Department of Primary Industries
Agricultural Production Group

Project Report to Greenspan Technology Pty Ltd

Evaluation of BirdDeter System for Bird Control in Apples

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Introduction

Bird damage is a very serious cause of loss for Granite Belt pome fruit growers. Depending on the location of orchards losses can exceed 50 percent. Losses are particularly severe in drought conditions when alternative food sources become scarce. The Lorikeet group appears to be the major pests although Currawongs and Friar-birds are commonly observed in the orchards.

The majority of the damage occurs as the crop approaches maturity with the birds attacking each maturing variety in turn. The birds nest outside the orchard in the shelter of larger trees and only appear to enter the orchard if their is little human activity taking place. If disturbed while in the orchard, the birds retreat as a flock to the shelter of the larger trees nearby. Orchards situated near large blocks of gum trees or pine plantations experience the greatest damage.

The bird problem is presently managed by harvesting the crop as quickly as possible, the use of scare guns, and shotguns. None of these measures are particularly effective or popular.

The aim of this project is to test the BirdDeter electronic bird deterrent system from Greenspan Technology Pty Ltd.

Description of the Project

(i) General Objectives

To test the effectiveness of the BirdDeter system in limiting bird damage in an experimental orchard in comparison with unprotected orchard areas nearby.

(ii) Methods

The BirdDeter system was deployed in a 1.5 hectare orchard on the Granite Belt Horticultural Research Station, (GBHRS), Applethorpe, Queensland. The orchard comprised 251 trees with a mixture of Jonathan, Red Delicious and Granny Smith varieties. The block had a history of sever bird damage with commercial losses of approximately 30 percent in most seasons with higher damage levels in recent season due to drought. Three other orchard blocks on the GBHRS were chosen as control blocks on which bird damage levels would be monitored.

During the season, from 6 February 1996, when the Jonathan apple variety was becoming attractive to bird species, trees in the treatment block and in the control blocks were monitored daily at first, and later at two and three daily intervals. Sugar content was assessed for each variety in each block. Rainfall, wind and solarimeter data were gathered throughout the duration of the trial.

blocks on windy days but were prevalent on overcast and rainy days. Windy weather did not appear to be setting off the BirdDeter system. Local residents commented on the noise, did not object to the operation of the system in their neighbourhood although one resident felt his radio reception was being affected.

The BirdDeter system was a prototype version and did fail mechanically and electronically on a number of occasions and was promptly repaired by Mr J Muehlebach of Greenspan Technology. These breakdown periods did not appear to affect the efficacy of the bird deterrent system.

Block 1 Bird Damage 1996 <------ W

8/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
0	3	1	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
3	0	0	2	0	0
0	0	0	1	0	0
1	0	0	0	0	0
4	0	0	0	0	0
4	0	0	2	0	0
0	1	0	0	0	0
0	0	1	1	0	1
0	0	0	1	0	3
0	0	0	0	0	0
0	0	0	0	0	4
0	0	0	0	0	1
0	0	0	0	0	0
0	0	0	0	0	2
0	0	0	0		

Block 1 Bird Damage 1996 <------ W

9/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
0	10	0	4	1	0
0	0	3	9	1	0
3	10	10	13	8	0
2	0	2	2	2	0
0	0	0	4	0	5
1	0	0	1	1	5
9	0	1	1	9	0
4	8	4	6	0	2
0	0	0	2	2	0
2	2	1	6	2	0
2	4	2	5	2	12
2	3	4	1	0	2
0	1	0	1	0	7
1	0	0	4	2	1
1	2	1	1	0	3
1	4	0	1	0	2
0	0	0	2		4

Block 1 Bird Damage 1996 <------ W

11/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
		0	1	3	0
		3	3	0	0
		0	4	9	4
		4	1	0	0
		5	0	4	0
		1	1	0	1
		4	5	1	4
		4	6	0	2
		1	0	4	0
		3	3	0	2
		6	4	4	4
		6	3	1	6
		5	0	6	0
		0	4	2	1
		6	3	0	2
		4	0	2	2
		1	0		0

