

Appendix C

LETTER FROM R.L. ANDERSON

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE
Natural Resource Economics Division
c/o Economics Department
Colorado State University
Fort Collins, Colorado 80523

May 13, 1982

Mr. V. Kuperan
Department of Agricultural Economics
Faculty of Economic Studies
University of New England
Armidale, N.S.W. 2351
Australia

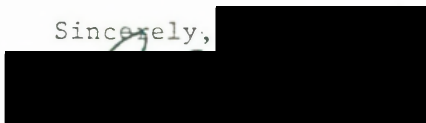
Dear Mr. Kuperan:

I'm sending you two listings of the irrigation system simulation program. One is the original program described in the manual. It has been running for several years. The second listing is of a new version that allows more flexibility in input data by allowing each farm to have different costs, yields, and irrigation sequences if you so choose. As indicated on the printout, it is new and has only been run with Distribution Types 1 and 3. I do not know if it will run with PLAN subroutine.

When you use the program, it is best if you start with simple situations to clean up the data and to become familiar with distribution types and different water supply situations. The PLAN subroutine is best used as a comparison to base runs to see if improvements can be made in traditional crop patterns.

I hope the simulation program is useful and contributes to your research.

Sincerely,


Raymond L. Anderson

RLA:dm
Encs.

Appendix D

EXAMPLE OF OUTPUT FROM SIMULATION

THIS IS A PRINT OUT OF THE INPUT DATA

THERE ARE 10 FARMS, 6 CROPS, AND 4 FIELDS PER CROP 26 TIME PERIODS.
TOTAL WATER SUPPLY = 52569. MEGALITRE DISTRIBUTION TYPE 22

THE CROPS ARE -----
FARM NO. 11

COTTON	TONNE GROSS RETURN = 2170.47	PREHARVEST COST = 966.00	HARVEST COST = 242.44	PRODUCTION = 2. TONNE
WATER NEEDED FOR EACH TIME PERIOD				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
1.24 1.12 3.28 0.00	0.00 0.00 0.00 0.00	0.00 3.56 0.00 0.00	0.00 0.00 2.47 0.00	1.24
LOSS IF NOT WATERED				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.15 0.00 0.00	0.00 0.00 0.26 0.00	0.00
0.09 0.09 0.30 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
WHEAT	TONNE GROSS RETURN = 428.85	PREHARVEST COST = 135.62	HARVEST COST = 37.02	PRODUCTION = 4. TONNE
WATER NEEDED FOR EACH TIME PERIOD				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	2.58 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 1.01 0.00 0.00	0.00 0.00 0.00 0.00	
LOSS IF NOT WATERED				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.16 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.07 0.00 0.00	0.00 0.00 0.00 0.00	
SOYBEAN	TONNE GROSS RETURN = 709.98	PREHARVEST COST = 232.49	HARVEST COST = 53.31	PRODUCTION = 3. TONNE
WATER NEEDED FOR EACH TIME PERIOD				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
LOSS IF NOT WATERED				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.21
0.00 0.00 0.14 0.39	0.00 0.00 0.06 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
MAIZE	TONNE GROSS RETURN = 960.00	PREHARVEST COST = 275.00	HARVEST COST = 75.00	PRODUCTION = 8. TONNE
WATER NEEDED FOR EACH TIME PERIOD				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
LOSS IF NOT WATERED				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.23 0.00 0.06 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
THE ABOVE CROPS ARE PRIORITY CROPS -----				
BARLEY	TONNE GROSS RETURN = 350.98	PREHARVEST COST = 151.55	HARVEST COST = 31.02	PRODUCTION = 4. TONNE
WATER NEEDED FOR EACH TIME PERIOD				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
LOSS IF NOT WATERED				
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00	
SOPGHUM	TONNE GROSS RETURN = 580.00	PREHARVEST COST = 132.91	HARVEST COST = 45.81	PRODUCTION = 7. TONNE

FARM 1 WITH AREA OF 164. HECTS AND 0. PERCENT OF THE WATER DEMAND WATER 3302.00									
IRRIGATION COTTON PERIOD	WHEAT 0. HECTS	SOYBEAN 0. HECTS	MAIZE 42. HECTS	BARLEY 26. HECTS	SORGHUM 0. HECTS	TOTAL WATER PER PERIOD			
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEASON TOTAL	983. MG-LT	0. MG-LT	320. MG-LT	96. MG-LT	0. MG-LT	0. MG-LT	0. MG-LT	0. MG-LT	0. MG-LT
YIELD	126. TONNE	0. TONNE	239. TONNE	75. TONNE	0. TONNE	0. TONNE	0. TONNE	0. TONNE	0. TONNE
HARVEST VALUE	171640.77	0.00	28643.33	6521.72	0.00	0.00	0.00	0.00	0.00
COSTS									
PREHARVEST	97736.00	0.00	11550.00	3947.30	0.00	0.00	0.00	0.00	0.00
HARVEST	23274.24	0.00	3150.00	802.52	0.00	0.00	0.00	0.00	0.00
NET VALUE	55630.53	0.00	13943.33	1771.00	0.00	0.00	0.00	0.00	0.00
GROSS VALUE	206809.42								
TOTAL COSTS	135457.06								
NET VALUE	71351.76								
WATER AVAILABLE AT THE BEGINNING OF EACH TIME PERIOD.									
STREAM	176.1	179.2	311.4	106.7	100.0	10.0	10.0	10.0	10.0
DEMAND	176.1	179.2	311.4	106.7	100.0	10.0	10.0	10.0	10.0
STREAM	193.5	208.2	292.1	30.0	33.0	33.0	33.0	33.0	33.0
DEMAND	193.5	208.2	292.1	30.0	33.0	33.0	33.0	33.0	33.0

