

Multicrop Production Decisions and Economic Irrigation Water Use Efficiency: Effects of Water Costs, Pressure Irrigation Adoption and Climatic Determinants

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Table S1. Model building process for two-level hierarchical linear models, continuous response variables.

	Model 1	Model 2	Model 3	Model 4
Class	Unconstrained	Random intercepts & fixed level-1	Random intercept & fixed and random level-1	Random intercept & fixed and random level-1 & fixed level-2
System of equations model	L1: $Y_{ij} = \beta_{0j} + r_{ij}$ L2: $\beta_{0j} = \gamma_{00} + u_{0j}$	L1: $Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + r_{ij}$ L2: $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10}$	L1: $Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + r_{ij}$ L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}Z_{ij} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{1j}$	L1: $Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + r_{ij}$ L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}Z_{ij} + u_{0j}$ $\beta_{1j} = \gamma_{10} + \gamma_{11}Z_{ij} + u_{1j}$
Mixed-effect model	$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij}$	$Y_{ij} = \gamma_{00} + \gamma_{10}X_{ij} + u_{0j} + r_{ij}$	$Y_{ij} = \gamma_{00} + \gamma_{10}X_{ij} + \gamma_{01}Z_{ij} + u_{1j}X_{ij} + u_{0j} + r_{ij}$	$Y_{ij} = \gamma_{00} + \gamma_{10}X_{ij} + \gamma_{11}X_{ij}Z_{ij} + \gamma_{01}Z_{ij} + u_{1j}X_{ij} + u_{0j} + r_{ij}$
Description	No predictors, <i>just random effect for the intercept</i>	Model 1 + level-1 fixed effects	Model 2 + random slopes for level-1 predictors	Model 3 + level-2 fixed effects
Notes	Output used to calculate ICC—provides information on how much variation in the outcome exists between level-2 units.	Results indicate the relationship between level-1 predictors and the outcome.	Fixed effect results provide the same information as Model 2; random slope results reveal if the relationships between level-1 predictors and the outcome vary between level-2 units	Level-2 fixed effect results indicate the relationship between level-2 predictors and the outcome. Rest of the results provide the same information as listed for Model 3

Adopted from Bell, Ene, and Schoeneberger (2013) and Luke (2004).

The state-level variables are only included in Model 4 (presented in the tables 5–8), thus they are dropped from the tables below.

Table S2. Results of multilevel models for land allocation to CORN.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	303.480***	22.498	-567.590***	41.889	-468.850***	34.956
<i>Water sources</i>						
On-farm surface water only			93.510***	25.390	78.811***	22.808
Off-farm surface water only			139.460***	23.516	143.170***	20.822
Two or more water sources			103.450***	17.356	80.487***	15.701
<i>Costs</i>						
Cost for off-farm surface water(\$/acre-foot)			0.216*	0.130	0.235**	0.113
Energy expenses (\$/acre)			0.199**	0.080	0.207***	0.072
Facility expenses (\$/acre)			0.207***	0.040	0.160***	0.035
Labor payment (\$/acre)			0.069	0.070	0.047	0.062
<i>Farm characteristics</i>						
# of wells used			37.133***	0.678	38.793***	3.992
LN(total acre)			93.438***	5.304	82.817***	4.969
% of owned land			-33.288**	15.807	-17.249	15.132
Pressure irrigation			43.682***	16.853	13.824	15.015
Federal assistance			-38.624***	14.432	-41.438***	13.031
<i>Barriers to improvements</i>						
Investigating improvement is not a priority			-19.349	15.295	-10.244	13.784
Risk of reduced yield or poorer quality crop			10.387	21.869	2.736	19.686
Limitation of physical field or crop conditions			-25.796	19.828	-28.051	17.873
Not enough to recover implementation costs			29.944*	15.726	30.023**	14.196
Cannot finance improvements			-29.817*	17.092	-21.547	15.417
Landlords will not share improvement costs			1.104	18.674	-9.473	16.856
Uncertainty about future water availability			-26.540	19.146	-33.740**	17.257
Will not be farming long enough			26.760	22.286	3.447	20.059