Block 1 Bird Damage 1996 <------ W

14/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
1	4	4	6	1	9
3	3	21	19	16	7
9	32	18	8	7	7
10	10	10	9	8	11
0	4	0	15	5	3
10	5	13	12	5	12
18	5	27	6	5	7
19	15	38	16	4	9
1	24	5	4	5	7
32	3	8	15	6	3
17	15	11	9	10	3
15	13	30	14	2	2
0	28	0	7	11	2
9	9	12	15	7	3
3	12	10	8	7	2
8	10	1	9	0	5
0	16	0	10		3

Block 1 Bird Damage 1996 <------ W

16/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
0	1	0	2	0	7
1	3	4	12	11	0
1	4	6	6	0	2
2	1	8	6	1	1
0	0	0	5	0	2
3	1	2	2	4	2
3	1	2	4	1	0
1	4	8	10	0	1
0	4	0	4	1	4
4	2	1	13	1	2
2	3	1	15	3	1
7	6	6	23	0	3
0	10	0	8	3	2
1	5	7	15	1	0
3	1	5	2	3	2
5	4	3	5	0	0
0	3	0	6		0

Block 1 Bird Damage 1996 <------ W

19/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
0	0	0	1	0	4
0	1	1	5	4	3
1	2	1	4	1	0
0	1	1	2	2	1
0	0	1	2	0	1
1	1	2	2	1	4
1	1	1	0	1	2
0	3	1	3	0	1
0	1	0	0	0	1
1	0	1	2	0	1
0	1	0	2	1	0
2	2	0	3	0	1
0	1	0	1	2	1
0	0	0	2	0	1
0	1	1	0	1	2
3	1	0	1	0	3
0	0	0	0		0

Block 1 Bird Damage 1996 <------ W

21/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
1	1	0	0	0	1
1	0	1	1	1	2
0	1	1	0	0	0
0	0	2	0	0	2
0	0	0	0	0	0
0	1	2	2	0	1
4	0	1	1	0	0
3	0	2	0	0	0
0	0	0	0	0	0
2	0	1	1	2	0
0	1	1	3	1	2
1	2	0	3	1	1
0	0	2	2	2	0
1	0	0	1	1	0
0	1	1	0	0	1
3	4	0	5	1	1
0	6	0	2		0

Block 1 Bird Damage 1996 <------ W

29/02/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
				1	
		1		1	
1			1	1	
		1	1		1
			5	3	4
					1
1	1	1		1	1
				1	
		1	3		
					1
			1		1
				2	
			1	0	1
		2		0	
1	1		3		1
2			2	1	

Block 1 Bird Damage 1996 <------ W

7/03/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
	1	0	0	0	6
		0	4	4	1
2		1	1	3	2
	1	0	4	0	5
		0	0	0	2
1	1	0	0	1	7
2		3	0	0	0
1	1	0	0	1	3
		1	0	0	4
3	1	0	2	0	2
		3	1	0	1
2		0	7	0	1
	2	2	1	3	0
		1	9	1	3
	2	0	5	4	2
2	3	0	7	0	5
1	6	0	9		2

Block 1 Bird Damage 1996 <------ W

16/03/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
			0		

Block 1 Bird Damage 1996 <------ W

17/03/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
		1	0		
				1	

Block 1 Bird Damage 1996 <------ W

18/03/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
		2	0		
				1	
		1			

Block 1 Bird Damage 1996 <------ W

25/03/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
6		5		2	
1		6		2	
1		3		3	
0		5		4	
0		2		2	

Block 1 Bird Damage 1996 <------ W

26/03/96

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
0		3	0	2	
0		5		3	
1		2		4	
0		5		4	
0		2		1	

