

Choosing Corn and Soybean Varieties Best Suited for Irrigation in Tennessee

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2012 Irrigation Workshop & In-Service Training



WATER TRIVIA

1 acre-inch of water = 27,154 gallons

30 acre-inches = ~815,000 gallons of water/a

100 acres x 30 inches = 81.5 million gallons;

1000 acres = 815 million gallons

1 gallon = ~ 0.13 cubic ft;

81.5 million gallons = enough to fill ~171 –
50,000 bu grain bins

Seasonal Water Consumption

Corn 25 - 30 inches
Soybeans 20 - 25 inches
Cotton 25 - 35 inches

Peak Use Water Demand

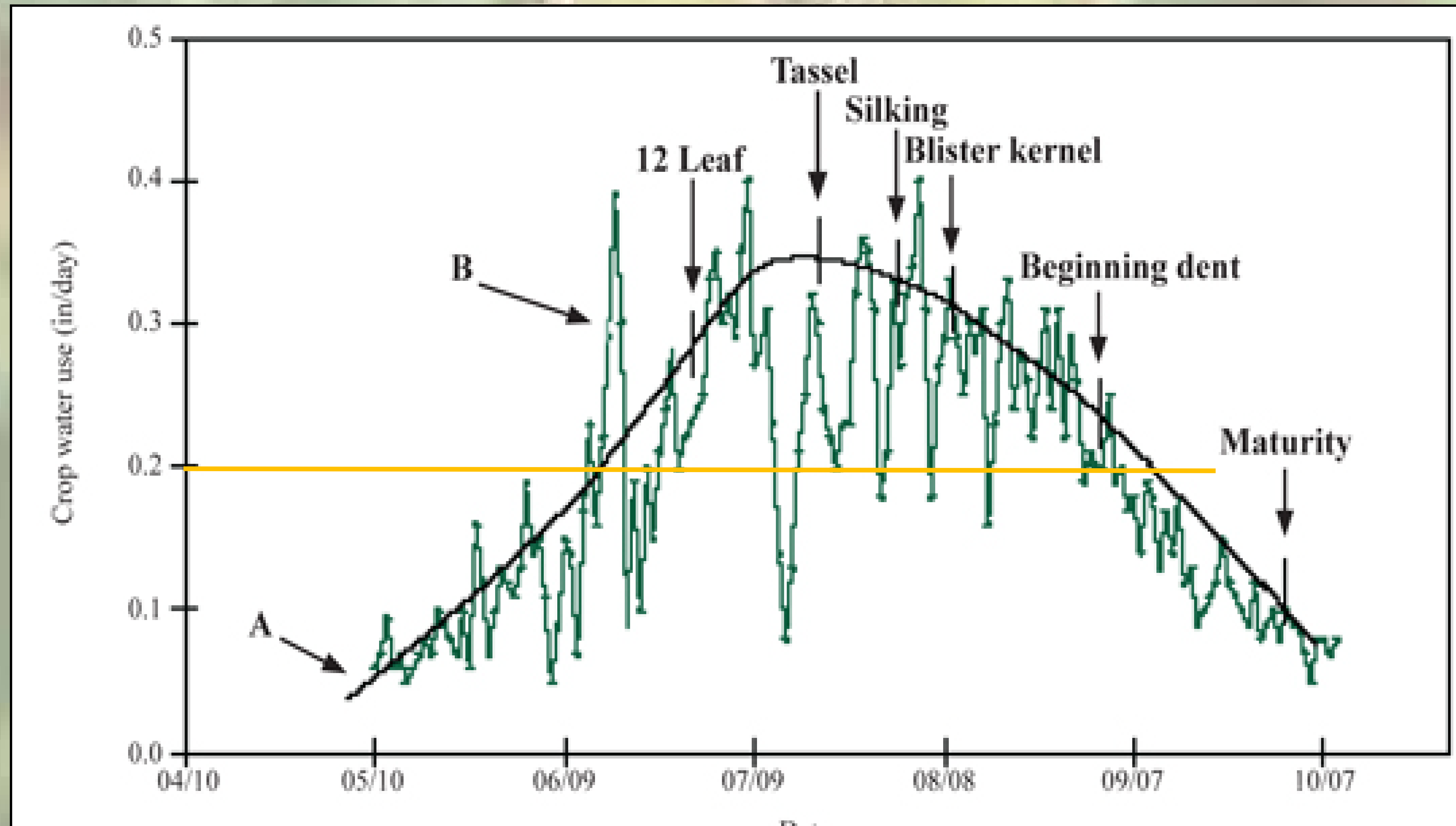
Corn ~0.35" / day
Soybeans ~0.30" / day
Cotton 0.36" / day

