

A-05

Breaking yield barriers in soybean through crop and nutrient management

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Six-soybean research trials (2014-15-16 seasons) were conducted at Scandia, KS, three under dryland and three under irrigated environments. The objective of this trial was to study the contribution of different farming systems to developing efficient and high-yielding soybean production systems. Each experiment had five treatments: farmer practices (FP), comprehensive fertilization (CF), production intensity (PI), ecological intensification (CF + PI), and advanced plus (AD). A balanced nutrition program (CF) increased yields over the CP, producing statistically significant yield differences under irrigated (+13%) and dryland (+17%). In dryland conditions, PI out yielded CP by 33% and by 40% when irrigation was provided. It is worth noting that yield increases (PI over CP) resulted in additional mining of soil nutrient resources. There was a yield penalty observed in the following crop in the rotation (corn) due to the soybean (PI) nutrient mining. For example during the 2016, a corn study that followed the soybean phase under irrigation for the CP treatment, yielded 37% less compared to CF. Analyzing the overall yields under irrigation, the partial factor productivity of the fertilizer (PFPf, seed yield to fertilizer applied ratio), was 15 (lb. yield/lb. fertilizer) for the CF treatment and 17 for the EI. For dryland, PFPf for CF was 17, and for EI it was 18. The PFPf for EI treatment was 16% greater under irrigation, and 8% greater under dryland than the CF. By intensifying production practices, each unit of fertilizer added to the system was more efficient in producing seed yield.