Block 1 Bird Damage 1996 <------ W

1/04/96

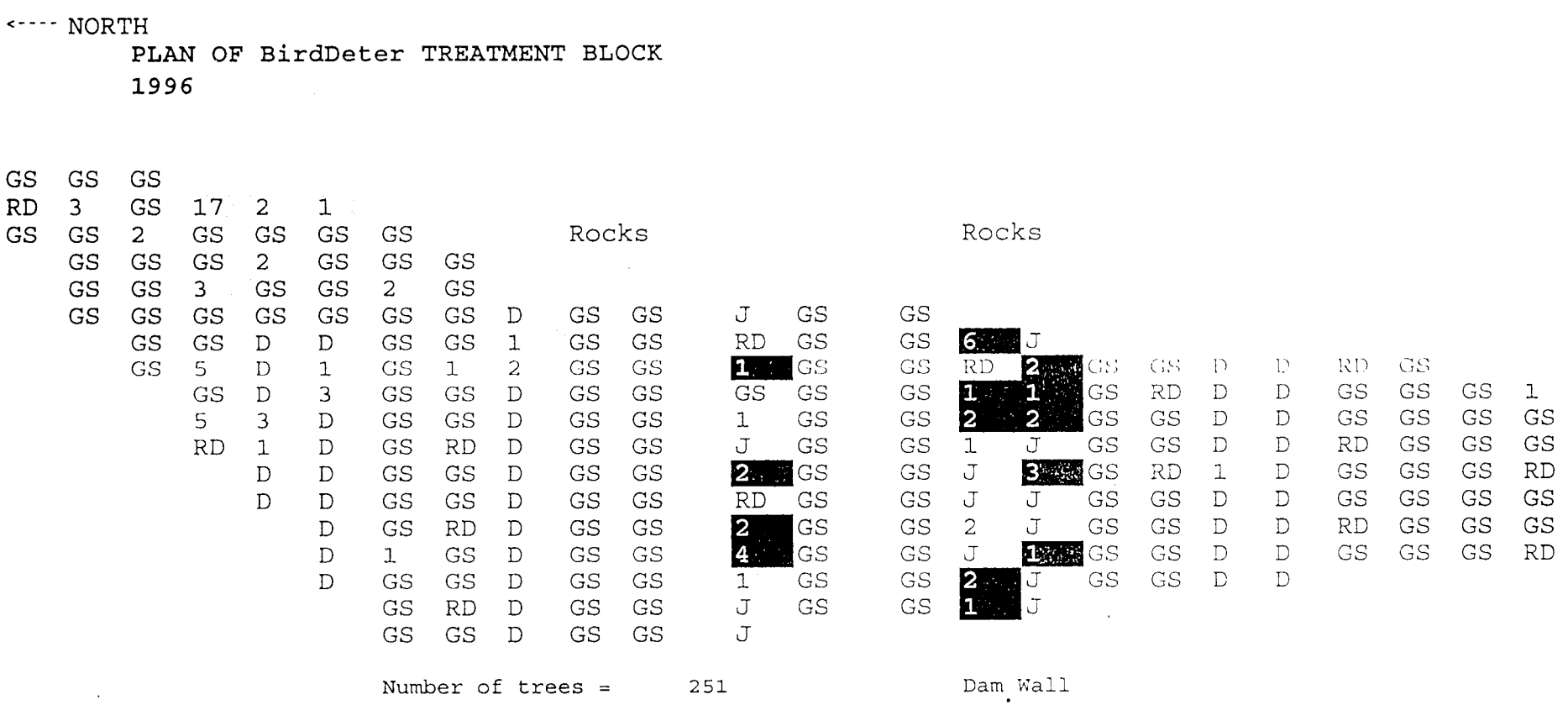
Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
0		1		1	
1		0		0	
0		0		2	
		0			
		1			

Block 1 Bird Damage 1996 <------ W

At
Harvest

Row 6	Row 5	Row 4	Row 3	Row 2	Row 1
	4		0		1
1	9	5	0	3	1
1	4	7	0	0	1
1	0	3	0	0	2
	0		1		2
0	0	7	0	0	5
0	2	4	0	0	1
0	7	11	0	0	5
	7		0		3
1	1	1	2	1	1
0	5	2	0	1	2
4	5	7	2	0	5
	12	12	4	0	3
3	7	1	6	2	4
1	2	1	0	1	0
6	7		13	3	5
	12		8		4

Appendix 2.