33 days = 1 inch of water or about ~2.5 inches per week during peak demand

Number of Irrigations Expected / Season

Corn – 5-6 events / season
Soybeans – 5-6 events / season
Cotton – 5-7 events / season

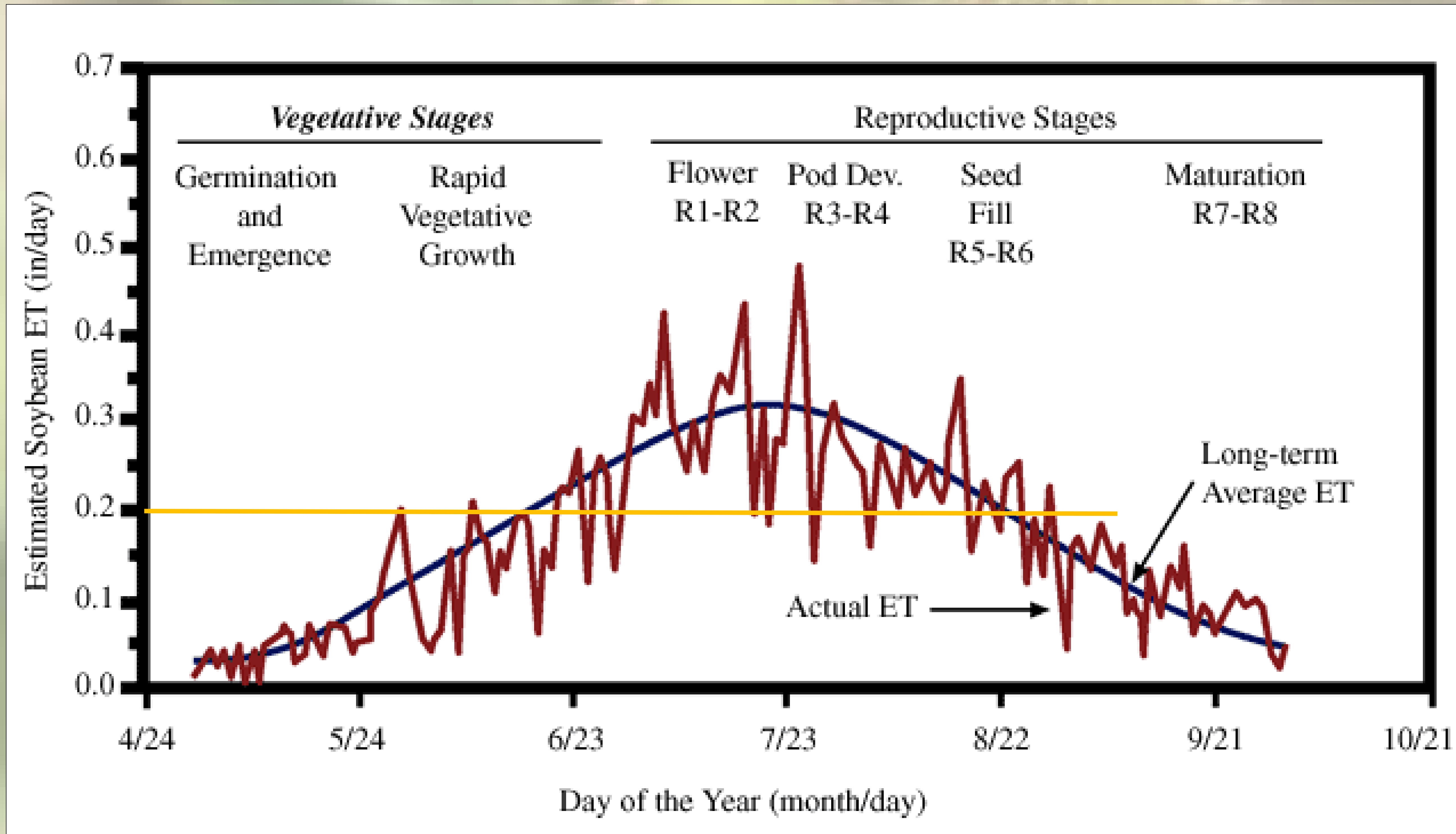
CORN EVAPOTRANSPIRATION or DAILY WATER USE



