Table 1. Some soil characteristics of the field demonstrations on the four farms in four major cash-crop counties in New York.

	CAYUGA CO. (Vaill)	ORLEANS CO. (Roberts)	SENECA CO. (Freier)	YATES CO. (Andersen)
Field size (acres)	10	18	12	8
Soil Type	Honeoye-Lima silt loam	Schoharie clay loam	Schoharie clay loam	Honeoye silt loam
Drainage	Well-drained	Moderately well drained	Moderately well drained	Well-drained
pH	7.8	6.4	6.7	7.7
Soil P Status	Medium	High	Medium	High
Soil K Status	Medium	High	Medium	High
OM (%)	3.6	3.7	3.2	2.9
Previous crop	Grain corn	Grain corn	Grain corn	Grain corn

Table 2 . Crop rotations for corn (C), soybean (S), wheat-clover (W/CL), and canola-clover (Ca/CL) and their sequences from 1993 to 1996.

		YEAR			
CROP ROTATION		1993	1994	1995	1996
1)	Continuous corn (with and without insecticide)	C	C	C	C
2)	Annual rotation of corn and soybean (corn every 2 years)	C S	S C	C S	S C
3)	Rotation of soybean, wheat/clover, and corn (corn every 3 years)	SA† S C	C W/CL S	S C W/CL	W/CL S C
4)	Rotation of soybean, wheat-clover, canola-clover, and corn (corn every 4 years)	C SA S	S Ca/CL W/CL	W/CL C Ca/CL	Ca/CL S C

† SA = Set Aside

Table 3. Corn, soybean, and wheat (15.5, 13, and 14 % H_2O, respectively) yields, averaged across tillage systems, in continuous corn, soybean-corn and soybean-wheat/clover-corn rotations at four sites in New York during the 1994, 1995, and 1996 growing seasons.

Grain Crop	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Site Mean
	---bu acre $^{-1}$---				
1994					
continuous corn	147	142	111	150	138
soybean-corn	169	139	127	137	143
soybean-wheat/clover-corn	157	163	137	161	155
corn-soybean	52	53	43	49	49
corn-soybean-wheat/clover	53	63	59	55	58
1995					
continuous corn	148	109	86	125	117
soybean-corn	170	118	103	153	136
soybean-wheat/clover-corn	164	123	115	152	138
corn-soybean	53	51	33	39	44
corn-soybean-wheat/clover	64	74	58	65	65
1996					
continuous corn	142	123	110	127	126
soybean-corn	164	130	127	133	138
soybean-wheat/clover-corn	141	120	133	126	130
corn-soybean	56	51	40	41	47
corn-soybean-wheat/clover	40	37	52	35	41
Year Mean					
continuous corn	146	125	102	134	127
soybean-corn	168	129	119	141	139
soybean-wheat/clover-corn	154	135	128	146	141
corn-soybean	54	52	39	43	47
corn-soybean-wheat/clover	52	58	56	52	55

Table 4. Plant density at the V3 growth stage of corn, averaged across tillage system, in continuous corn, soybean-corn and soybean-wheat/clover-corn sequences at four sites in New York during the 1994, 1995, and 1996 growing seasons.

	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Mean
1994	----------plants acre^{-1} ----------				
continuous corn	25422	25093	26792	25548	25921
soybean-corn	24903	25643	26798	26357	26019
red clover-corn	21177	25738	24702	25755	23878
LSD (0.05)	NS	NS	826	NS	1691
1995					
continuous corn	26648	28580	25041	24973	26310
soybean-corn	27677	27818	25291	26676	26865
soybean-wheat/red clover-corn	27729	27223	25220	22185	25589
LSD (0.05)	NS	NS	NS	4247	1217
1996					
continuous corn	27911	26721	25607	28861	27275
soybean-corn	28530	27849	25796	29671	27961
soybean-wheat/red clover-corn	25674	26052	25556	28855	26534
LSD (0.05)	2294	NS	NS	NS	821

Table 5. Weed density at the V4 growth stage of corn, averaged across tillage system, in continuous corn, soybean-corn, and soybean-wheat/clover-corn sequences at four sites in New York during the 1994, 1995, and 1996 growing seasons.

	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Mean
	----------no. ft^{-2}----------				
1994					
continuous corn	0.04		0.01	0.05	0.03
soybean-corn	0.02		0.03	0.19	0.07
red clover-corn	0.24		0.04	0.24	0.17
LSD (0.05)	NS		NS	0.12	0.10
1995					
continuous corn	0.08	0.15	0.03	0.10	0.09
soybean-corn	0.18	0.23	0.03	0.16	0.15
soybean-wheat/red clover-corn	0.15	0.12	0.02	0.08	0.09
LSD (0.05)	NS	NS	NS	NS	NS
1996					
continuous corn	0.22	0.16	0.03	0.09	0.12
soybean-corn	0.13	0.14	0.01	0.24	0.13
soybean-wheat/red clover-corn	0.07	0.59	0.07	0.92	0.41
LSD (0.05)	0.15	0.20	NS	0.25	0.07

Table 6 Significance (P-values) for plant density (PD), soil NO_3-N (NO_3-N), weed density (WD), ear-leaf N (ELN), grain yield (GY) and grain N (GN) of corn during the 1994, 1995, and 1996 growing seasons.