<---- NORTH
PLAN OF BirdDeter TREATMENT BLOCK
1996
Rocks
Rocks
Number of trees = 251
1 = DAMAGED GRANNY SMITH
1 = DAMAGED DELICIOUS
1 = DAMAGED JONATHAN
Dam Wall
GS=GRANNY SMITH
D=DELICIOUS
RD=REWORKED TO DELICIOUS
J=JONATHON

Control Block Bird Damage 1996				<----- W		
Total Damage:						
Row 6	Row 5	Row 4	Row 3	Row 2	Row 1	
	32		14		30	
9	18	43	57	41	15	
18	55	52	39	30	16	
22	13	31	30	13	24	
	6		29		15	
19	9	28	28	17	41	
46	12	46	20	20	15	
38	39	71	45		25	
	39		10	15	20	
49	10	20	48	12	12	
28	31	26	40	22	30	
34	32	56	57		24	
	54		24	31	22	
15	21	23	58	17	15	
10	21	40	20	16	15	
29	34	9	44		26	
	53		40	1	13	
334	479	530	603	299	358	
TOTAL DAMAGED =		2603				

Total Damaged Red Delicious	2603
Total Red Delicious	7958
Percentage Red Del's Damaged	32.71
Total Damaged Granny Smith	166
Percentage Granny Smith's Damaged	13.26

denotes Granny Smi

Appendix 3.

Treatment	Date	Variety	Sugar Content
BirdDeter	9/2/96	Jonathan	9.3
		Delicious	10.4
		Granny Smith	6.4
	12/2/96	Jonathan	10.8
		Delicious	9.7
		Granny Smith	6.8
	22/2/96	Jonathan	12.5
		Delicious	9.8
		Granny Smith	9.3
Block 1	9/2/96	Delicious	10.4
		Granny Smith	6.2
	12/2/96	Delicious	9.2
		Granny Smith	6.8
	22/2/96	Delicious	10.8
		Granny Smith	10.1

Appendix 4.