EVAPOTRANSPIRATION (ET) = evaporation from soil surface + water transpired through plants

smooth line = longterm average; irregular line = daily water use for given year

SOYBEAN EVAPOTRANSPIRATION or DAILY WATER USE



Objectives

Determine the best way to utilize the TN variety test information to choose varieties for irrigation

Corn = 40 - 80 bu/a

Soybeans = 20 - 35 bu/a

Cotton = 180 - 400 lbs. lint/a

Corn \$6.20 / bu x +50 bu/a = \$310 / ac

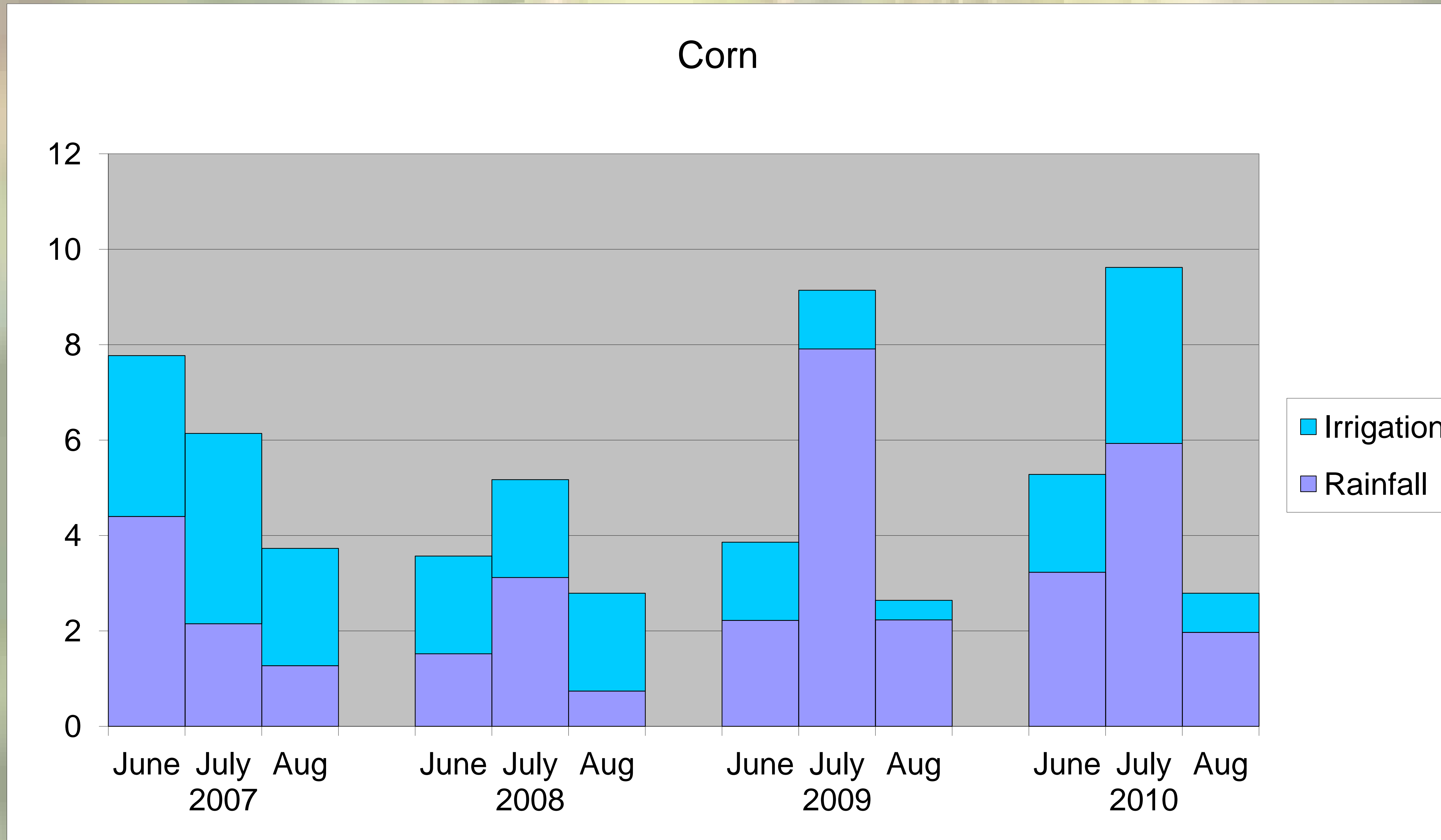
Soybeans \$12.00 / bu x +25 bu/a = \$300 / ac