ANOVA	PD	NO_3-N	WD	ELN	GY	GN
1994						
Site (S)	NS	NS	NS	0.0129	0.0025	NS
Tillage (T)	0.0085	NS	0.0352	0.0482	NS	NS
S x T	NS	NS	NS	NS	NS	0.0294
Rotation (R)	0.0286	0.0001	0.0312	0.0001	0.0001	0.0001
S x R	NS	0.0006	NS	0.0111	0.0009	0.0001
T x R	NS	NS	NS	NS	NS	NS
S x T x R	NS	NS	NS	NS	NS	NS
CV (%)	7.5	36.0	121.0	5.6	5.3	3.2
1995						
Site (S)	NS	NS	NS	0.0048	0.0037	0.0009
Tillage (T)	NS	NS	NS	NS	NS	NS
S x T	NS	NS	NS	0.0116	NS	NS
Rotation (R)	NS	0.01	NS	0.0204	0.0001	NS
S x R	NS	NS	NS	NS	NS	NS
T x R	NS	NS	NS	NS	NS	NS
S x T x R	NS	NS	NS	NS	NS	NS
CV (%)	6.2	45.2	75.2	7.5	5.4	4.7
1996						
Site (S)	NS	0.0078	0.0207	0.0034	0.0416	0.001
Tillage (T)	NS	0.0187	0.0262	NS	NS	NS
S x T	NS	NS	NS	NS	NS	NS
Rotation (R)	0.0073	0.021	0.0001	NS	0.0045	NS
S x R	NS	NS	0.0001	NS	0.0458	0.0053
T x R	NS	NS	NS	NS	NS	0.0434
S x T x R	NS	NS	0.0264	NS	NS	0.0092
CV (%)	4.0	49.0	42.1	3.1	6.9	2.9

Table 7. Soil NO_3-N concentrations at the V4 growth stage of corn from the 0 to 12 in. soil depth, averaged across tillage system, in continuous corn, soybean-corn and soybean-wheat/clover-corn sequences at four sites in New York during the 1994, 1995, and 1996 growing seasons.

Crop Sequences	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Mean
	ppm				
1994					
continuous corn	8	9	6	5	7
soybean-corn	16	9	10	7	11
red clover-corn	15	11	19	29	18
LSD (0.05)	5	NS	NS	8	3
1995					
continuous corn	13	12	11	16	13
soybean-corn	18	20	14	18	18
soybean-wheat/red clover-corn	25	31	23	14	23
LSD (0.05)	11	NS	NS	NS	6
1996					
continuous corn	7	0	9	3	5
soybean-corn	14	2	10	8	8
soybean-wheat/red clover-corn	11	1	12	1	6
LSD (0.05)	NS	NS	NS	2	2

Table 8. Ear-leaf N of corn at silking in 1994 and 1996 and whole-plant N in 1995, averaged across tillage system, in continuous corn, soybean-corn and soybean-wheat/clover-corn sequences at four sites in New York.

Crop Sequence	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Mean
	----------%----------				
1994					
continuous corn	2.6	2.8	2.2	2.4	2.5
soybean-corn	2.7	2.6	2.4	2.1	2.4
red clover-corn	2.8	2.8	2.7	2.7	2.7
LSD (0.05)	NS	NS	0.2	0.3	0.1
1995					
continuous corn	1.6	1.3	1.4	1.6	1.5
soybean-corn	1.5	1.4	1.6	1.6	1.5
soybean-wheat/red clover-corn	1.6	1.5	1.6	1.7	1.6
LSD (0.05)	NS	NS	NS	0.1	0.1
1996					
continuous corn	2.7	3.0	2.9	2.5	2.8
soybean-corn	2.8	2.9	2.9	2.4	2.7
soybean-wheat/red clover-corn	2.7	2.9	2.8	2.3	2.7
LSD (0.05)	NS	NS	NS	0.1	NS

Table 9. Grain N of corn at harvest, averaged across tillage system, in continuous corn, soybean-corn and soybean-wheat/clover-corn sequences at four sites in New York during the 1994, 1995, and 1996 growing seasons.