APPLETHORPE

MEMORY1		# 6 AVER R.H.	# 7 MIN R.H.	# 8 MAX DRY B	# 9 MIN DRY B	# 10 MIN 10-SO	# 11 MIN 20-SO	# 12 MIN GRASS	# 13 TOT. RAIN	# 14 EVAP	# 15 TOT. WIND	# 16 AVER WIND	# 17 MAX WIND	# 18 TOT. SOLAR	# 19 TOT. PAR
1		%RH	%RH	° C	° C	° C	° C	° C	mm	mm	Run Km	KPH	Run Km	MJ/M^2	µMoles
1/02/96	9:00:00	62%	33%	33	18.9	23.1	23.6	21.2	4	7.2	146	6	0.33	27	1063
2/02/96	9:00:00	57%	40%	29.2	14.2	21.5	22.6	18.7	0	8	124	5.1	0.33	26.6	1043
3/02/96	9:00:00	64%	34%	29.2	13.3	21.8	22.6	18.6	0	7.8	60	2.5	0.25	29.7	1127
4/02/96	9:00:00	65%	27%	30.3	17.5	22.4	22.7	20.8	0	5.6	91	3.8	0.25	27.3	1032
5/02/96	9:00:00	80%	56%	26.9	16.9	22.9	23.5	20.2	0	5.8	106	4.4	0.18	25.1	964
6/02/96	9:00:00	80%	54%	27.4	15.8	22	22.9	19.8	10.2	5.3	83	3.4	0.19	21.8	847
7/02/96	9:00:00	84%	51%	28.7	15.9	22	22.8	20.2	0	5.3	56	2.3	0.21	22.6	879
8/02/96	9:00:00	76%	45%	30.4	14.1	22.2	22.9	19.6	0	6.8	75	3.1	0.24	25.2	981
9/02/96	9:00:00	69%	38%	29.9	18.4	22.6	23	20.7	7.8	4	147	6.1	0.29	24.8	953
10/02/96	9:00:00	87%	50%	19.1	6.4	18	19.7	15	3.4	3.1	114	4.7	0.27	9.8	387
11/02/96	9:00:00	68%	46%	19.7	7.9	18.1	19.6	15.3	0	5.7	129	5.3	0.32	27.7	1022
12/02/96	9:00:00	81%	47%	21	6.1	17.7	19.1	14.3	0	5.8	73	3	0.32	23.5	868
13/02/96	9:00:00	64%	28%	25.7	11.4	19.7	19.5	16.6	0	5.9	104	4.3	0.23	29.1	1070
14/02/96	9:00:00	75%	52%	21.4	8.7	17.6	19.2	14.3	4.2	5.2	157	6.5	0.26	23.6	873
15/02/96	9:00:00	76%	53%	20.6	10.9	18	19.1	15.4	0	4.1	96	4	0.25	19	714
16/02/96	9:00:00	77%	56%	21.4	10.8	18.3	19.2	16.1	3.2	1.5	48	2	0.16	9	351
17/02/96	9:00:00	91%	64%	21.3	13.1	18.5	19.2	17	4	2.5	32	1.3	0.18	11.7	467
18/02/96	9:00:00	85%	48%	25.7	15.7	19.1	19.6	18.7	0.2	4.8	68	2.8	0.19	20.9	795
19/02/96	9:00:00	86%	46%	26.2	14	19.8	20.5	18	0	4.5	44	1.8	0.15	17	647
20/02/96	9:00:00	73%	31%	29.1	15.3	20.7	20.8	18.7	0	5	59	2.4	0.15	24.5	926
21/02/96	9:00:00	79%	51%	26.5	14.5	20	20.9	17.6	8.8	4.8	135	5.6	0.22	23.6	890
22/02/96	9:00:00	81%	58%	22.5	13.4	18.5	19.7	15.9	0	3.6	203	8.4	0.34	17.3	652
23/02/96	9:00:00	80%	55%	20.7	12.9	18.3	19.3	15.8	0.4	4.1	217	9	0.34	17.7	650
24/02/96	9:00:00	89%	60%	20.8	13.6	18.1	19.1	15.8	4.6	2.5	190	7.9	0.32	13.7	510
25/02/96	9:00:00	86%	63%	20.9	13.5	17.9	19	15.6	1.6	3.4	181	7.5	0.35	17.1	638
26/02/96	9:00:00	88%	64%	20.6	12.9	17.9	18.9	15.7	1	3.8	131	5.4	0.26	15.5	581
27/02/96	9:00:00	88%	52%	22.9	11.6	18.5	19	16.1	0	4.4	67	2.8	0.17	18.3	689
28/02/96	9:00:00	86%	46%	25.2	14.4	19.1	19.4	17.6	0	4.6	75	3.1	0.17	19	717
29/02/96	9:00:00	79%	48%	26	16.5	19.8	20.2	19.2	8.8	3.9	94	3.9	0.22	21.3	809

