DARLING DOWNS COTTON MANAGEMENT GROUP BENCHMARKING 1998 – 1999 - 2000

3 YEAR SUMMARY REPORT

Cotton Research and Development Corporation

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INTRODUCTION

This report has been prepared as a cotton management tool for the cotton growers and their consultants in the Darling Downs Cotton Management Group.

This report summarises the data collected in this group for the 1997/98, 1998/99 and 1999/2000 seasons. The first part of the report presents the information in bar graphs showing the average results for each season. The second part of the report presents the information in scatter graphs which shows the range and variability of each field's results.

The Report's information has been collected from 162 dryland and 169 irrigated fields over the last three seasons. All of the fields are located around Dalby based on the cotton growing areas of Jimbour, Macalister and Warra north of Dalby, and Nandi and Kupunn to the south-west.

In the last three years there has been a change in the attitude of growers in the group towards the adoption of Integrated Pest Management (IPM). This has been driven by the increased availability of IPM tools such as the newer Ingard varieties and softer chemical options. The group has also participated in this benchmarking report and workshops which have shown the economic benefits of IPM. They have also shared experiences of other growers and consultants on how they have managed their crops and what has been successful.

FARMBIS ACKNOWLEDGMENT

The writers acknowledge the funding provided to this project over the last three years under the Farmer Group Training provisions of *Farmbis*.

METHODOLOGY

All data has been collected from the participating growers and their cotton crop consultants in the Cotton Management groups during the three seasons. The information has then been entered into the *Cotbench* computer program for comparison and reporting.

To eliminate the variations in chemical prices between chemical suppliers and cash and account prices, the prices of all inputs have been standardised using an average of the selling prices of various chemical outlets. The prices used for operations, including spray applications and cultivations, are a percentage of available contractor's rates.

By standardising all of the above costs we have put the emphasis of this report on production management, rather then attitudes to marketing or hail risk or the purchasing price of inputs. Therefore the gross margin figures do not reflect the actual financial performance of grower's fields but are a measure which allow grower's field performance to be measured against others in the district.

BENCHMARKING RESULTS

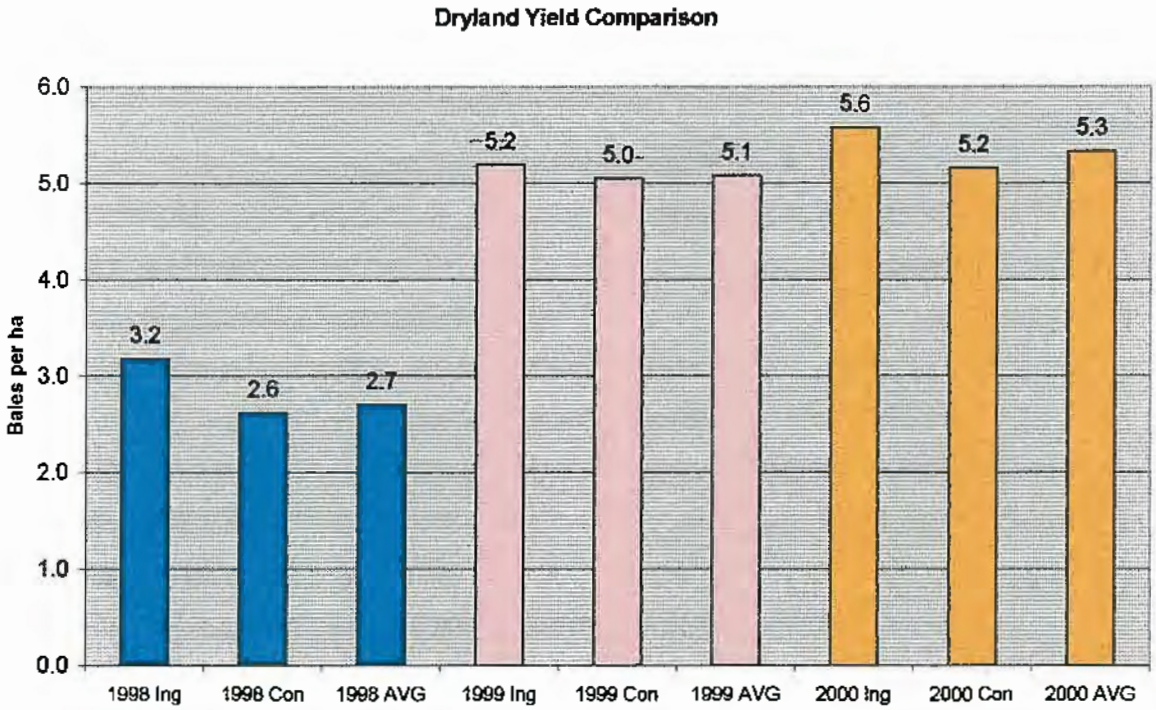
The results of the benchmarking report are summarised for the group using the graphs below. Ingard and conventional fields have been reported separately with a consolidated graph adjacent.

