Table 1. Input Data from an Agricultural Region of California

---- PARAMETER B Total inputs

	85	86	87	88	89	90	91
LAND	2.5227360	2.2526430	2.0994360	2.1472000	2.2489490	2.1785680	2.00803
WATER	9.1027340	8.1980920	8.0426350	8.6711670	8.7030010	8.1768200	7.54985
OTHER	5.3240723	3.4727446	3.9179319	3.5405830	4.3006292	4.9299998	4.52277

---- PARAMETER R Input prices

LAND	1.3900000	1.2300000	1.0800000	1.2700000	1.3900000	1.3900000	1.46000
WATER	0.0494350	0.0381230	0.0397990	0.0360290	0.0402180	0.0456640	0.04273
OTHER	0.1000000	0.1000000	0.1000000	0.1000000	0.1000000	0.1000000	0.10000

---- PARAMETER XBAR Total production

	85	86	87	88	89	90	91
Rice	2.9825080	2.6622330	2.6725530	2.9210750	3.2612910	2.6702910	2.5026
Fodder	1.2221741	1.0976051	1.0710793	1.0249787	1.0266300	0.9914199	1.1345
Field	2.5976575	2.5611960	2.6446376	2.1392148	2.1240729	2.2599815	1.9356
Grain	1.4609767	0.8597838	0.6639428	0.7105997	0.9506397	0.7936282	0.7146
Tomato	5.8887000	6.4537410	6.0530910	5.9482500	7.5285210	7.6154190	10.2426
SugarB	1.7742340	1.8800100	2.4728200	2.5799830	2.5998530	1.8893600	2.0331
Truck	0.9682400	0.9058000	0.8088600	0.7394400	0.6915000	0.8369400	0.8550

---- PARAMETER PRI Output prices

Rice	1.5100000	1.6100000	1.5900000	1.5400000	1.4100000	1.5300000	1.6600
Fodder	0.8500000	0.7700000	0.7170000	0.8730000	0.9230000	1.0070000	0.8330
Field	0.9670000	0.7700000	0.7930000	1.0130000	1.0270000	1.0600000	1.0930
Grain	0.9670000	0.8070000	0.8030000	1.0700000	1.1970000	0.9830000	1.0170
Tomato	0.5100000	0.5100000	0.4600000	0.4800000	0.5200000	0.5500000	0.5470
SugarB	0.3500000	0.3430000	0.3330000	0.3730000	0.3870000	0.3900000	0.3730
Truck	1.7800000	1.5800000	1.6800000	1.9800000	1.8800000	1.9500000	2.0500

Table 1. Input Data from an Agricultural Region of California (continue)

---- PARAMETER A input per unit output

	85	86	87	88	89	90
Rice.LAND	0.2680965	0.2610966	0.2652520	0.2832861	0.2457002	0.2652520
Rice.WATER	1.7238606	1.6788512	1.7055703	1.8215297	1.5798526	1.7055703
Rice.OTHER	0.7000820	0.4635210	0.5492880	0.4775640	0.4976560	0.6115440

Fodder.LAND	0.1441047	0.1658292	0.1554171	0.1571438	0.1589092	0.1622955
Fodder.WATER	0.5692135	0.6550252	0.6138976	0.6207183	0.6276916	0.6410674
Fodder.OTHER	0.1878220	0.1404730	0.1691550	0.1088950	0.1273210	0.1781920
Field.LAND	0.2439024	0.2272727	0.2114165	0.2309469	0.2398082	0.2439024
Field.WATER	0.6268294	0.5840908	0.5433402	0.5935337	0.6163070	0.6268295
Field.OTHER	0.1388760	0.0490460	0.1031320	0.0700430	0.1027150	0.1694790
Grain.LAND	0.3270004	0.4236391	0.3856537	0.3346272	0.3399164	0.3739156
Grain.WATER	0.2910307	0.3770390	0.3432314	0.2978189	0.3025258	0.3327856
Grain.OTHER	0.0342240	0.0581540	0.0753080	0.0703630	0.0525960	0.0630020
Tomato.LAND	0.0370370	0.0326477	0.0332557	0.0363636	0.0333000	0.0347584
Tomato.WATER	0.1137037	0.1002285	0.1020951	0.1116364	0.1022311	0.1067084
Tomato.OTHER	0.3117840	0.2104210	0.2240180	0.2210730	0.2268710	0.2697160
SugarB.LAND	0.0050839	0.0047393	0.0042017	0.0045310	0.0041964	0.0044248
SugarB.WATER	0.0170819	0.0159242	0.0141176	0.0152243	0.0140999	0.0148673
SugarB.OTHER	0.1887100	0.1335000	0.1239300	0.1201200	0.1251600	0.1510400
Truck.LAND	0.1315789	0.1428571	0.1282051	0.1265823	0.1333333	0.1351351
Truck.WATER	0.2473684	0.2685714	0.2410256	0.2379747	0.2506667	0.2540541
Truck.OTHER	0.4388870	0.3311560	0.3505610	0.2829400	0.3547930	0.4157290