MEMORY1		# 6 AVER R.H.	# 7 MIN R.H.	# 8 MAX DRY B	# 9 MIN DRY B	# 10 MIN 10-SO	# 11 MIN 20-SO	# 12 MIN GRASS	# 13 TOT. RAIN	# 14 EVAP	# 15 TOT. WIND	# 16 AVER WIND	# 17 MAX WIND	# 18 TOT. SOLAR	# 19 TOT. PAR
1		%RH	%RH	° C	° C	° C	° C	° C	mm	mm	Run Km	KPH	Run Km	MJ/M^2	µMoles
1/04/96	9:00:00	82.00%	40.00%	26.7	8.1	18.5	19.1	13.5	0	5.1	61	2.5	0.22	20.1	777
2/04/96	9:00:00	58.00%	19.00%	25.8	2.2	17	18	10.3	0	5.9	66	2.7	0.23	22.1	815
3/04/96	9:00:00	55.00%	20.00%	25.4	0.9	16.8	17.8	10	0	5.9	60	2.5	0.19	22	766
4/04/96	9:00:00	63.00%	18.00%	27	2.2	16.7	17.6	10.1	0	5.4	39	1.6	0.18	21.8	709
5/04/96	9:00:00	68.00%	24.00%	26.3	3.1	16.7	17.6	10.6	0	5.6	49	2	0.21	20.4	551
6/04/96	9:00:00	68.00%	24.00%	26.1	6	17	17.6	12.4	0	4	64	2.6	0.22	19	191
7/04/96	9:00:00	94.00%	48.00%	23.9	8	17.9	18.2	13.3	0	4.3	68	2.8	0.2	19.5	137
8/04/96	9:00:00	74.00%	41.00%	26.4	11.7	18.3	18.7	16	0	4.1	64	2.7	0.2	18.6	172
9/04/96	9:00:00	85.00%	47.00%	26.1	15.9	19.2	19.3	18.1	0	2.5	75	3.1	0.24	13.2	11
10/04/96	9:00:00	66.00%	44.00%	21	3.7	17.1	18.1	10.3	0	2.7	57	2.3	0.14	8.7	0
11/04/96	9:00:00	59.00%	28.00%	19.9	-0.3	16.1	17.2	8.7	0	4.5	84	3.5	0.26	19	0
12/04/96	9:00:00	56.00%	36.00%	18.6	1.6	15.8	16.9	9.9	0	4.6	118	4.9	0.29	19.6	0
13/04/96	9:00:00	52.00%	38.00%	17.1	4.2	15.9	16.8	10.9	0	5.1	148	6.1	0.38	19.3	0
14/04/96	9:00:00	65.00%	29.00%	20.8	2.5	15.5	16.5	9.5	0	5	79	3.3	0.26	16	1
16/04/96	9:00:00	78.00%	32.00%	21.7	3.7	16.5	17.1	11.2	0	3.3	72	3	0.25	18.2	0
17/04/96	9:00:00	77.00%	31.00%	21.9	0.9	15.5	16.5	8.8	0	4.6	61	2.5	0.23	18.3	0
18/04/96	9:00:00	59.00%	30.00%	22.3	1	15.7	16.5	9	0	4.3	68	2.8	0.21	18.8	19
19/04/96	9:00:00	68.00%	31.00%	19.9	-2.5	14.5	15.6	6.6	0	4.6	72	3	0.25	18.7	0
20/04/96	9:00:00	78.00%	23.00%	22.6	3.2	14.7	15.6	9.9	0	3.4	52	2.1	0.18	17.9	0
21/04/96	9:00:00	86.00%	49.00%	20.7	6.7	16.2	16.5	11.1	0.2	3.6	75	3.1	0.2	16.7	0
22/04/96	9:00:00	99.00%	52.00%	20.4	5.3	15.8	16.5	10.2	0	3.5	71	2.9	0.23	17.2	19
23/04/96	9:00:00	77.00%	45.00%	21.5	12.5	16.1	16.5	14.6	0	3	163	6.8	0.22	16.1	1
24/04/96	9:00:00	108.00%	73.00%	16.2	11.8	16.4	17.2	14.4	15	0.7	103	4.3	0.28	5.1	5
25/04/96	9:00:00	130.00%	95.00%	16.6	14.1	16.5	17.2	15.7	5.2	0.7	67	2.8	0.14	4.6	165
26/04/96	9:00:00	109.00%	56.00%	24.6	10.9	17.1	17.7	14.8	0.4	2	39	1.6	0.14	10.9	240
27/04/96	9:00:00	99.00%	56.00%	24.6	13.5	17.6	17.8	16.2	0	2.8	57	2.3	0.18	14.2	15
28/04/96	9:00:00	106.00%	59.00%	23.4	10.3	17	17.7	14.5	3.8	1.3	59	2.4	0.23	8.6	0
29/04/96	9:00:00	91.00%	78.00%	17.7	10	15.6	16.6	13.1	0	2.3	246	10.2	0.36	7.9	0
30/04/96	9:00:00	90.00%	58.00%	17	10.2	15.6	16.5	13.5	2.4	1.7	167	6.9	0.3	11.8	25
		23.0	12.2	642.2	181.4	479.3	500.9	347.2	27.0	106.5	2404.0	99.3	6.6	464.3	4619.0
		79%	42%	22.1	6.3	16.5	17.3	12.0	0.9	3.7	82.9	3.4	0.2	16.0	159.3