Cotton 90¢ / lb. x 250 lbs. lint/a = \$225 / ac

Procedures

- Trials at Research & Education Centers in each physiographic region of TN:
 - Milan (irr & non-irr), RECM
 - Springfield (irr & non-irr), HRREC
- Corn
 - Early-season Test (<114 day)
 - Medium-season (114 - 116 day)
 - Full-season (116> day)
- Soybean
 - RR3, RR4E, RR4L, RR5E, RR5L, Conv. 4 & 5, and LL
- Plot size - 2 - 30 inch rows, 30 ft long, 3 replications
 - Soybeans 175,000 / a
 - Corn 26,000 / a (150-180 # N / a)
- Fungicide / Pesticide applied as needed

Rainfall & Irrigation at Milan, 2007-10



- Irrigation applied based on field observations & use of MOIST irrigation program (Leib, Univ. of TN)

Mean yields of full-season (>116 DAP) corn hybrids evaluated in six environments in 2007.

Brand	Hybrid	Avg. Yld	Spring		Milan		Ames	
		± Std Err (n=6)	Knoxville	Hill (Non-Irr.)	Springfield (Irr.)	(Non-Irr.)		
----- bu/a -----								
DeKalb	DKC67-23	149 ± 4	196	92	106	244	163	94
Garst	8247	147 ± 4	179	109	70	270	167	90
Pioneer	31G71	146 ± 4	194	105	73	270	152	84
Garst	8295	145 ± 4	184	101	71	266	154	94
Pioneer	31P41	134 ± 4	168	105	55	228	149	102
Augusta	A-06-02HX	134 ± 4	198	83	45	241	143	95
TN Exp	TN 0704	134 ± 4	171	101	85	212	144	88
Dyna-Gro	58P45	134 ± 4	198	84	41	232	134	112
TN Exp	TN 0701 (W)	133 ± 4	177	91	58	221	139	111
F Choice	7880 WPR	133 ± 4	185	111	58	224	139	79
Dyna-Gro	58P60	132 ± 4	185	92	58	235	128	91
Croplan	799 RB	131 ± 4	179	92	58	222	158	76
TN Exp	TN 0702 (W)	130 ± 4	174	97	58	240	130	83
Augusta	A-04-102CB	129 ± 4	179	82	53	236	141	86
Dyna-Gro	58K02	129 ± 4	168	84	56	234	154	80
FFR	842 RR2	128 ± 4	175	94	57	255	117	72
Dyna-Gro	58K40	127 ± 4	172	79	66	218	131	97
Dyna-Gro	58P74	127 ± 4	188	81	52	226	119	93
Dyna-Gro	58P19	126 ± 4	197	89	32	228	129	80
DeKalb	DKC69-43	125 ± 4	152	87	54	215	156	86
TN Exp	TN 0506 (W)	121 ± 4	167	82	46	229	125	79
TN Exp	TN 0703 (W)	117 ± 4	168	83	39	211	123	79
Avg. (bu/a)		133	180	92	59	234	141	89
L.S.D._{.05} (bu/a)		10	22	23	30	18	25	26
C.V. (%)		10.8	7.2	15.1	31.2	4.7	10.6	16.3