Will increase management time or cost			-2.610	22.334	-0.373	20.131
<i>Information sources</i>						
Extension agents			-38.202***	13.019	-28.021**	11.717
Private irrigation specialists			41.348***	12.482	24.310**	11.238
Irrigation equipment dealers			1.819	13.075	-3.827	11.778
Local irrigation district employee			-20.099	22.038	2.309	19.883
Government specialists			-26.349	17.226	-6.763	15.568
Media reports			2.848	18.503	-0.378	16.674
Neighboring farmers			-22.567	14.148	-29.198**	12.748
E-information services			23.000	15.261	13.241	13.752
Error Variance	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Intercept	13,704***	4152	7466***	2107	<0.0001***	<0.0001
Residual	1,982,591***	36,208	1,058,238***	19,320	859,702***	15,768
Fit Statistics						
N	6030		6030		6030	
-2 Log Likelihood	98,287		94,502		93,319	
AIC	98,293		94,566		93,389	
AICC	98,293		94,566		93,389	
BIC	98,298		94,622		93,451	

Significance levels: * 10%; ** 5%; *** 1%.

Table S3. Results of multilevel models for land allocation to SOYBEANS.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	251.560***	36.365	-559.860***	49.189	-488.890***	70.552
<i>Water sources</i>						
On-farm surface water only			53.993**	26.139	29.337	24.599
Off-farm surface water only			84.522**	35.078	55.902*	32.696
Two or more water sources			82.163***	17.063	66.167**	18.512
<i>Costs</i>						
Cost for off-farm surface water(\$/acre-foot)			0.154	0.323	0.059	0.301
Energy expenses (\$/acre)			-1.034***	0.202	-0.541*	0.260
Facility expenses (\$/acre)			-0.002	0.041	0.009	0.037
Labor payment (\$/acre)			0.001	0.472	0.204	0.427
<i>Farm characteristics</i>						
# of wells used			26.798***	0.644	18.112***	2.587
LN(total acre)			104.310***	6.176	93.807***	10.859
% of owned land			-38.648**	15.518	-17.687	14.232
Pressure irrigation			-5.626	14.232	6.627	22.892
Federal assistance			-28.991**	13.303	-24.863**	12.092
<i>Barriers to improvements</i>						
Investigating improvement is not a priority			39.375***	15.101	24.635*	13.697
Risk of reduced yield or poorer quality crop			-7.174	21.826	-1.054	19.718
Limitation of physical field or crop conditions			-21.666	18.698	-20.495	16.979
Not enough to recover implementation costs			1.015	14.419	-1.521	13.206
Cannot finance improvements			-13.699	17.191	-1.988	15.583

Landlords will not share improvement costs			-27.246*	16.473	-29.687**	14.930
Uncertainty about future water availability			-40.029*	20.772	-29.033	18.991
Will not be farming long enough			8.091	22.843	16.063	20.735
Will increase management time or cost			0.895	22.199	4.858	20.089
Information source						
Extension agents			-5.977	11.381	-19.407*	10.398
Private irrigation specialists			3.464	11.464	8.654	10.440
Irrigation equipment dealers			4.104	12.228	-4.019	11.097
Local irrigation district employee			29.577	23.722	23.857	21.660
Government specialists			13.728	15.598	4.769	14.130
Media reports			0.108	16.763	-1.229	15.189
Neighboring farmers			-21.697*	12.978	-18.505	11.698
E-information services			-9.579	14.137	12.719	12.828
Error Variance	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Intercept	33,062***	9046	12,197***	3563	54,283***	20,602
Residual	1,101,143***	24,905	537,987***	12,169	433,603***	9931
Fit Statistics						
N	3933		3933		3933	
-2 Log Likelihood	61,977		59,154		58,453	
AIC	61,983		59,218		58,527	
AICC	61,983		59,218		58,528	
BIC	61,988		59,269		58,587	

Significance levels: * 10%; ** 5%; *** 1%.