Recorded from : EASIDATA R3.82 111
GBHRS, APPLETHORPE
MEMORY1

1		# 6 AVER R.H. %RH	# 7 MIN R.H. %RH	# 8 MAX DRY B °C	# 9 MIN DRY B °C	# 10 MIN 10-SO °C	# 11 MIN 20-SO °C	# 12 MIN GRASS °C	# 13 TOT. RAIN mm	# 14 EVAP mm	# 15 TOT. WIND Run Km	# 16 AVER WIND KPH	# 17 MAX WIND Run Km	# 18 TOT. SOLAR MJ/M^2	# 19 TOT. PAR µMoles
1/03/96	9:00:00	#####	71.00%	22.8	15.5	19.7	20.5	18.2	22.6	1.1	44	1.8	0.11	7.3	263
2/03/96	9:00:00	85.00%	53.00%	24.9	10.5	19.2	20.2	16.5	4.2	4.6	55	2.3	0.14	20.3	0
3/03/96	9:00:00	79.00%	48.00%	23.9	13.3	19.6	20.2	17.5	0	5.2	86	3.5	0.16	25.8	0
4/03/96	9:00:00	80.00%	56.00%	23.7	15.5	19.9	20.6	18	0	4.3	116	4.8	0.22	21.5	0
5/03/96	9:00:00	83.00%	65.00%	20	14.6	19.1	20	17.1	0.6	3.2	174	7.2	0.27	12.7	0
6/03/96	9:00:00	88.00%	68.00%	20.6	13.7	18.8	19.7	16.7	0.8	3.3	141	5.8	0.24	14.7	0
7/03/96	9:00:00	82.00%	54.00%	23.1	9.1	18.8	19.7	15.4	0	5.1	98	4	0.2	22.7	0
8/03/96	9:00:00	74.00%	39.00%	25	14.1	19.3	19.8	17.1	0	5.1	112	4.6	0.22	24	0
9/03/96	9:00:00	75.00%	54.00%	22.8	13	19.1	19.9	16.4	0	4.2	149	6.2	0.26	18.3	0
10/03/96	9:00:00	79.00%	65.00%	19.4	13.1	18.4	19.2	15.9	0	3.1	147	6.1	0.28	11.4	0
11/03/96	9:00:00	79.00%	61.00%	20.2	13.5	18.7	19.2	16.3	0	3.4	164	6.8	0.31	16.6	0
12/03/96	9:00:00	87.00%	64.00%	20.3	13.8	18.6	19.3	16.3	0.2	2.2	132	5.5	0.24	11.7	0
13/03/96	9:00:00	81.00%	53.00%	23.4	12.1	18.8	19.4	15.9	0	4.6	115	4.8	0.23	20.5	0
14/03/96	9:00:00	87.00%	50.00%	24.4	12.8	19.3	19.6	16.9	0	4.2	51	2.1	0.18	20	0
15/03/96	9:00:00	80.00%	33.00%	27.1	7.4	18.4	19.3	14	0	4.7	44	1.8	0.18	21	0
16/03/96	9:00:00	86.00%	38.00%	24.6	6.9	18.2	19.1	13.6	0	4.8	60	2.5	0.19	22.4	0
17/03/96	9:00:00	68.00%	39.00%	24.3	15.2	18.6	19.1	17.6	0	4.9	117	4.8	0.25	22.2	0
18/03/96	9:00:00	79.00%	51.00%	26.6	8.3	19	19.6	14.6	0	4.4	78	3.2	0.28	19.1	0
19/03/96	9:00:00	78.00%	35.00%	27.4	14.7	19.4	19.7	17.5	0	4.4	69	2.8	0.2	22.1	337
20/03/96	9:00:00	90.00%	45.00%	24.9	9.9	19.4	20	15.4	0.2	4.1	59	2.4	0.16	18.6	407
21/03/96	9:00:00	85.00%	35.00%	26.1	7.2	18.9	19.6	14.3	0	5.3	61	2.5	0.28	22.5	195
22/03/96	9:00:00	64.00%	26.00%	26.4	11.9	19.2	19.6	15.5	0	4.4	101	4.2	0.23	22.8	788
23/03/96	9:00:00	80.00%	47.00%	21.3	12.6	19.2	19.8	15.7	0	4.1	132	5.5	0.24	20.3	761
24/03/96	9:00:00	96.00%	64.00%	20.2	12.8	18.6	19.5	16	4.4	2	108	4.5	0.22	13	499
25/03/96	9:00:00	88.00%	61.00%	20.9	13.4	18.1	19	15.5	0.6	3.3	146	6.1	0.25	15.4	606
26/03/96	9:00:00	88.00%	62.00%	20.1	13.1	18	18.8	15.6	0.2	2.5	109	4.5	0.22	12.5	481
27/03/96	9:00:00	92.00%	64.00%	21.1	13.1	18.3	18.8	15.7	0.2	3.3	118	4.9	0.24	15.5	592
28/03/96	9:00:00	83.00%	50.00%	22	13.8	18.5	19	16.2	0	3.7	115	4.7	0.22	17.3	662
29/03/96	9:00:00	84.00%	57.00%	22	13.8	18.5	19.1	15.7	0.2	3	145	6	0.23	13.5	467
30/03/96	9:00:00	92.00%	49.00%	23.3	9.5	18.6	19.2	14.3	0.2	4	92	3.8	0.21	19.1	300
31/03/96	9:00:00	91.00%	44.00%	24.9	10.4	18.6	19.2	14.7	0	3.8	51	2.1	0.15	15.8	614
		25.8	16.0	717.7	378.6	584.8	605.7	496.1	34.4	120.3	3189.0	131.8	6.8	560.6	6972.0
		83%	52%	23.2	12.2	18.9	19.5	16.0	1.1	3.9	102.9	4.3	0.2	18.1	224.9