Full-season (>116 DAP) corn hybrids 2007

Brand	Hybrid	Avg Yield (n=6)	Rank	Milan		Irrigation		Avg Irrigation Response		
				(Irr.)	Rank	(Non-Irr.)	Rank			
				bu/a		bu/a		bu/a		
Garst	8247	147	2	270	1	167	1	103	8	Top 1/3
Pioneer	31G71	146	3	270	2	152	7	118	2	109
Garst	8295	145	4	266	3	154	6	112	3	
FFR	842 RR2	128	16	255	4	117	22	138	1	
DeKalb	DKC67-23	149	1	244	5	163	2	81	17	
Augusta	A-06-02HX	134	6	241	6	143	10	99	10	
TN Exp	TN 0702 (W)	130	13	240	7	130	16	110	4	
Augusta	A-04-102CB	129	14	236	8	141	11	95	12	Mid 1/3
Dyna-Gro	58P60	132	11	235	9	128	18	107	6	94
Dyna-Gro	58K02	129	15	234	10	154	5	79	18	
Dyna-Gro	58P45	134	8	232	11	134	14	98	11	
TN Exp	TN 0506 (W)	121	21	229	12	125	19	104	7	
Dyna-Gro	58P19	126	19	228	13	129	17	99	9	
Pioneer	31P41	134	5	228	14	149	8	79	19	
Dyna-Gro	58P74	127	18	226	15	119	21	107	5	Low 1/3
F. Choice	7880 WPR	133	10	224	16	139	13	85	15	80
Croplan	799 RB	131	12	222	17	158	3	65	21	
TN Exp	TN 0701 (W)	133	9	221	18	139	12	82	16	
Dyna-Gro	58K40	127	17	218	19	131	15	87	14	
DeKalb	DKC69-43	125	20	215	20	156	4	59	22	
TN Exp	TN 0704	134	7	212	21	144	9	68	20	
TN Exp	TN 0703 (W)	117	22	211	22	123	20	89	13	
Avg. (bu/a)		133		234		141		94		
L.S.D._{.05} (bu/a)		10		18		25		68%		
C.V. (%)		10.8		4.7		10.6				
			3/4			1/4			3/4	
			75%			25%			75%	

Medium-season (114-116 DAP) corn hybrids 2007 - 2008

Brand	Hybrid	Avg Yield (n=12) bu/a	Rank	Milan		Irrigation		Avg Irrigation Response bu/a		
				(Irr.) bu/a	Rank	(Non-Irr.) bu/a	Rank			
Dekalb	DKC66-23	149	4	221	1	125	12	97	1	Top 1/3
Agrigold	A6633VT3	147	5	216	2	139	4	77	4	79
Augusta	A5338CB	145	10	211	3	115	16	97	2	
Belle	1533 Y	147	6	205	4	144	2	61	12	
Agrigold	A6596HXLL	151	2	203	5	124	14	80	3	
Pioneer	33M57	142	14	201	6	127	9	74	6	
Dairyland	7615	150	3	200	7	130	7	70	8	
Dyna-Gro	57F87	146	8	198	8	132	6	66	10	Mid 1/3
Belle	1545 RY	154	1	197	9	149	1	48	18	58
Dyna-Gro	58P59	143	12	194	10	126	11	68	9	
Agrigold	A6639VT3	134	15	192	11	137	5	55	16	
Agrigold	A6622HXLL	146	9	189	12	124	13	65	11	
Dyna-Gro	57P12	147	7	186	13	140	3	46	19	
FFR	746 RR2/Bt	143	13	186	14	126	10	60	13	Low 1/3
Belle	1646 RY	144	11	183	15	128	8	54	17	63
Terral	TV 26BR61	128	17	178	16	105	18	73	7	
Dyna-Gro	57K33	132	16	176	17	119	15	57	15	
Steyer	4171W	120	19	169	18	93	19	76	5	
Dyna-Gro	57K58	127	18	168	19	109	17	59	14	
Avg. (bu/a)		142		193		126		67		
L.S.D._{.05} (bu/a)		9		24		20		55%		
C.V. (%)		10.2		8.4		10.7				
			7/9				6/9		6/9	
			78%				67%		67%	

