-use Efficiency and Yield: 3rd Year"

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In peanut production, seeds are one of the most expensive variable inputs, accounting for 18% of total cost (https://agecon.uga.edu/extension/budgets.html). A higher seed rate results in increased competition between plants for water, space, and light (Humphrey and Schupp, 2000) and higher seed cost. On the other hand, a lower seed rate can cause increased loss from TSWV (Branch et al., 2003; Wehtje et al., 1994). UGA Extension recommends planting 6-7 seeds/ft to maintain a final plant stand of at least 4 plants/ft to reduce the risk of TSWV (Kemerait et al., 2018). In addition, Georgia water resource is increasingly under pressure and the variability in climate and rainfall is on the rise. Seeding rate strategies also impact irrigation management strategies. This study proposes to quantify water-use efficiency (WUE) and yield difference among peanut in three different seeding rates.

Like previous two years of the present project, the third year of the study was also conducted at the UGA Southwest Research and Education Center, Plains GA. Three flat and irrigated fields were selected to plant peanuts in twin-row pattern with 4.5 seed/ft, 7 seed/ft, and 9.5 seed/ft. Two eddy-covariance systems were installed at two sides in each field to collect data with opposite wind directions. The eddy-covariance systems provide continuous 10 Hz time series of 3-dimentional wind components, temperature, CO_2 and H_2O concentration. The time series were processed to calculate CO_2 fluxes and evapotranspiration (ET) data throughout growing season at the field scale. These data are used to calculate the WUE. Plant samples was taken at the time of digging up for yield measurements. The peanut leaf area index (LAI) was also measured weekly using the LI-2000 plant canopy analyzer.

The preliminary results show that peanut ecosystem with 7 seeds/ft usually had larger CO_2 fluxes than 4.5 and 9.5 seeds/ft, and peanut with 9.5 seeds/ft usually had larger CO_2 fluxes than 4.5 seeds/ft at most times across growing season (Figure 1). In a whole, evapotranspiration was much less influenced by seed rates (Figure 2). As the ratio of CO_2 flux to evapotranspiration, WUE of 7 seeds/ft was larger than 4.5 seeds/ft and similar to 9.5 seeds/ft (Figure 3). The yield was similar between 7 and 9.5 seeds/ft and higher than 4.5 seeds/ft (Figure 4). Therefore, the 2022 results suggest that seed rate of 7 seeds/ft would be suggested for its higher WUE and yield than 4.5 seeds/ft and lower cost in seeds than seed rate of 9.5 seeds/ft. The data and results from three years' experiments with be combined and analyze to form a peer-review paper.