Results

The BirdDeter electronic bird deterrent system proved an effective method of reducing bird damage in trial orchard to a negligible level. Only 0.2 percent of the crop was damaged by birds compared with 25.9 percent in block 1 and 6.8 percent in block 2 (Table 1.).

Table 1.

Treatment	Variety	Percent damaged
BirdDeter	Granny Smith	0.15
BirdDeter	Delicious	0.34
BirdDeter	Jonathan	0.64
BirdDeter	All varieties	0.21
Block 1	Delicious	38.49
Block 1	Granny Smith	13.26
Block 2	Granny Smith	6.80

Damage appeared to occur evenly over time provided the apples were sufficiently ripe to be attractive to the birds. Appendix 1 provides site maps Block 1 for each sample day giving the damage recorded for each tree. Damage in the BirdDeter block was too minor to generate a site map for each sampling day. Appendix 2 provides site maps for the total damage in the BirdDeter block and in Block 1.

Appendix 3. gives sugar levels recorded for all varieties. Increases in sugar levels coincided with ripening fruit. Weather data for the period of the project including rainfall, temperature, solarimeter and wind information is included in appendix 4.

Discussion

While the layout of the trial prevents statistical analysis of the data the large differences in damage levels between orchard blocks demonstrates that the BirdDeter system effectively controls bird pests. From observations recorded during the duration of the project by far the major cause of the bird damage that occurred was due to Lorikeets and Crimson Rosellas (*Platycercus elegans*). Other birds observed causing very minor amounts of damage were Currawongs and Friar-birds. No bird was ever observed to ignore the bird scaring device but the Friar-birds did not fly far away.

Damage to Granny Smith apples in the unprotected areas of the GBHRS was not as high as in previous years. This may have been due to the relatively good season for native tree species in the Granite Belt as the Lorikeets were not as noticeable in the orchard from mid-March onward. Birds were generally not as active in the control