

FIELD EXPERIMENT HISTORY

Year: 2005
Title: Corn/Soybean/Wheat Rotation Study
Experiment: 2591
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Organization: UW Madison, Dept. of Agronomy
Location: Arlington Agricultural Research Station, Arlington, WI

FIELD INFORMATION

Field: ARS 335
 Soil Type: Plano Silt Loam
 Soil Test Results: Date:5/04 pH: 6.9 O.M.(%): 2.9 P(ppm): 32 K(ppm): 150
 Fertilizer Applied: Soybean: None
 Wheat: see Treatments below
 Corn: 210 lb/A N as 28-0-0 pre-emerge
 Tillage Operations: No-till
 Previous Crop: Corn/Soybean/Wheat
 Previous Herbicide: Roundup
 Irrigation: None

EXPERIMENTAL PROCEDURE

Exp. Design: RCB Split plot
 Replicates: 3
 Variables: Factors/Treatments:

<u>System</u>	<u>Rotation</u>
Continuous	Corn, Soybean or Winter Wheat
Alternating	Corn/Soybean
Grain system I	Corn/Soybean(early)/Winter Wheat(red clover)
Grain system II	Corn(early)/Winter Wheat(red clover)/Soybean
Livestock system	Corn(silage)/Winter Wheat(straw removed)/Soybean

	<u>Corn</u>	<u>Soybean</u>	<u>Wheat</u>
Area Planted:	60' x 60'	60' x 60'	60' x 60'
Area Harvested:	5' x 56'	5' x 56'	5' x 56'
Row Spacing:	30"	30"	7.5"
Seeding Rate:	32,500 seeds/acre	150,000 seeds/acre	150 lb/acre
Hybrid/Variety:	Trelay 7693 RR2	Kaltenberg KB192 RR	Kaskaskia
Planting Date:	28-Apr-05	2-May-05	11-Oct-04
Planting Equip:	Kinze 2000 Interplant planter	Kinze 2000 Interplant planter	JD 750 No-Till Drill
Harvesting Date:	15-Sept (S), 5-Oct (G), and 13-Oct (G)	16-Sep-05	28-Jul-05
Harvesting Equip:	707 silage harvester, Kinkaid plot combine	Almaco plot combine	Almaco plot combine

Treatments:	<u>Fungicide:</u>	<u>Fungicide:</u>	<u>Nitrogen (lbs/A)</u>
	Maxim XL	UTC	0
	Maxim + Apron XL	SoyGard	25
	Maxim + Azoxystrobin	Rival/Alleg	50
	Captan + Apron XL	ApronMaxx	75
			100
			125

Herbicides:	<u>Material</u>	<u>Crop</u>	<u>Rate</u>	<u>Timing</u>	<u>Date</u>
	2,4-D Ester	All	0.67 pt/A	preplant	25-Apr-05
	Dual	Corn	2 pt/A	pre-emerge	2-May-05
	Dual	Soybean	2 pt/A	pre-emerge	3-May-05
	Roundup	Corn/Soybean	21 oz/A	post-emerge	2-Jun-05
	Roundup	Corn/Soybean	22 oz/A	post-emerge	22-Jun-05

Insecticides:	Force 3G	Continuous Corn	4.4 lbs/A	at planting	28-Apr-05
Rodenticide:	Prozap	Corn	10 lbs/A	at planting	28-Apr-05

Results: Tables C-54, C-55, C-56, C-57, C-58, C-59, and C-60.