Table S4. Results of multilevel models for mean water application on CORN farms.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	1.076***	0.123	0.870***	0.129	1.027***	0.154
<i>Water sources</i>						
On-farm surface water only			-0.015	0.038	-0.024	0.070
Off-farm surface water only			0.132***	0.036	-0.045	0.080
Two or more water sources			0.075***	0.025	0.106**	0.041
<i>Costs</i>						
Cost for off-farm surface water(\$/acre-foot)			0.000	0.000	0.003**	0.001
Energy expenses (\$/acre)			0.001***	0.000	0.001*	0.001
Facility expenses (\$/acre)			0.000***	0.000	0.000	0.000
Labor payment (\$/acre)			0.001***	0.000	0.003**	0.001
<i>Farm characteristics</i>						
# of wells used			0.001	0.001	0.003*	0.001
LN(total acre)			0.033***	0.008	0.023	0.017
% of owned land			0.020	0.023	-0.012	0.048
Pressure irrigation			-0.090***	0.025	-0.196	0.119
Federal assistance			-0.003	0.021	0.023	0.032
<i>Barriers to improvements</i>						
Investigating improvement is not a priority			0.067***	0.022	0.053***	0.021
Risk of reduced yield or poorer quality crop			0.046	0.032	0.061**	0.029
Limitation of physical field or crop conditions			-0.083***	0.029	-0.094***	0.026
Not enough to recover implementation costs			0.015	0.023	0.004	0.021
Cannot finance improvements			0.093***	0.025	0.134***	0.023
Landlords will not share improvement costs			0.008	0.027	-0.015	0.025

Uncertainty about future water availability			-0.060**	0.028	-0.071***	0.026
Will not be farming long enough			-0.014	0.032	0.060**	0.030
Will increase management time or cost			-0.052	0.032	-0.074**	0.030
<i>Information source</i>						
Extension agents			-0.094***	0.019	-0.063***	0.017
Private irrigation specialists			-0.040**	0.018	-0.042**	0.017
Irrigation equipment dealers			0.060***	0.019	0.056***	0.018
Local irrigation district employee			0.117***	0.032	0.103***	0.030
Government specialists			0.012	0.025	0.039*	0.023
Media reports			-0.040	0.027	-0.010	0.025
Neighboring farmers			-0.059***	0.021	-0.069***	0.019
E-information services			0.070***	0.022	0.062***	0.020
Error Variance	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Intercept	0.619***	0.141	0.554***	0.127	0.536***	0.167
Residual	2.325***	0.042	2.228***	0.041	1.761***	0.033
Fit Statistics						
N	6030		6030		6030	
-2 Log Likelihood	16,071		15,812		14,788	
AIC	16,077		15,876		14,874	
AICC	16,077		15,876		14,875	
BIC	16,082		15,932		14,950	

Significance levels: * 10%; ** 5%; *** 1%.

Table S5. Results of multilevel models for mean water application on SOYBEAN farms.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	0.712***	0.073	0.691***	0.089	0.842***	0.093
<i>Water sources</i>						
On-farm surface water only			0.151***	0.036	0.018	0.079
Off-farm surface water only			0.075	0.049	0.022	0.052
Two or more water sources			0.034	0.023	0.040	0.033
<i>Costs</i>						
Cost for off-farm surface water(\$/acre-foot)			0.001***	0.000	0.001	0.000
Energy expenses (\$/acre)			0.001	0.000	0.001**	0.001
Facility expenses (\$/acre)			0.000	0.000	0.000	0.000
Labor payment (\$/acre)			-0.002***	0.001	-0.001	0.002
<i>Farm characteristics</i>						
# of wells used			0.001	0.001	0.003**	0.001
LN(total acre)			0.027***	0.008	0.001	0.013
% of owned land			-0.007	0.021	-0.034	0.032
Pressure irrigation			-0.214***	0.020	-0.162**	0.058
Federal assistance			0.033*	0.018	0.047*	0.025
<i>Barriers to improvements</i>						
Investigating improvement is not a priority			0.016	0.021	0.007	0.020
Risk of reduced yield or poorer quality crop			0.056*	0.030	0.078***	0.028
Limitation of physical field or crop conditions			0.003	0.026	0.037	0.025
Not enough to recover implementation costs			0.037*	0.020	-0.007	0.019
Cannot finance improvements			0.016	0.023	0.026	0.022