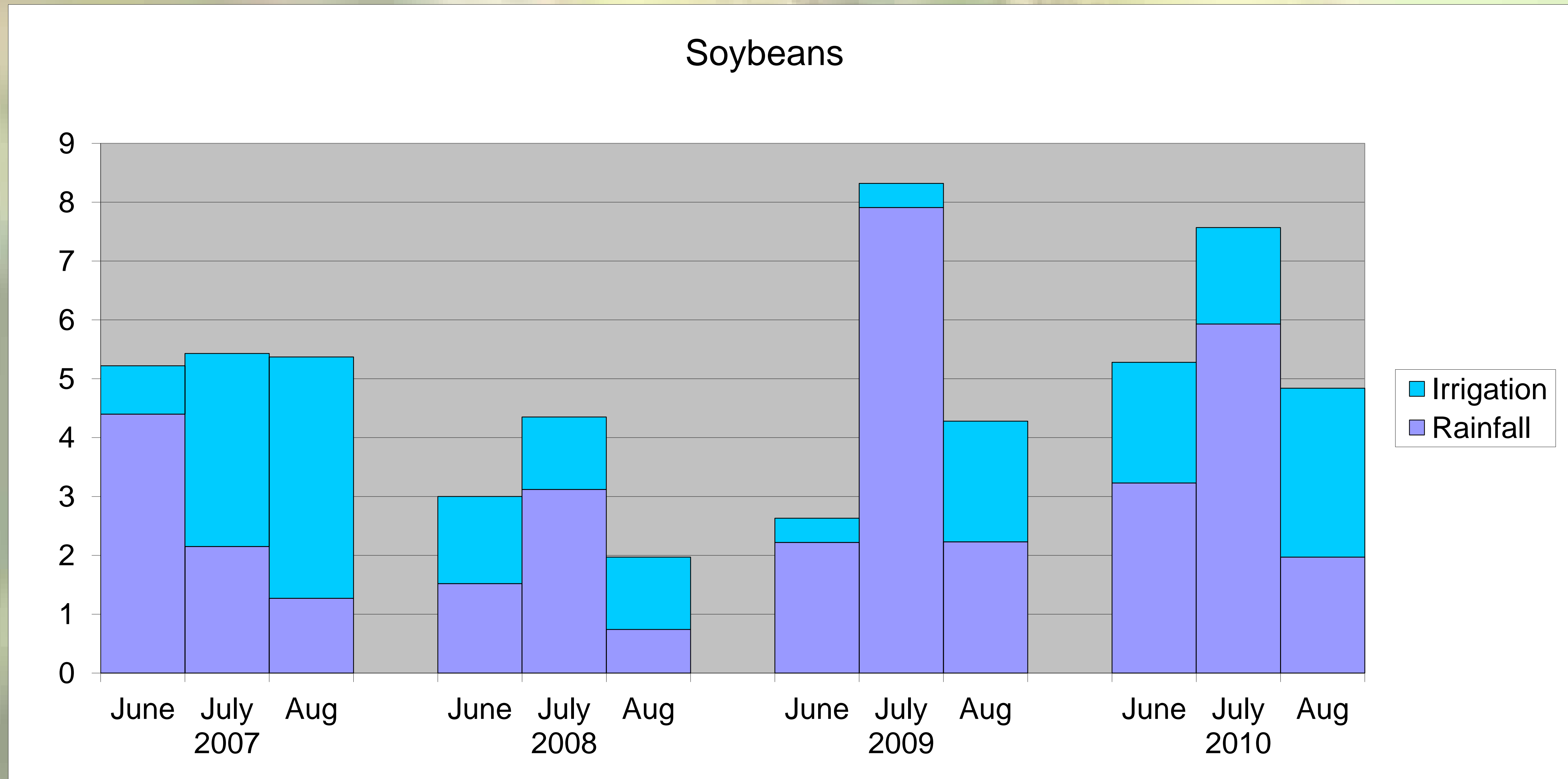
YIELD of 39 EARLY SEASON CORN HYBRIDS, 7 LOC. AVG. & IRRIGATED v. NON-IRRIGATED, MILAN, 2011