Table 2. Estimation results

---- PARAMETER Gamma Output price expectation diagonal matrix

Rice	Fodder	Field	Grain	Tomato	Sugarbeets	Truck
-0.0118	0.0059	-0.0271	0.0295	0.1032	-0.0113	0.0111

---- PARAMETER Q Output cost matrix for 1991

	Rice	Fodder	Field	Grain	Tomato	Sugarbts	Truc
Rice	0.6775	-0.0328	0.0132	-0.0421	0.0024	-0.0015	-0.17
Fodder	-0.0328	0.6607	0.0062	-0.0029	0.0001	0.0005	-0.06
Field	0.0132	0.0062	0.3298	0.0254	0.0022	0.0026	0.00
Grain	-0.0421	-0.0029	0.0254	1.0083	0.0074	0.0074	-0.08
Tomato	0.0024	0.0001	0.0022	0.0074	0.1006	0.0003	0.00
SugarB	-0.0015	0.0005	0.0026	0.0074	0.0003	0.2212	0.00
Truck	-0.1767	-0.0607	0.0005	-0.0803	0.0012	0.0008	1.49

---- Matrix of Supply Elasticities for 1991

	Rice	Fodder	Field	Grain	Tomato	Sugarbts	Truck

Rice	0.2811	0.0087	-0.0084	0.0091	-0.0026	0.0003	0.0430
Fodder	0.0355	0.2867	-0.0083	0.0035	-0.0007	-0.0003	0.0343
Field	-0.0139	-0.0034	0.4001	-0.0098	-0.0039	-0.0015	-0.0037
Grain	0.0468	0.0044	-0.0304	0.3530	-0.0142	-0.0042	0.0457
Toamto	-0.0021	-0.0001	-0.0019	-0.0022	0.1593	-0.0001	-0.0010
SugarB	0.0018	-0.0004	-0.0053	-0.0048	-0.0008	0.2454	-0.0010
Truck	0.0835	0.0163	-0.0043	0.0173	-0.0025	-0.0003	0.3790

Table 3. Estimation results (continue)

---- S matrix of limiting inputs 1991

	LAND	WATER	OTHER
LAND	2.7690	0.9475	3.6797
WATER	0.9475	3.3798	0.5712
OTHER	3.6797	0.5712	7.3425

---- DERIVED DEMAND ELASTICITIES 1991

	LAND	WATER	OTHER
LAND	-1.2344	0.0404	1.1940
WATER	0.3668	-0.6549	0.2881
OTHER	0.3122	0.0083	-0.3205

ALLEN ELASTICITIES OF SUBSTITUTION 1991

	LAND	WATER	OTHER
LAND	-6.0918	1.8100	1.5406
WATER	1.8100	-29.3707	0.3718
OTHER	1.5406	0.3718	-0.4135

Morishima elasticities of Substitution 1991

	LAND	WATER	OTHER
LAND		0.6953	1.5145
WATER	1.6011		0.6086
OTHER	1.5465	0.6632	

Table 4. Estimation results (continue)

---- PARAMETER S Generalized-Leontief matrix for limiting inputs (seven years)

	85	86	87	88	89	90	91
LAND .LAND	2.8108	2.6254	2.4966	2.6781	2.8777	2.6659	2.7690
LAND .WATER	1.0650	0.9549	0.9794	0.9666	1.0062	0.9815	0.9475
LAND .OTHER	3.4911	3.3117	3.2238	3.3089	3.6164	3.4435	3.6797
WATER.LAND	1.0650	0.9549	0.9794	0.9666	1.0062	0.9815	0.9475
WATER.WATER	3.7012	3.4115	3.5236	3.4523	3.5296	3.4988	3.3798
WATER.OTHER	0.7033	0.5704	0.6193	0.5809	0.6234	0.6129	0.5712
OTHER.LAND	3.4911	3.3117	3.2238	3.3089	3.6164	3.4435	3.6797
OTHER.WATER	0.7033	0.5704	0.6193	0.5809	0.6234	0.6129	0.5712
OTHER.OTHER	5.8371	5.9146	6.2138	5.6363	6.3916	6.4714	7.3425

