

Identifying intensive management practices to increase soybean net returns, Carrington, 2011. (Gregory Endres, Hans Kandel and Blaine Schatz)

An irrigated trial was conducted at the NDSU Carrington Research Extension Center to examine soybean seed yield and quality based on individual or combinations of selected management inputs that may increase net return for producers. Experimental design was a randomized complete block with split plot arrangement with four replications. Whole plots were row spacing (14 and 28 inches) and split plots consisted of a factorial combination of cultivars, planting rate (150,000 and 200,000 pure live seeds/A), and foliar inputs versus untreated check. The conventional-till study was established with wheat as the previous year's crop on a Heimdal-Emrick loam soil with 56 lb/A (0-24") nitrate-N, 27 ppm P, 305 ppm K, 0.2% carbonate, 0.36 mmho/cm (0-6") and 0.23 mmho/cm (6-24") soluble salts, 20.1 meq CEC, 4.0% organic matter, and 7.8 pH. Secondary and micro nutrients were at medium to high soil levels, except chloride (20 lb/A) and sodium (42 ppm) at low levels. Inoculated Peterson Farms Seed '1002 RR' (treated with ApronMax) and Dairyland Seed 'DSR-0747/R2Y' (treated with Cruiser Max) were planted on May 23. Foliar treatments were applied with a CO₂-pressurized hand-boom sprayer delivering 14 gal/A at 35 psi with 8001 XR flat-fan nozzles. V3 growth stage treatments (TJ Technologies 'Sunflower/Canola/Soybean Mix' at 48 fl oz/A plus an experimental EMD Crop BioScience 'Ratchet' at 4 fl oz/A) were applied on July 5 and R2-3 growth stage treatment (Headline fungicide at 6 fl oz/A + NIS at 0.125% v/v) was applied on July 27 (three days after plant damage by hail on July 24). Canopy closure notes had started before the hail but were re-started about two weeks after the plant damage occurred. The trial was harvested with a plot combine on October 3.

Numerous differences occurred between varieties except canopy closure and seed yield were similar (Table 1). The early variety reached initial maturity when a killing frost occurred while the late-maturing variety was at R6 stage. Canopy closure occurred 18 days earlier with the 14-inch rows compared to the 28-inch rows. Yield with narrow rows was 5 bu/A (8.6%) greater than yield of the wide rows. Plant stand measured on June 8 with 150,000 pls/A planted was 1.5% less than targeted while the stand with 200,000 pls/A was about 9% less than targeted. Yield with the high seeding rate was 1.5 bu/A (2.7%) greater than yield with the low seeding rate. The special foliar inputs resulted in an increase of 3 bu/A (5.2%) compared to the untreated check.

Table 1. Soybean response to main factors in intensive management study, CREC, 2011.														
Main factor	Sub factor	Plant								Seed				
		Emergence	Stand	Canopy closure	Flowering	R stage ¹	Height	Lodge	Pod height	Yield	Test weight	Number /lb	Oil	Protein
		Jday ²	plt/A	Jday ²		14-Sep	inches	0-9	cm	bu/A	lb/bu		%	%
Variety	PFS1002	157	160042	221	189	7	60	0	6	55.3	56.6	2449	20.6	31.1
	DRS0747	156	170178	225	195	6	77	1	9	56.4	57.3	3508	19.0	32.2
Row spacing (inches)	14	157	168756	216	192	7	70	1	8	58.4	57.0	2997	19.8	31.5
	28	156	161465	234	192	7	67	1	7	53.4	56.8	2945	19.8	31.7
Planting rate (x1000 pls/acre)	150	156	147684	223	192	7	70	1	7	55.1	57.0	2987	19.8	31.5
	200	156	182537	223	192	7	68	1	8	56.6	56.9	2954	19.8	31.7
Special inputs ³	Foliar	156	165822	223	192	7	68	1	8	57.3	56.9	2944	19.7	31.6
	UC	156	164399	223	192	7	70	1	7	54.3	56.9	2998	19.9	31.6
Mean		156	165111	223	192	7	69	0.7	7	55.8	56.9	2971	19.8	31.6
CV %		0.3	11.5	0.9	0.2	0.0	4.5	72.7	31.6	5.3	0.4	2.5	1.9	1.0
LSD (0.05): pairs of data for each main factor within column with bold type = significantly different.														
¹ R stage=reproductive stage at killing frost.														
² Jday=Julian calendar.														
³ Foliar=V3 stage application of micro-nutrient blend + LCO promoter; followed by R2-3 stage application of fungicide; UC=untreated check.														

Economic analysis was applied to main factors that had statistical yield differences. Assumptions include soybean market price of \$11/bushel, seed costs of \$40/50 lb unit, seed count of 3000/lb and germination of 95%, and \$20/acre foliar input cost plus \$5/acre application cost. Assuming planting costs are similar between row spacings, the increased yield with the narrow rows provided additional income of \$55 compared to the wide rows. The high planting rate provided a \$2.50/A advantage over the lower planting rate. The yield increase with foliar inputs provided a net return of \$8/A compared to the untreated check.

Analysis of variance (AOV) P values with statistical significance (LSD 0.05) for main factor and factor interactions are identified in Table 2.

Table 2. AOV P values of factor interactions for soybean intensive management study, CREC, 2011¹.

Factors ²	Plant								Seed				
	Emergence	Stand	Canopy closure	Flowering	R stage ¹	Height	Lodge	Pod height	Yield	Test weight	Number /lb	Oil	Protein
	Jday	plt/A	Jday		14-Sep	inches		cm	bu/A	lb/bu		%	%
rep													
ROW	*	*	*			*			*		*		*
rep*ROW			*				*						
VAR	*	*		*	*	*	*	*		*	*	*	*
SEED		*							*				*
SPIN						*			*		*		
ROW*VAR											*		
ROW*SEED													
ROW*SPIN													
VAR*SEED							*						
VAR*SPIN											*		*
SEED*SPIN													
ROW*VAR*SEED													*
ROW*VAR*SPIN													
ROW*SEED*SPIN													
VAR*SEED*SPIN						*							

¹*=statistically significant using LSD 0.05.