**Table C-54. Corn, Soybean, and Wheat Rotation.
Arlington, WI - 2005.**

Crop	Rotation	Fungicide	Residue cover	Grain								Ears Dropped	Harvest	
				Yield	Moisture	Test Weight	Grower Return	Lodged					plants/A	ears/A
								%	%	lbs/bu	\$/A			
Corn		Captan + Apron XL	-	176	21.3	54	265	1	1	0	5	0	32691	30948
Corn		Maxim + Apron XL	-	185	21.9	54	278	2	1	1	5	0	32857	31363
Corn		Maxim + Azoxystrobin	-	186	21.7	54	280	3	2	1	6	0	33852	31944
Corn		Maxim XL	-	183	21.5	54	275	7	3	4	5	0	33520	31778
Corn	Continuous		80	171	24.1	53	249	7	2	5	5	0	30285	28791
Corn	Alternating		67	186	19.4	56	288	3	3	0	5	0	34682	33106
Corn	Grain System I		66	164	20.9	53	250	2	2	1	9	0	33106	30202
Corn	Grain System II		54	209	22.1	56	312	1	1	0	3	0	34848	33935
Corn	Continuous	Captan + Apron XL	-	174	23.8	53	255	1	0	1	4	0	30533	29206
Corn	Continuous	Maxim + Apron XL	-	163	24.0	53	238	2	0	2	6	0	26551	24891
Corn	Continuous	Maxim + Azoxystrobin	-	176	24.8	53	255	7	5	2	6	0	32525	30533
Corn	Continuous	Maxim XL	-	170	23.8	53	250	18	4	14	4	0	31529	30533
Corn	Alternating	Captan + Apron XL	-	186	19.3	56	289	2	2	0	3	0	33520	32525
Corn	Alternating	Maxim + Apron XL	-	187	19.7	56	288	4	4	0	5	0	35512	33520
Corn	Alternating	Maxim + Azoxystrobin	-	187	19.3	56	289	2	2	0	6	0	34184	32525
Corn	Alternating	Maxim XL	-	184	19.2	56	286	4	4	0	5	0	35512	33852
Corn	Grain System I	Captan + Apron XL	-	147	21.1	52	222	0	0	0	12	0	30865	27215
Corn	Grain System I	Maxim + Apron XL	-	182	21.4	53	275	2	1	1	6	0	33852	31861
Corn	Grain System I	Maxim + Azoxystrobin	-	164	20.8	53	249	3	3	0	9	1	33189	30202
Corn	Grain System I	Maxim XL	-	165	20.2	53	252	5	3	2	9	0	34516	31529
Corn	Grain System II	Captan + Apron XL	-	195	21.0	57	296	1	1	0	3	0	35844	34848
Corn	Grain System II	Maxim + Apron XL	-	209	22.6	55	310	1	1	0	1	0	35512	35180
Corn	Grain System II	Maxim + Azoxystrobin	-	218	21.9	56	327	0	0	0	3	0	35512	34516
Corn	Grain System II	Maxim XL	-	212	22.8	55	314	2	2	0	4	0	32525	31197
Mean			67	182	21.6	54	275	3	2	1	5	0	33230	31508
Probability(%)														
Rotation (R)			6.2	4.8	6.4	3.5	3.7	20.6	51.4	46.9	17.7	45.5	2.8	4.8
Fungicide (F)			-	48.3	62.4	96.2	57.9	5.0	13.1	29.7	81.1	41.0	45.0	60.4
R x F			-	62.0	77.2	70.8	68.6	29.9	50.8	52.6	69.0	46.6	1.7	0.4
LSD (0.10)														
Rotation (R)			4	17	1.9	1	25	NS	NS	NS	NS	NS	1636	2132
Fungicide (F)			-	NS	NS	NS	NS	3	NS	NS	NS	NS	NS	NS
R x F			-	NS	NS	NS	NS	NS	NS	NS	NS	NS	1965	1926
CV(%)														
			13	10	6	2	10	156	133	366	71	693	6	6

**Table C-55. Corn, Soybean, and Wheat Rotation.
Arlington, WI - 2005.**

Crop	Fungicide	Dry Matter Yield	Whole Plant								Milk per		Plant population
			Moisture	Kernel Milk	Crude Protein	ADF	NDF	<i>In Vitro</i> Digest	NDFD	Starch	Ton	Acre	
		tons/A	%	%	%	%	%	%	%	%	lbs/T	lbs/T	plants/A
Silage	Captan + Apron XL	8.2	47.3	33.3	6.9	17.6	38.3	81.3	51.1	41.3	3182	26104	33852
Silage	Maxim + Apron XL	8.4	48.0	35.0	6.7	20.1	42.0	79.9	52.1	37.2	3125	26284	33189
Silage	Maxim + Azoxystrobin	8.3	49.0	35.0	6.7	19.0	40.1	80.4	51.3	39.7	3138	26085	32193
Silage	Maxim XL	8.5	50.8	38.3	6.7	19.9	41.6	80.4	52.9	37.9	3163	26988	34516
Mean		8.4	48.8	35.4	6.8	19.2	40.5	80.5	51.8	39.0	3152	26365	33437
<u>Probability(%)</u>													
Fungicide (F)		76.1	40.6	68.8	9.4	11.2	8.4	58.7	65.0	12.6	87.0	90.7	59.0
<u>LSD (0.10)</u>													
Fungicide (F)		NS	NS	NS	0.1	NS	1.7	NS	NS	NS	NS	NS	NS
<u>CV(%)</u>													
		5	5	14	1	6	4	1	4	5	3	7	6