---- Eigenvalues for the S matrix

	85	86	87	88	89	90	91
1	8.4220	8.1740	8.2987	8.0086	8.8680	8.7064	9.5374
2	3.4904	3.2983	3.4029	3.3109	3.4118	3.3956	3.3432
3	0.4366	0.4792	0.5324	0.4472	0.5191	0.5338	0.6097

Condition Number for the S matrices

85	86	87	88	89	90	91
19.290	17.057	15.587	17.908	17.083	16.310	15.643

---- EIGENVALUES FOR THE Q MATRIX

	85	86	87	88	89	90	91
1	1.6139	1.5600	1.5286	1.5362	1.5405	1.5260	1.5415
2	1.0315	1.0048	1.0106	1.0205	1.0388	1.0095	1.0088
3	0.6806	0.6790	0.6807	0.6756	0.6782	0.6738	0.6916
4	0.5779	0.6366	0.6525	0.6240	0.5549	0.6353	0.5991
5	0.3268	0.3279	0.3281	0.3311	0.3278	0.3300	0.3279
6	0.2271	0.2279	0.2260	0.2254	0.2205	0.2238	0.2210
7	0.1222	0.1249	0.1260	0.1257	0.1137	0.1186	0.1005

Condition Number for the Q matrices

85	86	87	88	89	90	91
13.207	12.490	12.132	12.221	13.549	12.867	15.338

Table 5. Results of Phase 3

---- Calibrated output decisions (Phase 3)

	85	86	87	88	89	90	91	92
Rice	2.9825	2.6622	2.6724	2.9211	3.2613	2.6703	2.5026	2.4827
Fodder	1.2222	1.0976	1.0710	1.0250	1.0266	0.9914	1.1346	1.0773
Field	2.5977	2.5612	2.6446	2.1392	2.1241	2.2600	1.9356	1.9611
Grain	1.4610	0.8598	0.6637	0.7106	0.9506	0.7936	0.7146	0.7004
Tomato	5.8887	6.4537	6.0529	5.9483	7.5285	7.6154	10.2427	9.6388
SugarB	1.7742	1.8800	2.4728	2.5800	2.5999	1.8894	2.0331	1.8803
Truck	0.9682	0.9058	0.8088	0.7394	0.6915	0.8369	0.8550	0.7912

---- Percent DIFFERENCE in output decisions. Weights (0 ,1.5, 3) and (-2.5, 0, 2.5)

	85	86	87	88	89	90	91	92
Rice	0.0001	0.0001	-0.0058	0.0001	0.0001	0.0001	0.0001	9.9096

Fodder	0.0001	0.0001	-0.0047	0.0001	0.0001	0.0001	0.0001	7.2408
Field	0.0001	0.0001	-0.0019	0.0001	0.0001	0.0001	0.0001	-13.3226
Grain	0.0001	0.0001	-0.0419	0.0001	0.0001	0.0001	0.0001	-14.3592
Tomato	0.0001	0.0001	-0.0031	0.0001	0.0001	0.0001	0.0001	2.3555
SugarB	0.0001	0.0001	-0.0023	0.0001	0.0001	0.0001	0.0001	20.1150
Truck	0.0001	0.0001	-0.0081	0.0001	0.0001	0.0001	0.0001	-17.5683

Average percent prediction error: 12.13

---- Calibrated input shadow prices (Phase 3)

	85	86	87	88	89	90	91	92
LAND	1.3900	1.1942	1.0184	1.1622	1.2350	1.1990	1.2227	1.1871
WATER	0.0494	0.0370	0.0375	0.0330	0.0357	0.0394	0.0358	0.0341
OTHER	1.4526	2.1502	1.7679	1.8113	1.8041	1.5889	2.0765	1.9003

Percent DIFFERENCE IN input shadow prices. Weights (0 ,1.5, 3) and (-2.5, 0, 2.5)

	85	86	87	88	89	90	91	92
LAND	0.0	0.0	0.0373	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0360	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	0.0	0.0356	-0.0001	0.0	0.0	0.0	28.9889

Average percent prediction error: 9.66

Table 6. Results of Phase 3 (continue)