Crop Sequence	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Mean
	----------%----------				
1994					
continuous corn	1.2	1.3	1.5	1.4	1.4
soybean-corn	1.3	1.2	1.4	1.2	1.3
red clover-corn	1.4	1.3	1.4	1.5	1.4
LSD (0.05)	0.1	0.1	0.1	0.1	0.1
1995					
continuous corn	1.4	1.3	1.4	1.4	1.4
soybean-corn	1.4	1.3	1.4	1.4	1.4
soybean-wheat/red clover-corn	1.4	1.3	1.4	1.4	1.4
LSD (0.05)	NS	NS	NS	NS	NS
1996					
continuous corn	1.3	1.4	1.4	1.2	1.3
soybean-corn	1.3	1.3	1.4	1.1	1.3
soybean-wheat/red clover-corn	1.3	1.4	1.4	1.2	1.3
LSD (0.05)	NS	0.1	NS	0.1	NS

Table 10 Production costs, gross returns, and net returns for each rotation, averaged across years and tillage system, at four sites in New York using the average yield and the average weighted marketing year price over the 3-year period for each crop.

Rotation	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Site Mean
			Production Costs		
			$ acre^{-1}		
continuous corn	390	366	328	374	365
corn-soybean	286	273	266	270	274
soybean-wheat/clover-corn	276	253	263	269	265
			Gross Returns		
			$ acre^{-1}		
continuous corn	471	403	329	433	409
corn-soybean	429	360	306	353	362
soybean-wheat/clover-corn	338	322	286	308	314
			Net Returns		
			$ acre^{-1}		
continuous corn	81	37	1	59	44
corn-soybean	143	87	40	83	88
soybean-wheat/clover-corn	62	69	23	39	49
LSD (0.05)	33	6	27	11	14

Table 11 Production costs per hectare, according to category, averaged across years and tillage system, for each rotation at four sites in New York.

Rotation	Cayuga Co.	Orleans Co.	Seneca Co.	Yates Co.	Site Mean
	----------$ acre^{-1}----------				
Seed, fertilizer, and pesticide					
continuous corn	146	159	134	164	151
soybean-corn	83	93	91	81	87
soybean-wheat/clover-corn	86	55	92	88	81
Machinery costs					
continuous corn	89	86	73	83	83
soybean-corn	78	78	72	84	78
soybean-wheat/clover-corn	79	69	71	81	75
Drying and hauling costs					
continuous corn	58	26	28	32	36
soybean-corn	38	16	18	19	23
soybean-wheat/clover-corn	27	14	15	16	18
Miscellaneous†					
continuous corn	96	95	92	96	95
soybean-corn	87	86	86	86	86
soybean-wheat/clover-corn	85	83	84	84	84

† Includes interest, insurance, and land rental.

Table 12 Production costs, gross returns, and net returns, averaged across four sites in New York, for each crop within three crop rotations.

Input	Continuous Corn	Soybean-Corn	Soybean-Wheat/Clover-Corn	Corn-Soybean	Corn-Soybean-Wheat/Clover
Production Costs					
			$ acre^{-1}		
Machinery†	83	88	88	67	69
Seed‡	29	29	29	24	48
Fertilizer	80	70	70	7	42
Pesticides	42	11	11	34	-
Drying and Hauling*	36	39	42	7	7
Int. on Oper. Capital	23	20	20	12	14
Crop Insurance	12	12	12	8	6
Land Rent	60	60	60	60	60
Total	365	329	332	219	246
Gross Returns	409	449	455	275	213
Net Returns	44	120	124	56	-33

† Machinery expenses calculated using custom rates.
‡ Seed costs for soybean include seed innoculant and clover seed for wheat.
* Soybean and wheat crops did not incur drying charges.

Table 13 Different whole-farm returns for different scenarios for an 800 acre cash crop farm, averaged across sites, based upon varying areas of three rotations, continuous corn (cont. corn), corn-soybean (c-s), and soybean-wheat/clover-corn (s-w/cl-c). The average annual weighted marketing year prices for each commodity and the average 3-year yields were used for each rotation. Corn-soybean implies one half corn and one half soybean production, whereas the 3-year rotation implies 1/3 production for each crop.

Crop Rotation	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10
	----------acre----------									
cont. corn	800	0	0	267	533	533	267	0	267	0
c-s	0	800	0	267	267	0	533	533	0	267
s-w/cl-c	0	0	800	266	0	267	0	267	533	533
	----------$----------									
Whole-farm return	35,200	70,400	39,200	48,278	46,948	36,535	58,652	59,987	37,865	49,613

Table 14 Different whole-farm returns for different scenarios for an 800 acre cash crop farm, averaged across sites, based upon varying areas of three rotations, continuous corn (cont. corn), corn-soybean (c-s), and soybean-wheat/clover-corn (s-w/cl-c). The average annual weighted marketing year prices from 1987 to 1996 were used for each commodity and the average 3-year yields were used for each rotation. Corn-soybean implies one half corn and one half soybean production, whereas the 3-year rotation implies 1/3 production for each crop.

Crop Rotation	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10
	acre									
cont. corn	800	0	0	267	533	533	267	0	267	0
c-s	0	800	0	267	267	0	533	533	0	267
s-w/cl-c	0	0	800	266	0	267	0	267	533	533
	$									
Whole-farm return	-9,600	44,800	13,600	16,270	8,556	-1,857	26,644	34,387	5,857	24,013