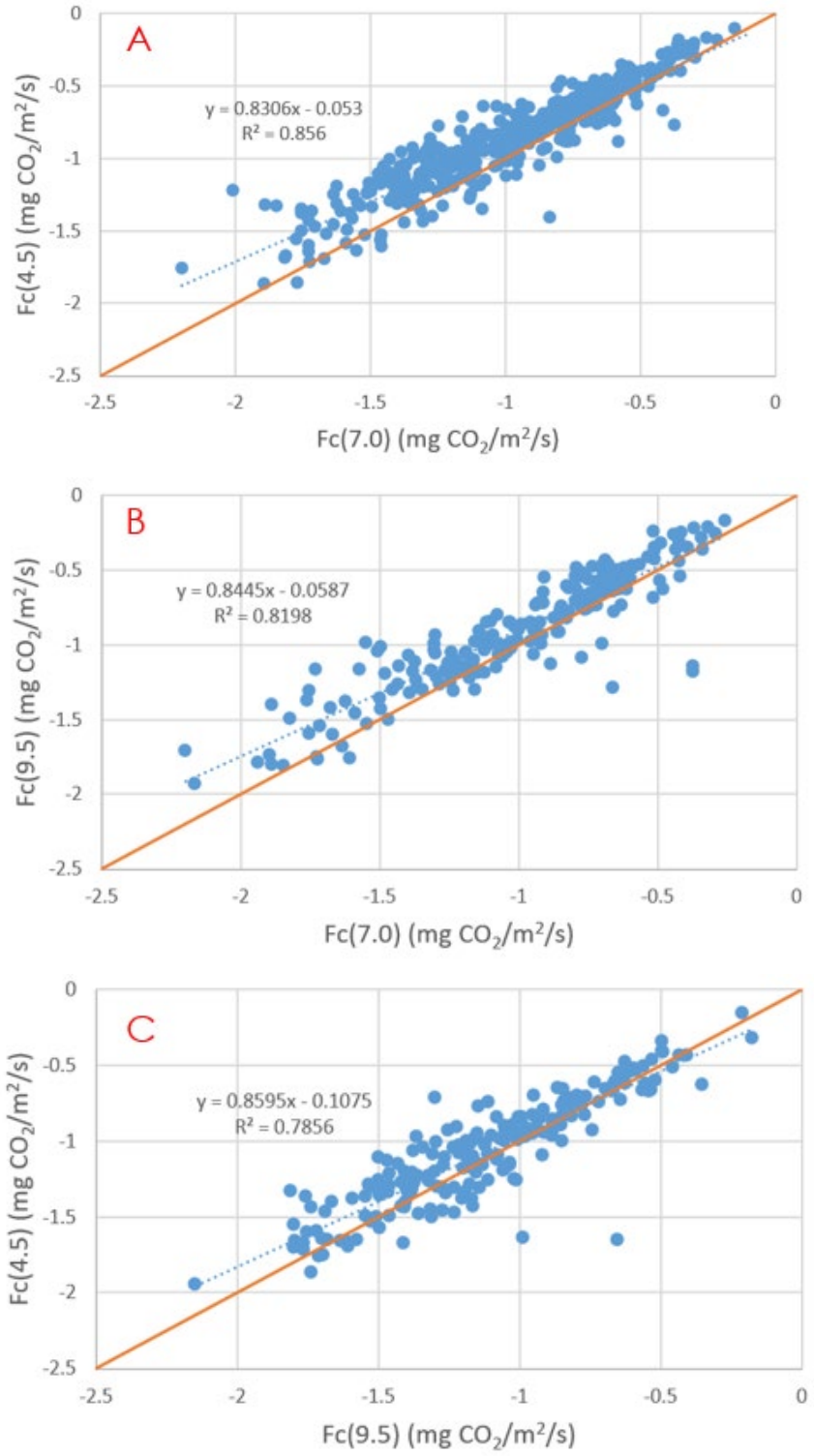

Fig. 1 Comparison of CO_2 fluxes (A) between 4.5 and 7 seeds/ft, (B) between 9.5 and 7 seeds/ft, and (C) between 4.5 and 9.5 seeds/ft through the 2022 growth season