**Table C-56. Corn, Soybean, and Wheat Rotation.
Arlington, WI - 2005.**

Crop	Rotation	Fungicide	Residue		Grower				Seed Composition			Protein +		
			cover	Yield	Moisture	return	Height	Lodging	Oil	Protein	Fiber	Protein	Oil	Oil
			%	bu/A	%	\$/A	inches	1 to 5	%	%	%	lbs/A	lbs/A	lbs/A
Soybean		Untreated	-	54	10.7	288	31	1	19.8	34.0	4.8	1104	646	1751
Soybean		SoyGard	-	55	10.6	293	32	1	19.8	34.1	4.7	1128	657	1784
Soybean		Rival/Alleg	-	54	10.7	289	31	1	19.8	34.1	4.7	1112	647	1759
Soybean		ApronMaxx	-	54	10.8	287	31	1	19.9	34.0	4.7	1103	645	1748
Soybean	Continuous		53	38	10.4	200	29	1	19.6	34.7	4.7	779	444	1223
Soybean	Alternating		78	62	10.9	327	32	1	19.8	33.9	4.8	1252	732	1983
Soybean	Grain System I		81	58	11.0	308	32	1	19.8	33.9	4.8	1177	688	1865
Soybean	Grain System II		80	59	10.8	314	30	1	19.9	33.9	4.8	1205	706	1911
Soybean	Livestock System		52	56	10.6	298	33	1	20.0	34.0	4.7	1146	674	1820
Soybean	Continuous	Untreated	-	37	10.4	196	29	1	19.5	34.7	4.7	763	433	1196
Soybean	Continuous	SoyGard	-	38	10.3	201	29	1	19.6	34.8	4.7	790	448	1238
Soybean	Continuous	Rival/Alleg	-	37	10.3	199	29	1	19.7	34.6	4.7	777	442	1219
Soybean	Continuous	ApronMaxx	-	38	10.4	203	29	1	19.8	34.4	4.7	786	453	1239
Soybean	Alternating	Untreated	-	61	11.0	325	32	1	19.8	34.0	4.8	1248	726	1974
Soybean	Alternating	SoyGard	-	61	10.7	325	33	1	19.8	33.8	4.8	1239	727	1966
Soybean	Alternating	Rival/Alleg	-	61	11.0	326	32	1	19.8	33.8	4.8	1245	730	1975
Soybean	Alternating	ApronMaxx	-	63	10.7	332	32	1	19.8	34.0	4.7	1274	744	2018
Soybean	Grain System I	Untreated	-	60	10.7	318	32	1	19.8	33.8	4.8	1213	711	1924
Soybean	Grain System I	SoyGard	-	58	10.8	307	33	1	20.0	33.5	4.8	1162	693	1855
Soybean	Grain System I	Rival/Alleg	-	56	11.1	300	34	1	19.8	34.0	4.7	1152	670	1822
Soybean	Grain System I	ApronMaxx	-	58	11.2	306	32	1	19.6	34.2	4.8	1181	679	1860
Soybean	Grain System II	Untreated	-	60	10.8	320	30	1	20.0	33.6	4.8	1214	725	1939
Soybean	Grain System II	SoyGard	-	60	10.7	318	29	1	19.8	34.3	4.7	1230	710	1940
Soybean	Grain System II	Rival/Alleg	-	59	10.7	316	29	1	19.7	34.1	4.8	1217	704	1921
Soybean	Grain System II	ApronMaxx	-	57	10.8	304	29	1	19.9	33.7	4.8	1158	684	1842
Soybean	Livestock System	Untreated	-	53	10.6	282	32	1	20.0	34.0	4.7	1083	637	1720
Soybean	Livestock System	SoyGard	-	59	10.5	315	34	1	19.9	34.2	4.7	1216	706	1923
Soybean	Livestock System	Rival/Alleg	-	57	10.5	305	33	1	20.0	33.9	4.7	1169	689	1858
Soybean	Livestock System	ApronMaxx	-	55	10.6	292	33	1	20.1	33.8	4.7	1115	664	1780
Mean			69	55	10.7	289	31	1	19.8	34.1	4.7	1112	649	1760
Probability(%)														
Rotation (R)			0.0	0.2	1.0	0.2	19.2	-	57.7	22.9	20.0	0.1	0.2	0.1
Fungicide (F)			-	83.6	46.1	83.6	65.0	-	84.4	82.3	70.9	72.6	88.1	79.2
R x F			-	77.9	63.5	77.9	89.1	-	40.3	41.3	88.3	59.6	85.1	72.2
LSD (0.10)														
Rotation (R)			2	5	0.2	27	NS	-	NS	NS	NS	96	64	158
Fungicide (F)			-	NS	NS	NS	NS	-	NS	NS	NS	NS	NS	NS
R x F			-	NS	NS	NS	NS	-	NS	NS	NS	NS	NS	NS
CV(%)														
			8	6	2	6	5	-	1	1	1	6	7	6