Each Season has been given a colour for the bar and scatter graphs as shown below.

1997/98 | 1998/99 | 1999/2000

DRYLAND GROUP AVERAGES

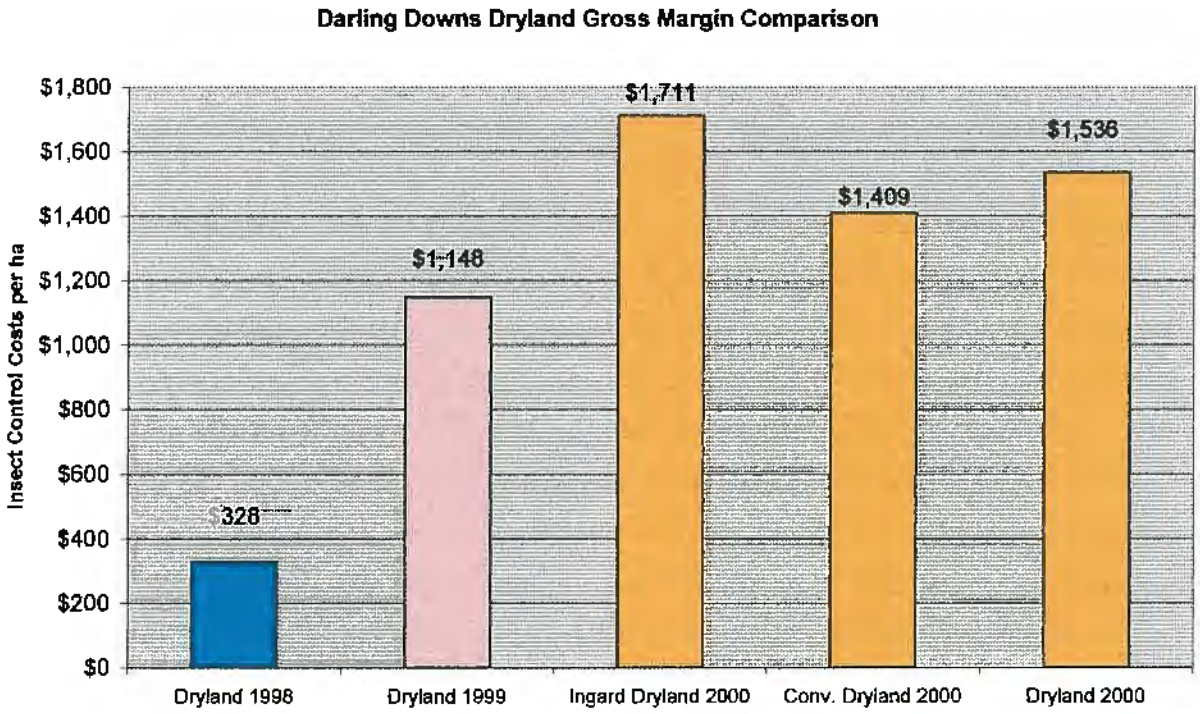
GRAPH 1 :- Dryland Yield



This graph shows the average yield for the three seasons of data for the Northern Downs dryland fields. The average yield for the three years is 4.4 bales per ha (1.8 bales per acre).