Landlords will not share improvement costs			-0.058***	0.022	-0.059***	0.022
Uncertainty about future water availability			-0.099***	0.028	-0.086***	0.028
Will not be farming long enough			-0.049	0.031	-0.064**	0.030
Will increase management time or cost			-0.019	0.030	-0.014	0.029
<i>Information source</i>						
Extension agents			-0.062***	0.016	-0.042***	0.015
Private irrigation specialists			-0.058***	0.016	-0.041***	0.015
Irrigation equipment dealers			-0.040**	0.017	-0.044***	0.016
Local irrigation district employee			0.052	0.032	0.024	0.031
Government specialists			0.037*	0.021	0.055***	0.020
Media reports			-0.058**	0.023	-0.037*	0.022
Neighboring farmers			-0.038**	0.018	-0.040**	0.017
E-information services			0.051***	0.019	0.038**	0.018
Error Variance	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Intercept	0.171***	0.053	0.137***	0.044	0.054	0.044
Residual	1.083***	0.025	1.000***	0.023	0.884***	0.020
Fit Statistics						
N	3933		3933		3933	
-2 Log Likelihood	7622		7305		6949	
AIC	7628		7369		7033	
AICC	7628		7369		7033	
BIC	7633		7420		7100	

Significance levels: * 10%; ** 5%; *** 1%.

Table S6. Results of multilevel models for mean yield on CORN farms.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	184.170***	2.330	180.110***	3.749	170.640***	5.663
<i>Water sources</i>						
On-farm surface water only			-15.384***	2.008	-6.250	3.806
Off-farm surface water only			-11.424***	1.895	-2.491	3.621
Two or more water sources			-5.704***	1.357	1.022	2.660
<i>Costs</i>						
Cost for off-farm surface water(\$/acre-foot)			0.008	0.010	0.007	0.012
Energy expenses (\$/acre)			0.003	0.006	0.001	0.025
Facility expenses (\$/acre)			-0.012***	0.003	0.003	0.007
Labor payment (\$/acre)			-0.002	0.006	0.013	0.021
<i>Farm characteristics</i>						
# of wells used			0.033	0.053	0.023	0.081
LN(total acre)			0.986**	0.417	1.883***	0.651
% of owned land			-6.216***	1.236	-5.739***	2.112
Pressure irrigation			6.099***	1.345	3.688	3.693
Federal assistance			2.426**	1.126	1.865	1.894
<i>Barriers to improvements</i>						
Investigating improvement is not a priority			-1.290	1.194	-1.595	1.150
Risk of reduced yield or poorer quality crop			10.405***	1.707	10.903***	1.636
Limitation of physical field or crop conditions			-4.097***	1.547	-3.824***	1.485
Not enough to recover implementation costs			-0.120	1.227	-0.881	1.187
Cannot finance improvements			-6.445***	1.334	-6.888***	1.298

Landlords will not share improvement costs			-2.276	1.457		-0.981	1.390
Uncertainty about future water availability			-0.971	1.496		-2.046	1.441
Will not be farming long enough			-0.016	1.740		0.969	1.682
Will increase management time or cost			0.010	1.743		-0.717	1.679
<i>Information source</i>							
Extension agents			3.523***	1.018		4.069***	0.976
Private irrigation specialists			4.120***	0.976		3.520***	0.940
Irrigation equipment dealers			-1.745*	1.022		-0.970	0.988
Local irrigation district employee			-0.303	1.722		-1.048	1.676
Government specialists			-5.552***	1.345		-3.708***	1.310
Media reports			1.575	1.445		2.096	1.380
Neighboring farmers			-1.044	1.105		-0.552	1.066
E-information services			3.319***	1.191		2.553**	1.147
Error Variance		Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
	Intercept	191***	52	174***	47	473***	189
	Residual	6887***	126	6434***	118	5635***	106
Fit Statistics							
	N	6030		6030		6030	
	-2 Log Likelihood	64,185		63,775		63,282	
	AIC	64,191		63,839		63,368	
	AICC	64,191		63,839		63,369	
	BIC	64,197		63,895		63,444	

Significance levels: * 10%; ** 5%; *** 1%.

