Undergraduate Internship Project #4 of 7 for FY12

Intern Daniel Kardashian’s project, co-sponsored by the DWRC and the UD College of Agriculture and Natural Resources’ Carvel Center, was titled “Improving Irrigation Management through Soil Moisture Monitoring and Automated Control of Sprinkler and Sub-Surface Drip Irrigation.” He was advised by Dr. Tom Sims and Mr. James Adkins of the UD’s Department of Plant and Soil Sciences.

Abstract

Through understanding the most efficient means of irrigation agricultural water use efficiency can be improved to maximize crop yield, minimize environmental effects, and ensure adequate water supplies in the future. The University of Delaware (UD) has been conducting farm studies in Sussex County, DE, and basic findings point to the potential to use sensor-based, precision irrigation management to significantly improve water use efficiency in crop production, which should also lead to better utilization of our fresh water resources. Field studies were conducted to determine the effects that width of crop rows and soil moisture levels have on soybean yield and to determine the optimal crop width as well as the most efficient level and method of irrigation for soybean yield. During the 2012 growing season two studies, one with full season soybeans and the other with double-crop soybeans, were conducted under eight different irrigation treatments to determine the response of soybeans to various soil moisture levels and row widths. For the full season study - Effect of Irrigation Treatment: Soybean yield in the irrigated treatments ranged from 63 to 70 bushels/acre compared to 54 bushels/acre in the no irrigation treatment. There was a 16 bushels/acre increase in yield over the no irrigation treatment when irrigation was applied on a reduced amount (>30% available soil moisture) until the R5/R6 vegetative growth stage and then >50% available soil moisture until maturity. This irrigation treatment resulted in the greatest yield and required the least amount of irrigation. There was no yield advantage in irrigating to maintain >50% available soil moisture until mid-August. Effect of Row Width: Soybean yield by row width ranged from 61 to 67 bushels/acre. Yield was greatest in the 15-in. row width at 67 bushels/acre, followed by the 7-in. row width at 64 bushels/acre, and then the 30-in. row width at 61 bushels/acre. For the double-crop study: Effect of Irrigation Treatment: Even though rainfall was below average in June and July the no irrigation treatment yielded 58 bushels/acre, which was comparable to all irrigation treatments. Yield from all irrigation treatments ranged from 58 to 61 bushels/acre. The above average rainfall in August had a significant effect on soybean yield. Effect of Row Width: Soybean yield by row width ranged from 55 to 64 bushels/acre. Yield was greatest in the 15-in. row width at 64 bushels/acre, followed by the 30-in. row width at 58 bushels/acre, and then the 7-in. row width at 55 bushels/acre. Final stand in the 7-in. row width was 107,000 plants/acre compared to 169,522 plants/acre in the 15-in. row width, and 154,427 plants/acre in the 30-in. row width. The reduced plant stand in the 7-in. row width, compared to the 15-in. and 30-in. row widths, may have limited yield potential.