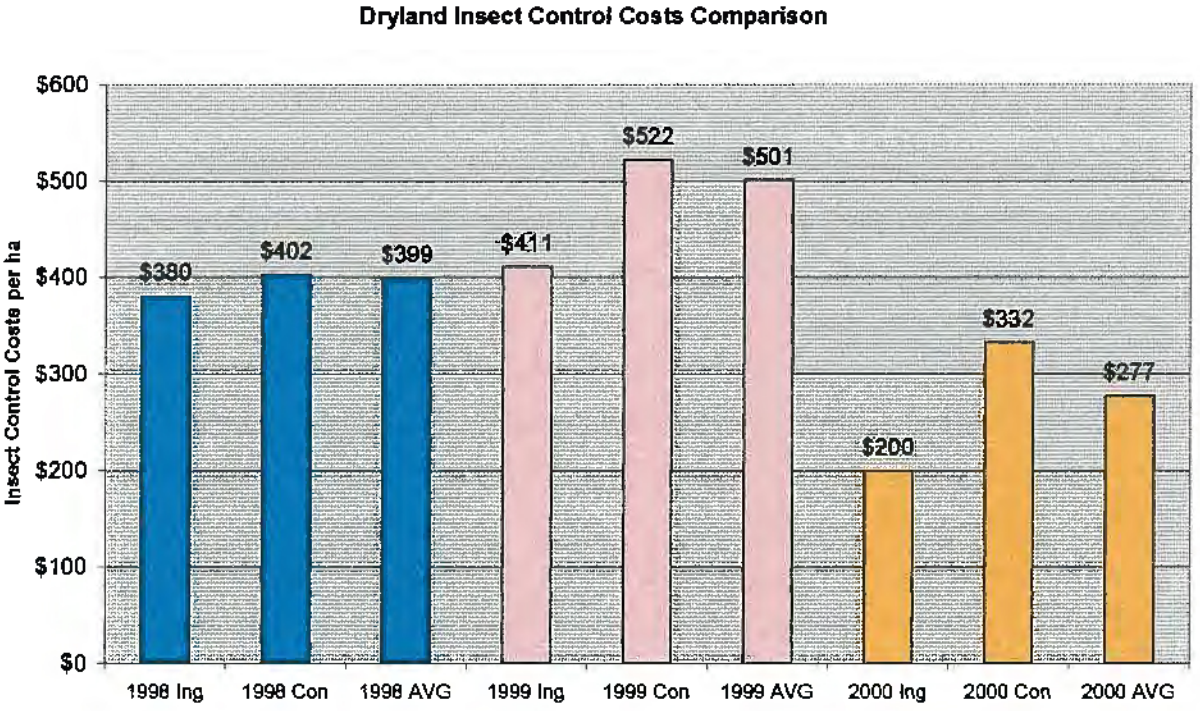
The graph shows the 1999 and 2000 seasons had about the same average yield. In both of these years however there was significant variation within the group with the Macalister Jimbour area receiving more beneficial rainfall and higher yields in both years.

GRAPH 2 :- Dryland Gross Income



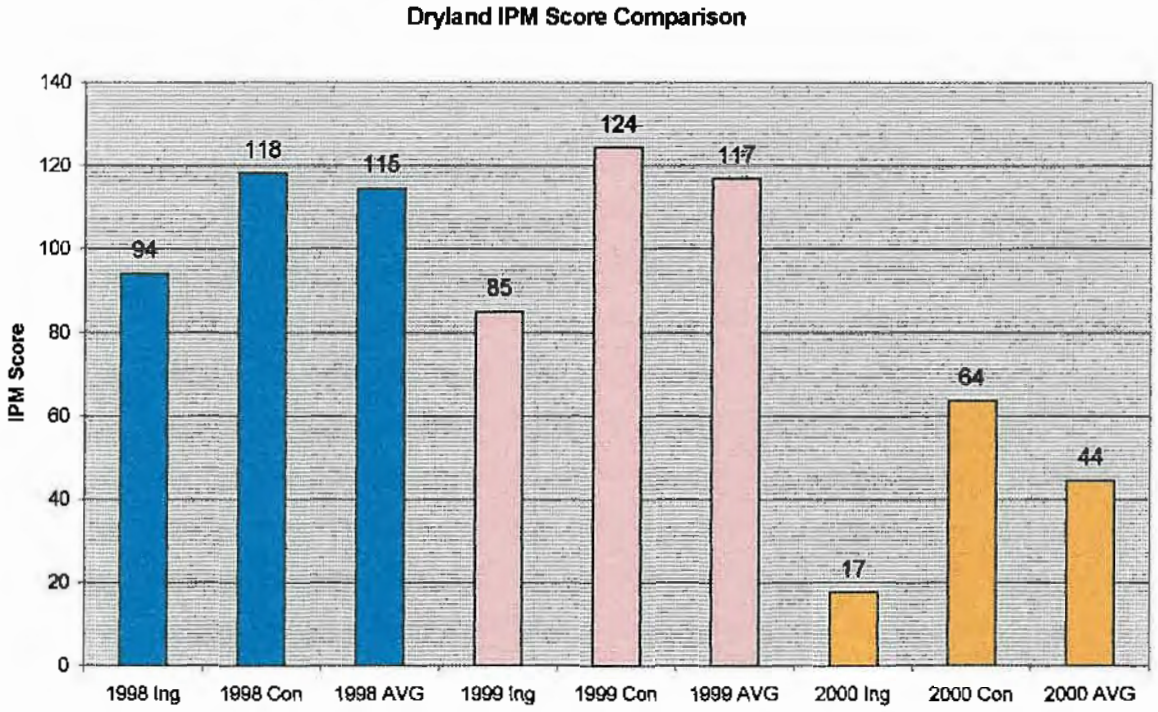
Graph 2 shows the average gross margin for 1998 and 1999 and the Ingard, conventional and average gross margin for 2000. The 2000 season showed an average gross margin which was 33% better than the 1999 season from about the same yield. The main difference between these years was reduced insect control costs due to lower insect pressure and more use of Ingard and Integrated Pest Management.