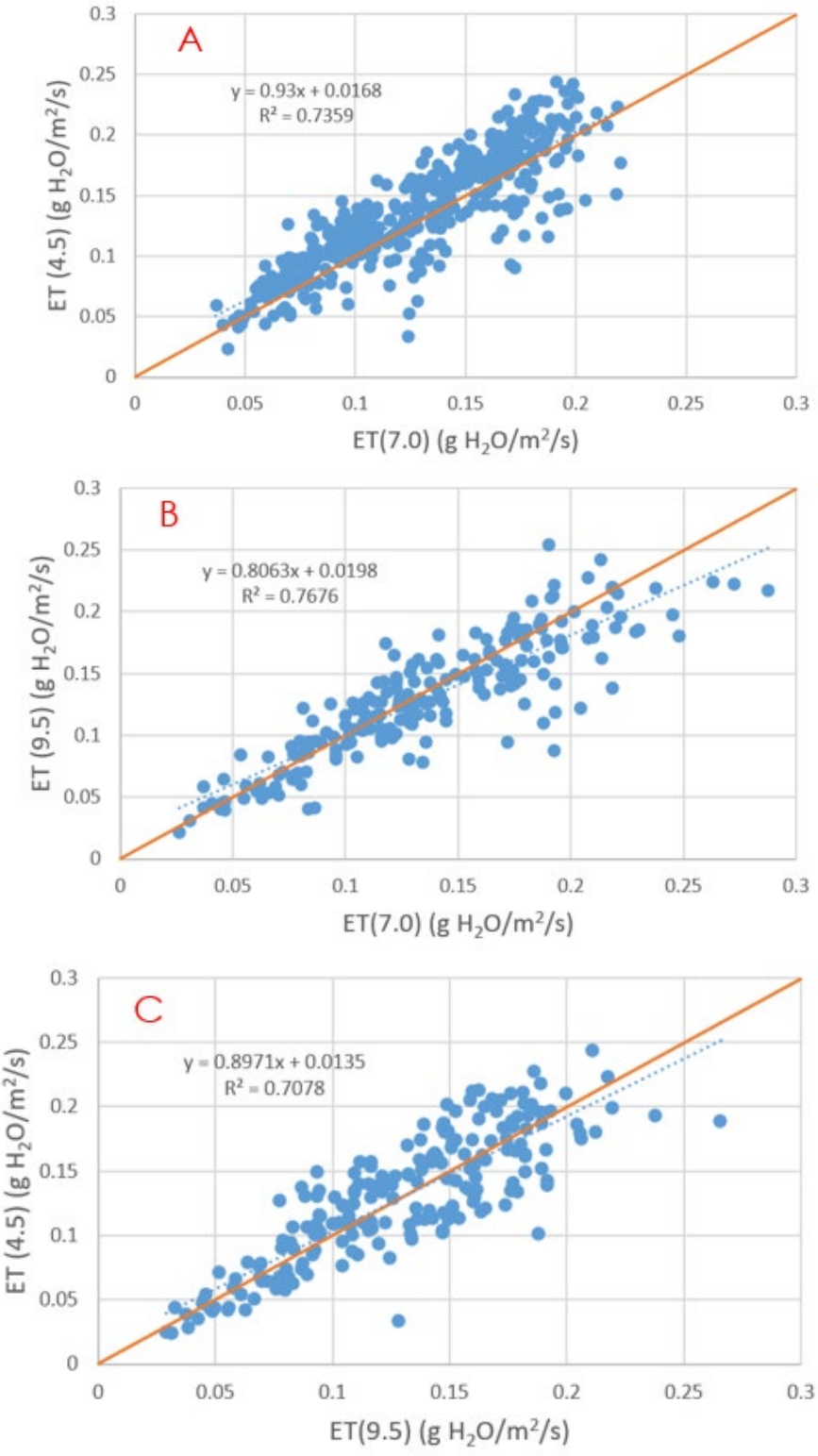

Fig. 2 Comparison of evapotranspiration (A) between 4.5 and 7 seeds/ft, (B) between 9.5 and 7 seeds/ft, and (C) between 4.5 and 9.5 seeds/ft through the 2022 growth season