---- Effective supply of limiting inputs

	85	86	87	88	89	90	91	92
LAND	2.5227	2.2526	2.0994	2.1472	2.2489	2.1786	2.0080	1.7473
WATER	9.1027	8.1981	8.0426	8.6712	8.7030	8.1768	7.5499	7.4007
OTHER	5.3241	3.4727	3.9179	3.5406	4.3006	4.9300	4.5228	4.4895

---- PARAMETER BETA

	92
LAND	0.1726
WATER	0.6941

---- Costate variables

	85	86	87	88	89	90	91	92
Rice	0.5890	0.5474	0.3508	0.1550	0	0.0049	0.0415	
Fodder	2.3440	2.0072	1.7945	1.6084	1.2171	0.8504	0.4877	0.266
Field	3.4598	2.9836	2.5648	2.1762	1.6200	1.1790	0.8286	0.357
Grain	2.4978	2.1117	2.0330	1.8697	1.4597	0.9497	0.6834	0.408
Tomato	0	0	0	0	0.0079	0	0	0.085
SugarB	0.2704	0.2706	0.2839	0.2344	0.1665	0.1041	0.0659	0.096
Truck	6.8853	6.0046	5.4233	4.6504	3.5452	2.7187	1.8902	1.054

Table 7. Sensitivity analysis of the supports' end points. Weights (0,1,2) and (-1,0,1

S matrix of the cost function

	LAND	WATER	OTHER
LAND	1.3194	0.6533	2.0756
WATER	0.6533	2.4630	0.4459
OTHER	2.0756	0.4459	4.9995

---- Eigenvalues of the S matrix

	85	86	87	88	89	90	91
1	5.4463	4.8799	5.0320	4.7918	5.5564	5.5540	6.0608
2	2.5615	2.3644	2.4435	2.3821	2.4872	2.4772	2.4175
3	0.2763	0.2312	0.2693	0.2303	0.2815	0.2830	0.3036

Condition number of the S matrices

19.711	21.106	18.685	20.807	19.739	19.625	19.960

---- Q matrix of the cost function

	Rice	Fodder	Field	Grain	Tomato	SugarB	Truck
Rice	0.3922	-0.0124	-0.0003	-0.0171	-0.0001	-0.0007	-0.0583
Fodder	-0.0124	0.4230	-0.0008	-0.0096	-0.0005	-0.0006	-0.0328
Field	-0.0003	-0.0008	0.2185	0.0020	0.0002	0.0003	-0.0087
Grain	-0.0171	-0.0096	0.0020	0.6291	0.0010	0.0008	-0.0356
Tomato	-0.0001	-0.0005	0.0002	0.0010	0.0640	0.0002	-0.0023
SugarB	-0.0007	-0.0006	0.0003	0.0008	0.0002	0.1454	-0.0025
Truck	-0.0583	-0.0328	-0.0087	-0.0356	-0.0023	-0.0025	0.8865

---- Eigenvalues of the Q matrix

	85	86	87	88	89	90	91
1	0.9406	0.9122	0.9158	0.9210	0.9386	0.9058	0.8995
2	0.5843	0.6292	0.6453	0.6394	0.6094	0.6257	0.6274
3	0.4332	0.4350	0.4373	0.4337	0.4313	0.4384	0.4271
4	0.3697	0.3861	0.4006	0.3633	0.3198	0.3908	0.3770
5	0.2139	0.2104	0.2126	0.2201	0.2173	0.2214	0.2184
6	0.1526	0.1525	0.1485	0.1470	0.1426	0.1483	0.1454
7	0.0847	0.0855	0.0875	0.0871	0.0756	0.0800	0.0640

Condition number of the Q matrices

11.105	10.669	10.466	10.574	12.416	11.323	13.992

Table 7. Sensitivity analysis of supports' end points. Weights (0,1,2) and (-1,0,1)

Percent Difference in output decisions

	85	86	87	88	89	90	91	92
Rice	0.0001	0.0001	0.0001	0.0022	0.0001	0.0001	0.0001	12.0758
Fodder	0.0001	0.0001	0.0001	0.0019	0.0001	0.0001	0.0001	5.5121
Field	0.0001	0.0001	0.0001	0.0016	0.0001	0.0001	0.0001	-12.0788
Grain	0.0001	0.0001	0.0001	0.0023	0.0001	0.0001	0.0001	-14.2596
Tomato	0.0001	0.0001	0.0001	0.0015	0.0001	0.0001	0.0001	-0.5895
SugarB	0.0001	0.0001	0.0001	0.0013	0.0001	0.0001	0.0001	16.2212
Truck	0.0001	0.0001	0.0001	0.0024	0.0001	0.0001	0.0001	-20.6870