GRAPH 3 :- Dryland Insect Control Costs



The insect control costs includes chemicals, application costs and Ingard licence fees. A significant trend is the reducing costs of insect control in Ingard as a percentage of conventional cotton, down to 60% in the 2000 season. This is due to improved varietal efficacy and better management of Ingard using IPM.

GRAPH 4 :- Dryland IPM Score



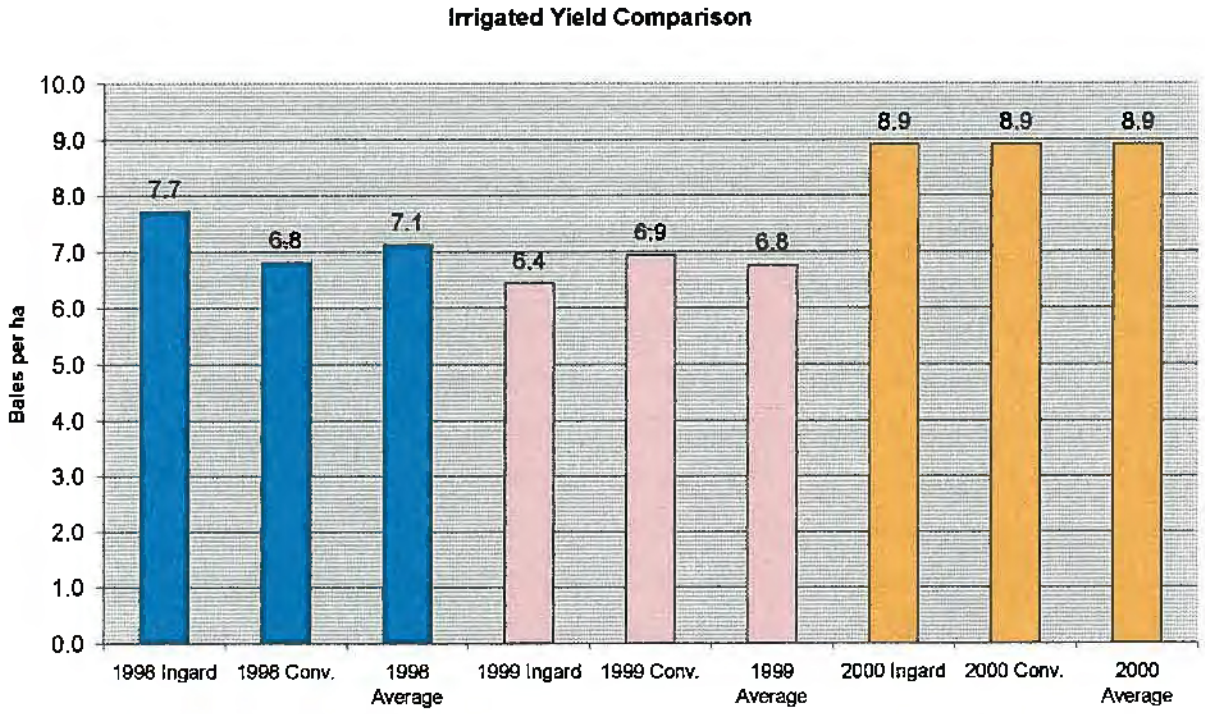
The IPM score is a measure of how disruptive a spray program is to beneficial insects. The results show a dramatic improvement in the third year score for the dryland fields. This season did have lower insect pressure and more significantly the increased availability and use of softer or less disruptive insecticides.