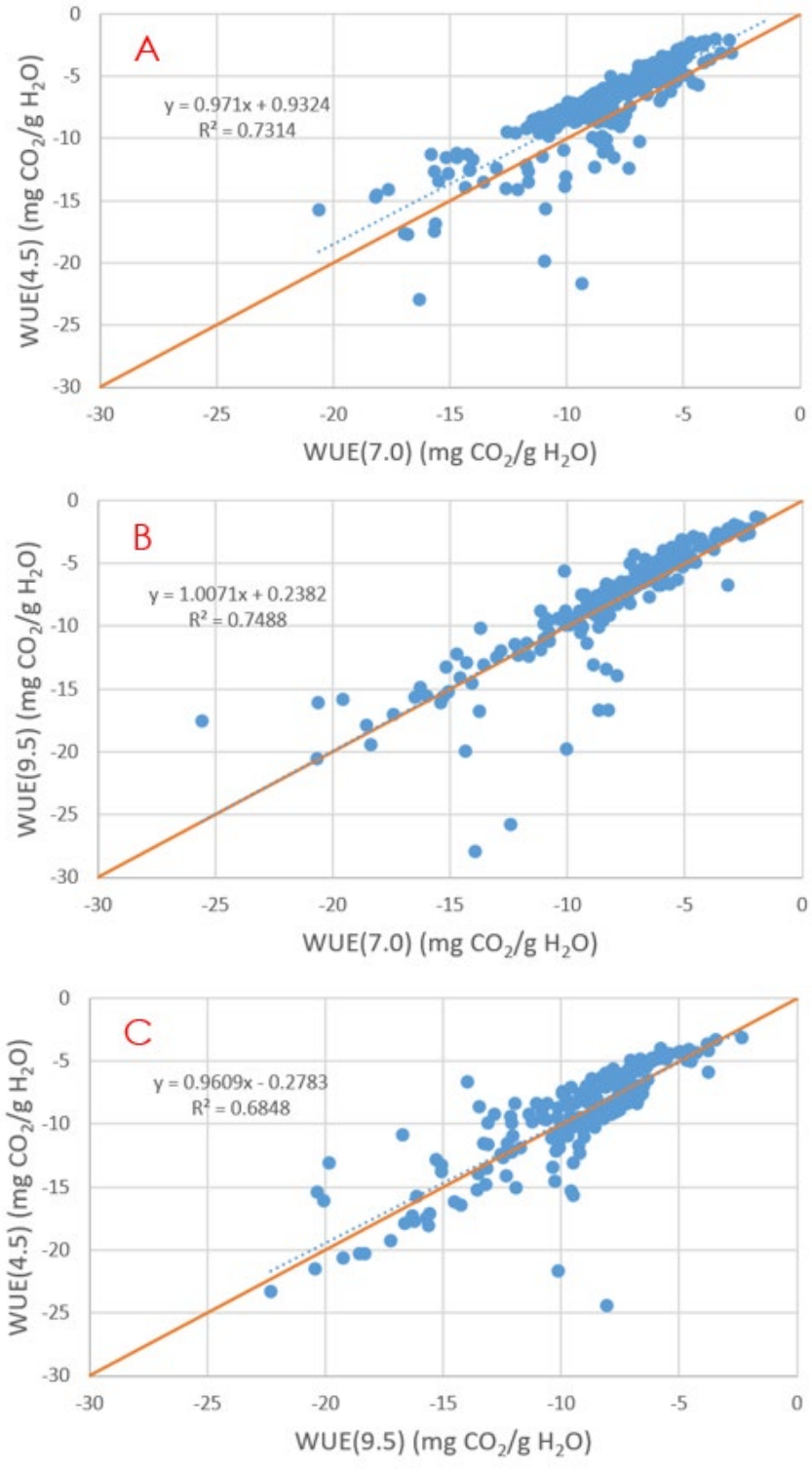

Fig. 3 Comparison of water-use efficiency (A) between 4.5 and 7 seeds/ft, (B) between 9.5 and 7 seeds/ft, and (C) between 4.5 and 9.5 seeds/ft through the 2022 growth season

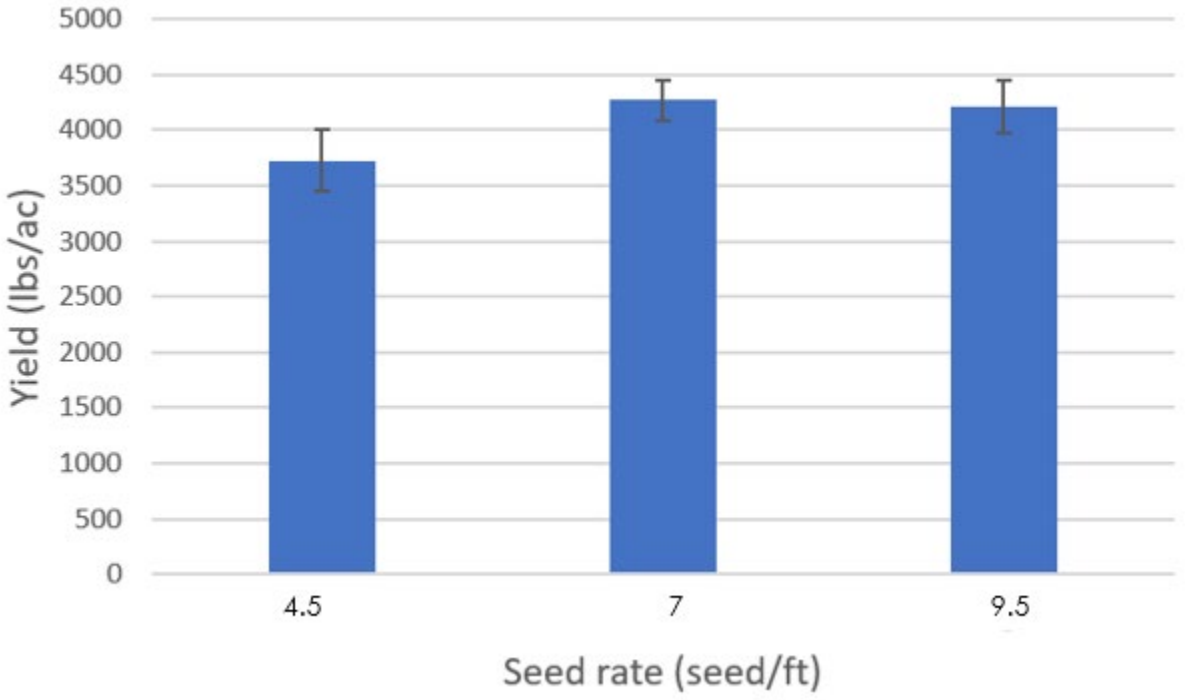

Fig. 4 Comparison of peanut yields with different seed rates in 2022