**Table C-57. Corn, Soybean, and Wheat Rotation.
Arlington, WI - 2005.**

Crop	Rotation	Nitrogen	Yield	Moisture	Test Weight	Grower return	Height	Lodging
		lbs/A	bu/A	%	lbs/bu	\$/A	inches	1 to 5
Wheat		0	51	13.4	55	144	33	1
Wheat		25	60	13.2	55	171	34	1
Wheat		50	64	12.8	54	181	34	1
Wheat		75	65	12.9	54	184	34	1
Wheat		100	66	13.0	55	186	34	1
Wheat		125	65	12.8	54	184	34	1
Wheat	Grain System I		72	13.2	55	204	35	1
Wheat	Grain System II		51	12.8	54	145	33	1
Wheat	Livestock System		62	13.0	55	176	33	1
Wheat	Grain System I	0	65	13.5	55	183	33	1
Wheat	Grain System I	25	72	13.4	55	205	35	1
Wheat	Grain System I	50	74	13.2	54	209	35	1
Wheat	Grain System I	75	71	13.0	54	201	35	1
Wheat	Grain System I	100	77	13.3	55	217	36	1
Wheat	Grain System I	125	73	13.2	55	207	35	2
Wheat	Grain System II	0	40	13.3	54	114	33	1
Wheat	Grain System II	25	52	13.1	55	146	34	1
Wheat	Grain System II	50	52	12.3	53	149	33	1
Wheat	Grain System II	75	57	12.7	54	161	33	1
Wheat	Grain System II	100	53	12.8	54	151	32	1
Wheat	Grain System II	125	53	12.5	53	151	33	1
Wheat	Livestock System	0	48	13.5	55	135	32	1
Wheat	Livestock System	25	56	13.3	55	160	33	1
Wheat	Livestock System	50	66	12.9	54	186	33	1
Wheat	Livestock System	75	67	13.0	54	190	34	1
Wheat	Livestock System	100	67	12.8	55	191	33	1
Wheat	Livestock System	125	68	12.8	54	195	34	1
Mean			62	13.0	54	175	34	1
Probability(%)								
Rotation (R)			0.0	10.2	0.8	0.0	7.1	31.2
Nitrogen (N)			0.0	0.0	0.0	0.0	1.0	1.5
R x N			14.9	2.6	77.3	14.9	18.9	0.3
LSD (0.10)								
Rotation (R)			2	NS	0	7	1.3	NS
Nitrogen (N)			4	0.2	0	10	0.7	0
R x N			NS	0.3	NS	NS	NS	0
CV(%)								
			10	2	1	10	4	26

**Table C-58. Corn, Soybean, and Wheat Rotation.
Arlington, WI - 2005.**

Crop	Rotation	Residue		Moisture	Test Weight	Grower return	Height	Lodging	Harvest Density	Soil NO ₃ ⁻ -N				
		cover	Yield							(0-1')	(1-2')	(2-3')	(0-2')	(0-3')
		%	bu/A	%	lbs/bu	\$/A	inches	1 to 5	heads/m ²			lbs/A		
Wheat	Continuous	100	42	11.9	52	119	33	1	562	-	-	-	-	-
Wheat	Grain System I	97	77	13.3	55	217	36	1	687	27	17	13	44	57
Wheat	Grain System II	91	53	12.8	54	151	32	1	621	22	15	9	37	46
Wheat	Livestock System	31	67	12.8	55	191	33	1	599	23	13	6	36	43
Means		80	62	12.8	54	177	34	1	617	24	15	9	39	49
Probability(%)														
	Rotation (R)	0.0	0.0	0.8	0.0	0.0	0.1	46.0	23.1	34.7	39.0	0.1	29.5	6.2
LSD (0.10)														
	Rotation (R)	2	6	0.5	1	16	1	NS	NS	NS	NS	2	NS	10
CV(%)														
		6	9	4	1	9	3	40	11	23	32	26	23	20