TABLE 1: Overall Dryland Results

	Yield	Gross Margin	Tot Ins	IPM Score
1998 Ingard	3.18		$380	94
1998 Conv.	2.61		$402	118
1998 Average	**2.70**	**$328**	**$399**	**115**
1999 Ingard	5.19		$411	85
1999 Conv.	5.05		$522	124
1999 Average	**5.07**	**$1,148**	**$501**	**117**
2000 Ingard	5.57	$1,711	$200	17
2000 Conv.	5.15	$1,409	$332	64
2000 Average	**5.33**	**$1,536**	**$277**	**44**

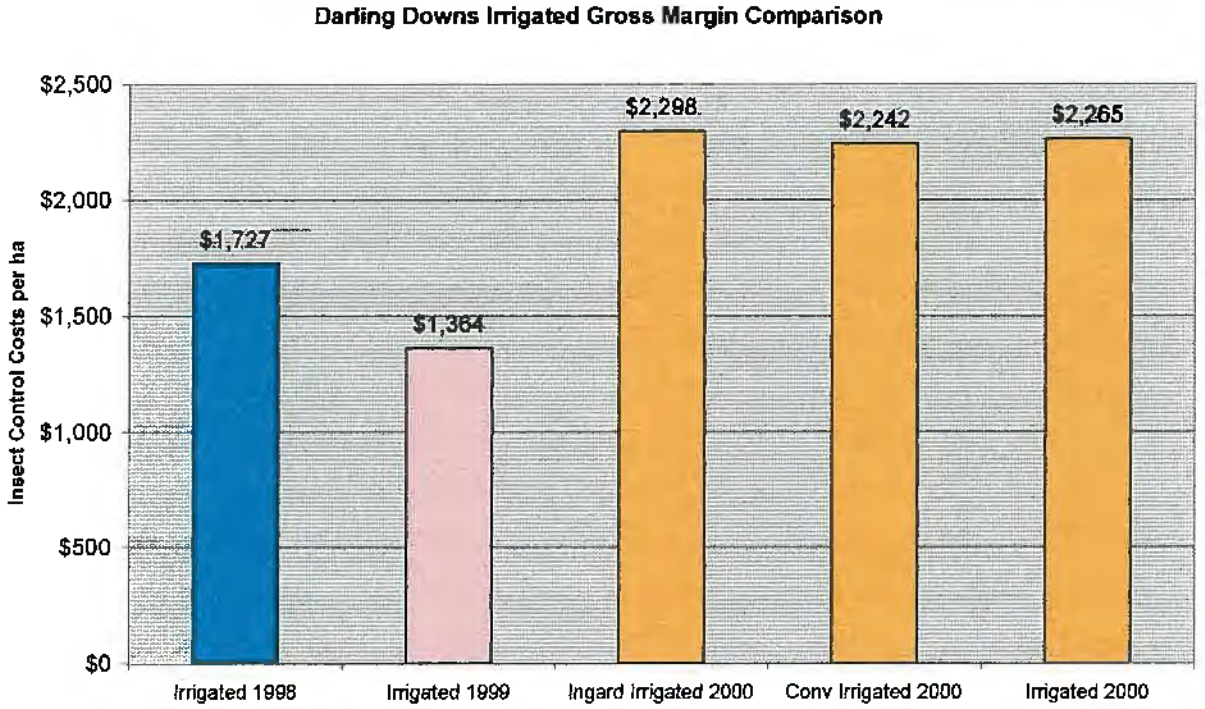
IRRIGATED GROUP AVERAGES

GRAPH 5 :- Irrigated Yield



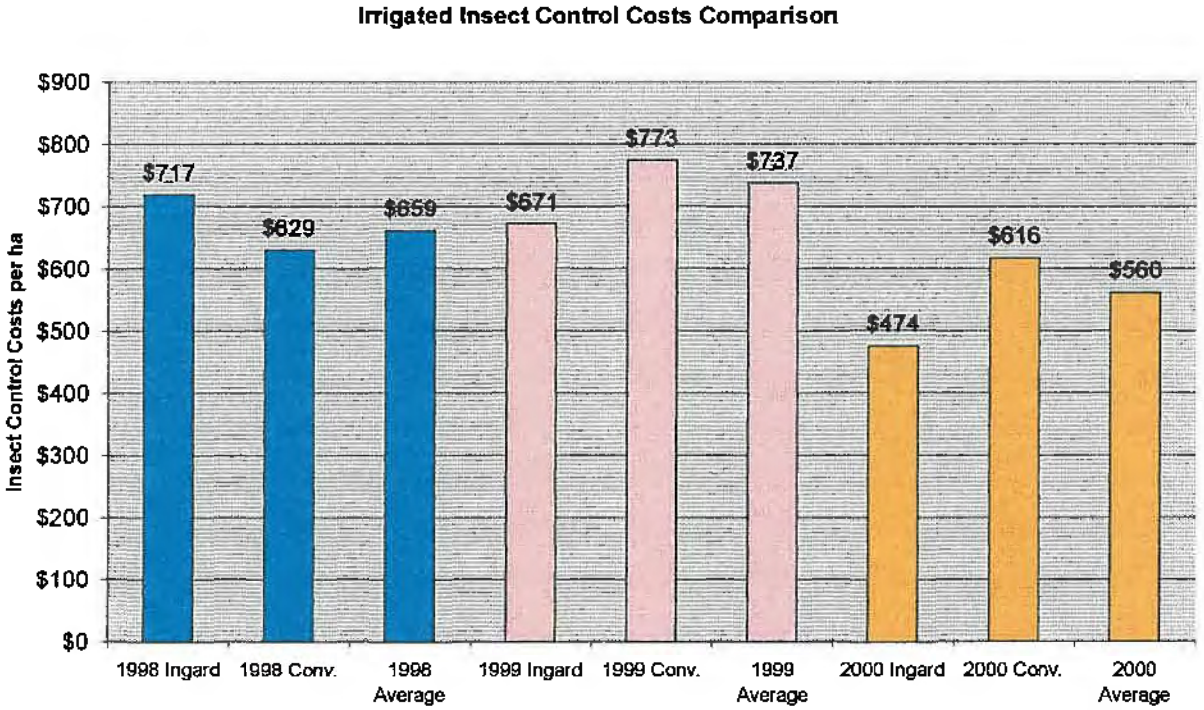
The overall average irrigated yield over the three seasons has been 7.6 bales/ha (3.1 bales/acre). Some irrigation fields had limited water in 1997/98 which reduced yield while the 1998/99 season was affected by lower yields due to late season water logging and the incidence of Bunchy Top affected crops.

GRAPH 6 :- Irrigated Gross Margin



The 1999/2000 season achieved the best gross margin by a significant margin due to the higher yields achieved combined with lower growing costs.