TOP 1/3 OF HYBRIDS				MIDDLE 1/3 OF HYBRIDS				BOTTOM 1/3 OF HYBRIDS			
7 LOC AVG	IRR.	NONIRR	DIFF	7 LOC AVG	IRR.	NONIRR	DIFF	7 LOC AVG	IRR.	NONIRR	DIFF
184 ± 4	250	174	76	182 ± 4	237	173	64	175 ± 4	239	163	76
190 ± 4	249	188	62	181 ± 4	246	175	71	173 ± 4	254	182	71
188 ± 4	249	172	76	181 ± 4	245	164	81	173 ± 4	246	171	75
185 ± 4	248	177	71	176 ± 4	244	173	71	170 ± 4	244	171	74
190 ± 4	248	187	61	182 ± 4	243	163	80	168 ± 4	237	159	77
189 ± 4	248	175	72	179 ± 4	240	181	59	169 ± 4	236	177	59
188 ± 4	248	181	67	179 ± 4	239	158	81	172 ± 4	228	156	72
188 ± 4	246	176	70	176 ± 4	238	179	59	174 ± 4	228	150	78
189 ± 4	245	178	67	180 ± 4	238	173	65	172 ± 4	224	158	66
190 ± 4	233	181	52	176 ± 4	237	162	75	175 ± 4	222	177	45
191 ± 4	231	169	61	181 ± 4	235	167	68	167 ± 4	216	157	59
183 ± 4	221	151	69	178 ± 4	230	152	78	161 ± 4	212	165	47
187 ± 4	217	168	49	177 ± 4	225	162	63	146 ± 4	191	143	48
	241	175	66		238	168	70		229	164	65

Average Corn Yield Response (bu/a) to Irrigation at Milan

		Top	Middle	Bottom	
Test	Year	1/3	1/3	1/3	
Early	2007	100	83	78	
	2008	82	68	54	
	2010	64	57	38	
	Avg.	82	69	44	
Medium	2007	89	81	69	
	2008	64	48	50	
	2010	93	69	62	
	Avg.	82	66	60	

Rainfall & Irrigation at Milan, 2007-10



Early Maturity Group IV (4.0 - 4.5) RR soybean varieties 2007

Brand	Variety ‡	Avg Yield (n=6)	Rank	Milan		Irrigation		Avg Irrigation Response		
				Irr. Rank	Non-Irr. Rank	Irr. Rank	Response Rank			
				bu/a	bu/a	bu/a				
Southern Cross	Caleb	33	3	83	1	16	39	67	1	Top 1/3
Delta Grow	4470 RR/STS	36	1	79	2	30	1	49	12	54
Dairyland	4300 RR	30	17	79	3	18	29	61	2	
Croplan	RC 4417 (RR)	33	4	77	4	18	30	59	4	
FFR	4526 RR	31	10	76	5	16	38	60	3	
N.K. Brand	S 43-B1 (RR)	28	31	75	6	18	28	56	5	
MO Exp	S04-5969 RR	30	14	72	7	19	27	53	7	
MO Exp	S04-6013 RR	34	2	71	8	17	37	54	6	
...
Steyer	4430 RR Scn	31	11	69	12	24	3	45	24	
Pioneer	94M30 (RR)	32	8	69	13	21	11	48	19	
Vigoro	V42N7RS	31	12	68	14	23	4	45	25	Mid 1/3
Vigoro	V43N8RR	30	16	68	15	20	19	48	15	46
...	
Schillinger	457 RCP	33	5	67	18	23	6	44	27	
MO Exp	S04-6008 RR	32	6	67	19	20	15	47	20	
...	
Morsoy	RT 4485N (RR)	32	9	66	26	25	2	40	33	
D&PL	DP 4450 RR	30	19	65	27	17	33	48	17	Low 1/3
D&PL	DP 4546 RR	30	20	63	28	22	7	42	30	40
...	
Pioneer	94M50 (RR)	30	21	59	35	23	5	36	36	
...	
TN Exp	TN05-4715 RR	29	28	52	39	21	9	31	39	
Average (bu/a)		30		67		20		47		
L.S.D._{.05} (bu/a)		3		10		7		241%		
C.V. (%)		13.4		9.5		21.7				
			3/6				1/6		5/6	
			50%				17%		83%	