Table S7. Results of multilevel models for mean yield on SOYBEAN farms.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	51.990***	0.852	47.767***	1.680	49.200***	2.023
<i>Water sources</i>						
On-farm surface water only			-0.506	0.859	0.422	1.548
Off-farm surface water only			4.534***	1.151	5.186***	1.241
Two or more water sources			1.444***	0.558	1.106	0.808
<i>Costs</i>						
Cost for off-farm surface water(\$/acre-foot)			-0.032***	0.011	-0.005	0.011
Energy expenses (\$/acre)			-0.011	0.007	0.001	0.014
Facility expenses (\$/acre)			0.001	0.001	0.000	0.001
Labor payment (\$/acre)			0.022	0.015	0.036	0.034
<i>Farm characteristics</i>						
# of wells used			0.139***	0.021	0.120***	0.035
LN(total acre)			-0.287	0.202	-0.102	0.239
% of owned land			-1.015**	0.508	-2.242**	1.010
Pressure irrigation			4.879***	0.467	2.052	1.296
Federal assistance			1.002**	0.435	0.772	0.667
<i>Barriers to improvements</i>						
Investigating improvement is not a priority			0.403	0.494	-0.294	0.484
Risk of reduced yield or poorer quality crop			-0.051	0.714	-0.240	0.695
Limitation of physical field or crop conditions			-1.277**	0.612	-1.417**	0.601
Not enough to recover implementation costs			1.071**	0.472	1.435***	0.475
Cannot finance improvements			-1.689***	0.562	-1.647***	0.551

Landlords will not share improvement costs			-1.096**	0.539		-0.611	0.529
Uncertainty about future water availability			-1.438**	0.680		-0.930	0.677
Will not be farming long enough			2.526***	0.747		2.713***	0.729
Will increase management time or cost			-0.113	0.726		-0.479	0.709
<i>Information sources</i>							
Extension agents			2.007***	0.372		1.829***	0.367
Private irrigation specialists			1.722***	0.375		1.568***	0.371
Irrigation equipment dealers			-0.600	0.400		-0.978**	0.394
Local irrigation district employee			0.098	0.776		-0.482	0.762
Government specialists			0.067	0.510		-0.069	0.498
Media reports			1.285**	0.549		1.224**	0.534
Neighboring farmers			0.693*	0.425		0.918**	0.411
E-information services			0.772*	0.463		0.556	0.453
Error Variance		Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
	Intercept	17.943***	5.807	19.890***	6.249	19.143***	9.372
	Residual	629.360***	14.251	575.210***	13.026	531.160***	12.307
Fit Statistics							
	N	3933		3933		3933	
	-2 Log Likelihood	32,608		32,259		32,078	
	AIC	32,614		32,323		32,162	
	AICC	32,614		32,323		32,162	
	BIC	32,619		32,374		32,229	

Significance levels: * 10%; ** 5%; *** 1%.

Table S8. Results of multilevel models for economic irrigation water use efficiency (EIWUE) of CORN.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	1920.710***	182.270	2228.690***	201.950	1907.850***	197.900
<i>Water sources</i>						
On-farm surface water only			284.240***	68.502	528.900***	196.320
Off-farm surface water only			163.000**	65.040	513.210	367.270
Two or more water sources			-34.817	45.944	-63.021	45.799
<i>Costs</i>						
Cost for off-farm surface water(\$/acre-foot)			-0.491	0.347	-10.831*	6.444
Energy expenses (\$/acre)			-1.264***	0.211	-3.152***	0.938
Facility expenses (\$/acre)			-0.137	0.105	-0.430	0.400
Labor payment (\$/acre)			-0.802***	0.193	-0.494*	0.277
<i>Farm characteristics</i>						
# of wells used			-5.903***	1.803	-9.892***	2.637
LN(total acre)			-57.837***	14.247	-1.622	23.655
% of owned land			-33.294	41.897	-2.715	67.490
Pressure irrigation			212.810***	45.958	144.780*	70.034
Federal assistance			64.142*	38.111	12.883	48.679
<i>Barriers to improvements</i>						
Investigating improvement is not a priority			-95.948**	40.433	-104.120***	38.537
Risk of reduced yield or poorer quality crop			-7.577	57.784	-13.755	54.740
Limitation of physical field or crop conditions			-40.131	52.376	-26.627	49.597
Not enough to recover implementation costs			-34.720	41.535	-56.299	39.584
Cannot finance improvements			-151.960***	45.172	-206.260***	43.568
Landlords will not share improvement costs			-49.482	49.295	-9.108	46.403