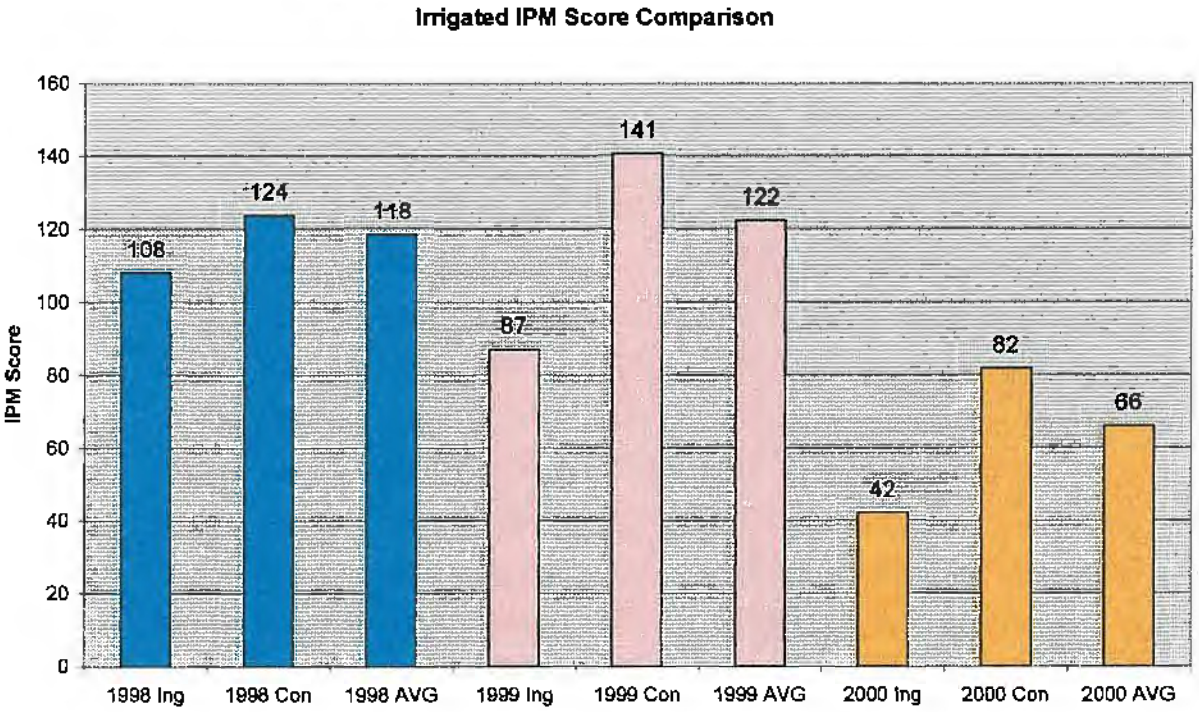
GRAPH 7 :- Irrigated Insect Control Costs



Insect control costs includes chemicals, application costs and Ingard licence fees. As for the dryland fields the graph shows lower insect control costs in the 2000 irrigated season as well as a trend towards Ingard becoming increasingly cheaper than conventional for insect control.

Ingard fields' insect control costs were **114%** of conventional in 1998 (even with the value guarantee included), **84%** in 1999 and down to **77%** in 2000. This trend is due to the improved efficacy of the newer Ingard varieties and the increasing implementation and effectiveness of IPM, especially on Ingard crops.