Early Maturity Group V (5.0 - 5.5) RR soybean varieties 2007 - 2008

Brand	Variety ‡	Avg Yield (n=10)	Rank	Milan		Irrigation		Avg Irrigation Response		
				(Irr.) bu/a	Rank	Non-Irr. bu/a	Rank			
Delta King	DK 52-K6	48	2	68	1	42	3	26	3	Top 1/3
MPG	MPG 5407nRR	40	19	66	2	35	26	31	1	23
Delta Grow	5450 RR	48	1	64	3	41	7	23	6	
MPG	MPG 5505nRR	42	13	63	4	38	15	25	4	
Dyna-Gro	33P54 (RR)	44	8	63	5	40	10	23	7	
Schillinger	557 RC	46	4	62	6	46	1	16	19	
FFR	5663 RR	47	3	62	7	42	4	20	10	
Dyna-Gro	33X55 (RR)	45	7	62	8	41	6	21	9	
USG	7553nRS	45	6	61	9	41	5	20	11	
Dairyland	8512 RR	40	22	61	10	34	27	27	2	
USG	7515nRS	38	27	59	11	37	19	22	8	Mid 1/3
Hornbeck	HBK RS 5227	42	14	59	12	39	14	20	13	19
Delta Grow	5470 RR	40	21	59	13	34	28	24	5	
Hornbeck	HBK R 5525	44	9	58	14	39	13	19	15	
USG	75J32 (RR)	41	16	56	15	40	8	16	20	
Delta Grow	5160 RR/STS	38	26	56	16	36	24	20	12	
Dyna-Gro	31R54 (RR)	42	12	56	17	36	21	19	14	
Southern Cross	Damascus	37	28	55	18	38	16	18	16	
Dyna-Gro	V51N7RS	40	20	55	19	39	12	16	21	
Delta Grow	5300 RR	43	10	54	20	40	11	14	23	
MPG	MPG 5308nRR	41	15	54	21	36	20	17	17	Low 1/3
Dyna-Gro	33B52 (RR)	42	11	53	22	40	9	13	27	13
NK	S 52-F2 Brand	45	5	53	23	43	2	10	30	
...
Hornbeck	HBK R 5226	41	18	44	30	33	30	11	29	
Average (bu/a)		42		57		38		19		
L.S.D._{.05} (bu/a)		3		10		6		49%		
C.V. (%)		11.5		11.4		10.0				
			10/14			7/14			12/14	
			71%			50%			86%	

Avg. Soybean Yield Response (bu/a) to Irrigation at Milan

		Top	Middle	Bottom	
Test	Year	1/3	1/3	1/3	
RR4 Early	2007	54	46	40	
	2008	25	21	19	
	2010	22	17	13	
	Avg.	34	28	24	
RR4 Late	2007	60	51	45	
	2008	25	20	15	
	2010	20	16	11	
	Avg.	35	29	24	

Summary

- During peak water demand corn, soybeans and cotton use (ET) about 1 inch of water every 3 days or about 2.5 inches per week
- There are considerable differences among varieties in how much they respond to irrigation
- The top yielding varieties across multiple environments tend to be the top yielding varieties under irrigation – “the cream rises to the top”
- For irrigated fields, choose varieties that are top yielders across all environments and then refine your choices by picking those that yield the best in irrigated tests