**Table C-59. Crop Rotation Influence on Corn Growth and Development.
Arlington, WI - 2005.**

Rotation	Observation Day of Year	Leaf Development			
		Leaf Collars	Hail Adjusters Method	Total Leaves	Plant Height
		no./plant	no./plant	no./plant	inches
	151	1.8	3.0	3.8	4.2
	165	5.3	7.4	8.4	16.8
	180	8.5	9.7	12.7	44.1
	194	12.6	12.7	15.6	69.6
	208	18.0	17.8	18.0	74.1
Continuous		9.0	10.0	11.6	38.7
Alternating		9.4	10.1	11.9	42.4
Grain System I		8.8	9.7	11.2	39.9
Grain System II		8.8	9.8	11.2	40.8
Livestock System		9.4	10.2	11.8	42.8
Continuous	151	1.3	2.8	3.7	3.6
Continuous	165	5.0	6.7	7.7	16.1
Continuous	180	8.3	9.7	12.7	42.2
Continuous	194	12.2	13.2	15.7	63.7
Continuous	208	18.2	17.8	18.2	68.0
Alternating	151	2.0	2.8	4.0	4.2
Alternating	165	5.5	7.8	8.8	17.1
Alternating	180	8.5	9.5	13.0	43.7
Alternating	194	13.0	12.5	16.0	71.3
Alternating	208	17.8	17.8	17.8	75.5
Grain System I	151	1.5	2.7	3.3	4.1
Grain System I	165	5.0	6.8	7.7	15.2
Grain System I	180	8.0	9.3	12.0	41.8
Grain System I	194	11.5	12.3	15.2	66.0
Grain System I	208	18.0	17.3	18.0	72.2
Grain System II	151	2.0	3.5	4.2	4.7
Grain System II	165	5.7	8.0	9.2	18.4
Grain System II	180	9.0	10.3	13.0	50.0
Grain System II	194	13.5	12.8	15.8	79.3
Grain System II	208	18.5	18.3	18.5	80.8
Livestock System	151	2.0	3.0	4.0	4.5
Livestock System	165	5.5	7.5	8.5	17.3
Livestock System	180	8.8	10.0	13.0	45.0
Livestock System	194	13.0	12.7	15.7	71.2
Livestock System	208	17.8	17.7	17.8	76.3
Mean		9.1	10.0	11.6	40.9
<u>Probability(%)</u>					
Rotation (R)		16.6	22.3	25.0	13.6
DOY (D)		0.0	0.0	0.0	0.0
R x D		7.7	53.9	0.8	44.1
<u>LSD (0.10)</u>					
Rotation (R)		NS	NS	NS	NS
DOY (D)		0.2	0.3	0.2	2.4
R x D		0.5	NS	0.4	NS
<u>CV(%)</u>					
		4	5	3	9

**Table C-60. Crop Rotation Influence on Corn Biomass Accumulation.
Arlington, WI - 2005.**

Rotation	Observation Day of Year	Dry Matter Yield tons/A	Plant Yield ounces/plant	Moisture %	Plant population plants/A
	152	0.01	0.01	73.3	33891
	161	0.04	0.03	90.0	34581
	172	0.35	0.32	88.7	34916
	182	1.01	0.92	89.2	35130
	194	2.18	1.95	86.0	35839
	213	3.94	3.62	80.9	34852
	271	8.57	7.85	50.3	35654
Continuous		2.08	1.97	80.3	34042
Alternating		2.28	2.12	79.0	35469
Grain System I		2.54	2.22	80.1	35431
Continuous	152	0.01	0.01	70.7	33946
Continuous	161	0.02	0.02	89.9	30922
Continuous	172	0.30	0.27	88.5	35250
Continuous	182	0.87	0.80	88.7	34796
Continuous	194	1.71	1.55	86.8	35418
Continuous	213	3.06	3.14	81.1	31920
Continuous	271	8.62	7.98	56.2	36039
Alternating	152	0.01	0.01	78.2	35733
Alternating	161	0.05	0.04	90.3	36924
Alternating	172	0.42	0.38	88.6	35534
Alternating	182	1.10	1.03	89.3	34268
Alternating	194	2.53	2.26	84.6	35888
Alternating	213	4.01	3.58	79.9	35897
Alternating	271	7.82	7.52	41.9	34036
Grain System I	152	0.01	0.01	71.0	31995
Grain System I	161	0.04	0.03	89.8	35897
Grain System I	172	0.34	0.32	88.8	33963
Grain System I	182	1.07	0.94	89.5	36326
Grain System I	194	2.30	2.03	86.8	36212
Grain System I	213	4.76	4.14	81.8	36740
Grain System I	271	9.29	8.05	52.7	36886
Mean		2.30	2.10	79.8	34980
Probability(%)					
Rotation (R)		26.2	79.0	29.1	48.4
DOY (D)		0.0	0.0	0.0	71.7
R x D		40.7	99.1	3.2	14.1
LSD (0.10)					
Rotation (R)		NS	NS	NS	NS
DOY (D)		0.57	0.66	3.2	NS
R x D		NS	NS	5.5	NS
CV(%)					
		31	39	5	7