GRAPH 8 :- Ingard IPM Score



This graph shows the halving of the average field IPM score from the 1999 to 2000 season due to lower insect pressure and the increased use of softer insecticides. It also highlights the trend of less disruptive spray programs being used in Ingard crops.

TABLE 2: Overall Irrigated Results

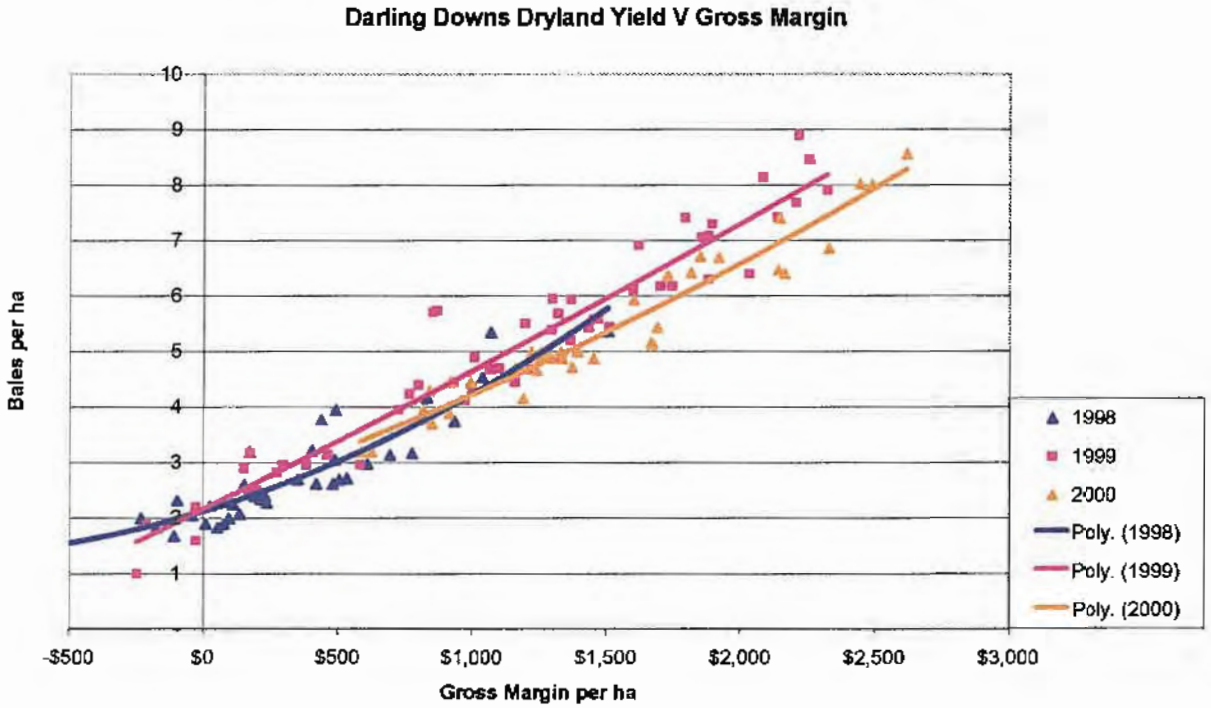
	Yield	Gross Margin	Tot Ins	IPM Score
1998 Ingard	7.72		$717	108
1998 Conv.	6.82		$629	124
1998 Average	**7.13**	**$1,727**	**$659**	**118**
1999 Ingard	6.44		$671	87
1999 Conv.	6.94		$796	141
1999 Average	**6.76**	**$1,364**	**$737**	**122**
2000 Ingard	8.91	$2,298	$474	42
2000 Conv.	8.91	$2,242	$616	82
2000 Average	**8.91**	**$2,265**	**$560**	**66**