Average absolute percent prediction error 11.62

---- Percent Difference in limiting inputs Weights (0,1,2) and (-1,0,1)

	92
LAND	0.0
WATER	0.0
OTHER	23.2809

Average absolute percent prediction error 7.76

Table 8. Sensitivity analysis of the supports' end points. Weights (0,3,6) and (-5,0,5

S matrix of the cost function 1991

	LAND	WATER	OTHER
LAND	6.2993	1.6474	7.5381
WATER	1.6474	5.7932	0.8565
OTHER	7.5381	0.8565	13.0223

---- Eigenvalues of the S matrix

	86	87	88	89	90	91
1	16.1937	16.2247	15.8037	16.9128	16.5639	18.1268
2	5.6620	5.8476	5.6241	5.7756	5.7901	5.7705
3	1.0301	1.0829	0.9016	0.9604	0.9459	1.2175

Condition number of the S matrices

86	87	88	89	90	91
15.720	14.983	17.153	17.610	17.511	14.988

---- Q matrix of the cost function 1991

Rice	Fodder	Field	Grain	Tomato	SugarB	Truck

Rice	1.3965	-0.1922	0.0191	-0.3375	0.0097	-0.0169	-0.7443
Fodder	-0.1922	1.3497	0.0269	0.0030	0.0022	0.0041	-0.1278
Field	0.0191	0.0269	0.6451	0.0697	0.0104	0.0099	0.0134
Grain	-0.3375	0.0030	0.0697	2.1174	0.0414	0.0361	-0.1197
Tomato	0.0097	0.0022	0.0104	0.0414	0.2016	0.0013	0.0158
SugarB	-0.0169	0.0041	0.0099	0.0361	0.0013	0.4433	0.0046
Truck	-0.7443	-0.1278	0.0134	-0.1197	0.0158	0.0046	3.3955

---- Eigenvalues of the Q matrices

	85	86	87	88	89	90
1	3.7911	3.8024	3.7558	3.9781	4.1022	3.7565	3.6440
2	2.5023	2.2788	2.2230	2.2467	2.3081	2.2846	2.2453
3	1.4118	1.4039	1.4018	1.3930	1.3933	1.3956	1.4480
4	0.8599	0.9627	1.0031	0.9588	0.8426	0.9501	0.9349
5	0.6403	0.6378	0.6358	0.6246	0.6305	0.6350	0.6350
6	0.4460	0.4467	0.4461	0.4457	0.4414	0.4444	0.4420
7	0.2309	0.2335	0.2339	0.2333	0.2214	0.2260	0.1999

Condition number of the Q matrices

85	86	87	88	89	90	91
16.419	16.284	16.057	17.051	18.528	16.622	18.229

Table 8. Sensitivity analysis of supports' end points. Weights (0,3,6) and (-5,0,5)

Percent Difference in output decisions

	85	86	87	88	89	90	91	92
Rice	-0.0008	0.0001	-0.0001	0.0019	0.0001	0.0001	-0.0012	9.3474
Fodder	-0.0014	0.0001	-0.0001	0.0017	0.0001	0.0001	-0.0011	9.5259
Field	-0.0011	0.0001	0.0001	0.0008	0.0001	0.0001	-0.0005	-13.8771
Grain	-0.0013	0.0001	-0.0002	0.0022	0.0001	0.0001	-0.0014	-13.6492
Tomato	0.0016	0.0001	0.0002	0.0008	0.0001	0.0001	-0.0004	5.4770
SugarB	-0.0012	0.0001	0.0001	0.0008	0.0001	0.0001	-0.0008	24.7367
Truck	-0.0017	0.0001	-0.0002	0.0025	0.0001	0.0001	-0.0015	-14.5219

Average absolute percent prediction error 13.02

---- Percent Difference in limiting inputs.

	85	86	87	88	89	90	91	92
LAND	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
WATER	-0.0018	-0.0001	-0.0001	-0.0093	0.0000	0.0000	0.0000	0.0000
OTHER	-0.0045	0.0000	0.0000	-0.0342	0.0000	0.0001	-0.0019	32.1727

Average absolute percent prediction error 10.72