Uncertainty about future water availability			104.840**	50.633	106.590**	48.465	
Will not be farming long enough			-65.038	58.923	-94.172*	56.534	
Will increase management time or cost			130.580**	59.016	179.420***	56.392	
<i>Information sources</i>							
Extension agents			7.256	34.497	-12.537	32.662	
Private irrigation specialists			-1.415	33.032	-15.023	31.364	
Irrigation equipment dealers			-46.253	34.617	-24.198	33.018	
Local irrigation district employee			-149.490***	58.298	-110.630**	56.266	
Government specialists			-130.910***	45.542	-170.130***	43.843	
Media reports			199.680***	48.923	170.730***	46.221	
Neighboring farmers			31.803	37.402	58.472*	35.660	
E-information services			-61.057	40.328	-35.264	38.358	
Error Variance		Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
	Intercept	1,349,132***	315,840	1,234,794***	292,676	736,041***	257,135
	Residual	7,639,249***	139,655	7,363,930***	134,627	6,264,332***	117,426
Fit Statistics							
	N	6030		6030		6030	
	-2 Log Likelihood	106,536		106,312		105,721	
	AIC	106,542		106,376		105,805	
	AICC	106,542		106,376		105,805	
	BIC	106,547		106,432		105,879	

Significance levels: * 10%; ** 5%; *** 1%.

Table S9. Results of multilevel models for economic irrigation water use efficiency (EIWUE) of SOYBEANS.

	Model 1: Random Intercept Only		Model 2: M1 + Fixed Level 1		Model 3: M2 + Random Level 1	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Fixed Effects						
Intercept	1768.550***	164.010	1751.090***	198.940	1814.070***	225.090
Water sources						
On-farm surface water only			17.919	71.708	28.057	95.000
Off-farm surface water only			142.940	96.472	166.270	297.100
Two or more water sources			-20.759	46.098	-131.790	124.290
Costs						
Cost for off-farm surface water(\$/acre-foot)			-2.789***	0.874	-7.519	4.462
Energy expenses (\$/acre)			-2.508***	0.548	-3.271***	0.861
Facility expenses (\$/acre)			0.036	0.110	0.103	0.560
Labor payment (\$/acre)			3.693***	1.274	0.369	3.396
Farm characteristics						
# of wells used			-2.118	1.743	-4.611*	2.201
LN(total acre)			-31.183*	16.805	-19.908	22.291
% of owned land			2.975	41.989	34.895	77.407
Pressure irrigation			221.650***	38.774	198.470**	74.680
Federal assistance			33.668	35.954	-13.822	63.952
Barriers to improvements						
Investigating improvement is not a priority			124.980***	40.828	106.500***	40.133
Risk of reduced yield or poorer quality crop			-116.510**	58.982	-154.650***	57.873
Limitation of physical field or crop conditions			-92.433*	50.513	-121.590**	49.937
Not enough to recover implementation costs			-86.521**	38.954	-38.334	39.349
Cannot finance improvements			-3.261	46.480	17.128	45.684
Landlords will not share improvement costs			16.654	44.477	6.790	43.883
Uncertainty about future water availability			88.545	56.228	71.141	57.527

Will not be farming long enough			41.026	61.701	62.919	60.427
Will increase management time or cost			36.033	59.938	23.831	59.676
Information sources						
Extension agents			54.725*	30.794	45.698	30.398
Private irrigation specialists			77.723**	31.006	29.558	30.794
Irrigation equipment dealers			19.191	33.093	7.559	32.882
Local irrigation district employee			-136.420**	64.231	-121.290*	64.163
Government specialists			-56.086	42.158	-89.588**	41.350
Media reports			192.190***	45.397	157.790***	44.378
Neighboring farmers			82.817**	35.079	87.685***	34.301
E-information services			39.641	38.288	60.271	37.552
Error Variance	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Intercept	878,725***	232,619	830,411***	222,879	773,961***	252,791
Residual	4,106,553***	93,048	3,917,688***	88,780	3,601,179***	84,806
Fit Statistics						
N	3933		3933		3933	
-2 Log Likelihood	67,211		67,026		66,887	
AIC	67,217		67,090		66,975	
AICC	67,218		67,091		66,976	
BIC	67,222		67,142		67,046	

Significance levels: * 10%; ** 5%; *** 1%.