[illegible]

FARM A WITH AREA OF 220 HECTS AND 0. PERCENT OF THE WATER. DEMAND WATER 4233.00											
IRIGATION COTTON											
PERIOD	53. HECTS	WHEAT 0. HECTS	SUNDEAN 160. HECTS	MAIZE 0. HECTS	BARLEY 15. HECTS	SORGHUM 0. HECTS	TOTAL WATER PER PERIOD				
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SEASON TOTAL	625. HG-LT	0. HG-LT	843. HG-LT	0. HG-LT	56. HG-LT	0. HG-LT	0. HG-LT	0. HG-LT	0. HG-LT	0. HG-LT	0. HG-LT
YIELD	75. TONNE	0. TONNE	441. TONNE	0. TONNE	61. TONNE	0. TONNE	0.00	0.00	0.00	0.00	0.00
MARKET VALUE	101847.60	0.00	93519.25	0.00	5264.70	0.00	0.00	0.00	0.00	0.00	0.00
COSTS											
PRE-HARVEST	51198.00	0.00	37198.40	0.00	2273.25	0.00	0.00	0.00	0.00	0.00	0.00
HARVEST	12849.32	0.00	8532.60	0.00	465.30	0.00	0.00	0.00	0.00	0.00	0.00
NET VALUE	37800.28	0.00	47788.05	0.00	2522.15	0.00	0.00	0.00	0.00	0.00	0.00
GROSS VALUE	200631.55										
TOTAL COSTS	112517.07										
NET VALUE	88114.48										
WATER AVAILABLE AT THE BEGINNING OF EACH TIME PERIOD.											
STREAM DEMAND	226.1	230.2	400.4	383.5	330.7	141.9	9.9	10.9	21.0	12.383	1.4
STREAM DEMAND	0.0	0.0	47.0	20.0	38.0	626.2	21.0	31.0	21.0	383.5	251.0
STREAM DEMAND	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
STREAM DEMAND	250.0	267.0	124.9	134.0	38.0	43.0	43.0	5.0	5.0	22.0	22.0

CNA FORT WAIN TO DISNEYAIN 1

FARM 9 WITH AREA OF 657.00 HECTS AND 27. PERCENT OF THE WATER. DEMAND WATER 11996.00

IRIGATION PERIOD	COTTON 251. HECTS	WHEAT 0. HECTS	SOYBEAN 0. HECTS	MAIZE 0. HECTS	BARLEY 202. HECTS	SURGHUM 200. HECTS	TOTAL WATER PER PERIOD
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
SEASON TOTAL	2831.00	0.00	0.00	0.00	531.00	1900.00	11996.00
YIELD	374.00	0.00	0.00	0.00	470.00	1312.00	
MARKET VALUE	510755.00	0.00	0.00	0.00	40669.46	116000.00	
COSTS							
PREHARVEST	245750.40	0.00	0.00	0.00	30673.72	38582.00	
HARVEST	61676.74	0.00	0.00	0.00	6278.45	9162.00	
NET VALUE	203327.87	0.00	0.00	0.00	3717.29	68256.00	
GROSS VALUE	667424.46						
TOTAL COSTS	392123.30						
NET VALUE	275301.16						
WATER AVAILABLE AT THE BEGINNING OF EACH TIME PERIOD.							
STREAM DEMAND	741.1	1301.3	1315.4	1259.5	448.7	462.8	11
	755.2	1310.2	1311.8	1259.5	448.7	462.8	12
	755.2	1310.2	1311.8	1259.5	448.7	462.8	13
STREAM DEMAND	823.5	1331.1	1331.1	1260.0	470.0	1256.0	14
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	15
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	16
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	17
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	18
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	19
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	20
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	21
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	22
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	23
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	24
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	25
	823.5	1331.1	1331.1	1260.0	470.0	1256.0	26

FARM 10 WITH AREA OF 478. HECTS AND 16. PERCENT OF THE WATER. DRYLAND WATER 8332.00

IRIGATION PERIOD	COTON 162. HECTS	WHEAT 0. HECTS	SOYBEAN 0. HECTS	WHAZE 186. HECTS	BARLEY 136. HECTS	SURCHUP 0. HECTS	TOTAL WATER PER PERIOD
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
SEASON TOTAL	1785. MG-LT	0. MG-LT	0. MG-LT	1406. MG-LT	357. MG-LT	0. MG-LT	0
YIELD	238. TONNE	0. TONNE	0. TONNE	1066. TONNE	316. TONNE	0. TONNE	0
MARKET VALUE	324441.86	0.00	0.00	127872.00	27377.10	0.00	0
COSTS							
HARVEST	138195.60	0.00	0.00	49500.00	20610.80	0.00	0
PREPARE	39198.30	0.00	0.00	13500.00	4218.72	0.00	0
NET VALUE	129157.95	0.00	0.00	64872.00	2497.78	0.00	0
GROSS VALUE	479641.16						
TOTAL COSTS	283113.42						
NET VALUE	196527.74						
WATER AVAILABLE AT THE BEGINNING OF EACH TIME PERIOD.							
STREAN	440.	773.	781.	748.	266.	42.	14
DEMAND	0.	0.	0.	0.	1066.	17.	490.
STREAN	490.	773.	241.	75.	75.	23.	575.
DEMAND	491.	1216.	17.	0.	0.	0.	0