Range of Results

The graphs of the group averages have shown some of the trends over the three years. The scatter graphs below will show these trends and also the variation in field results experienced in each year and between the years.

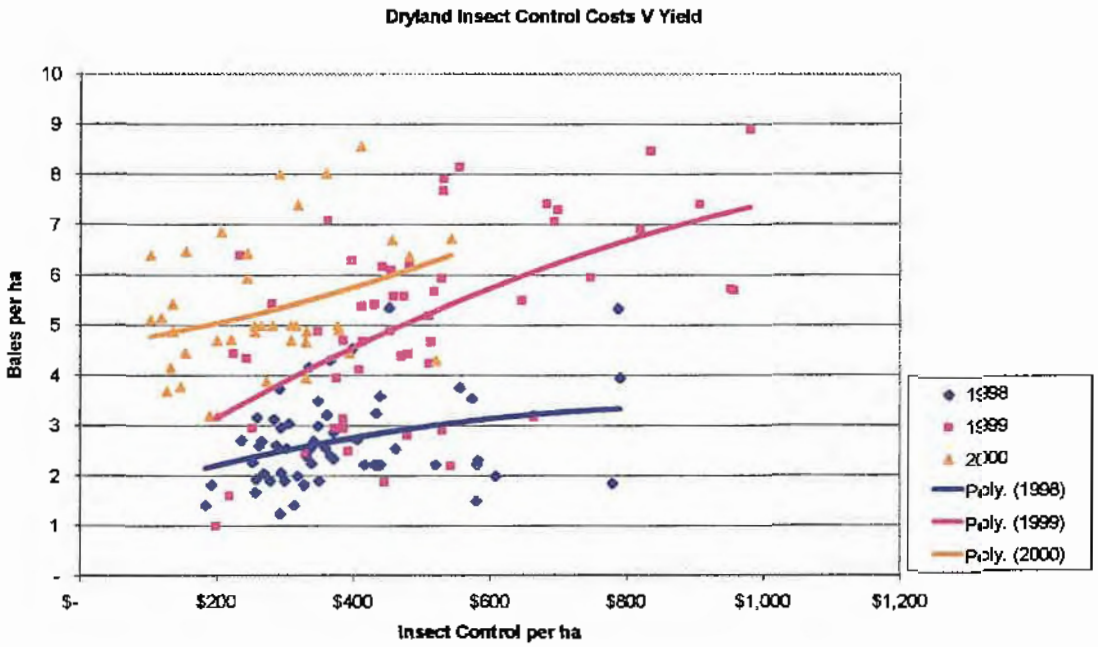
DRYLAND SCATTER GRAPHS

GRAPH 9 :- Yield and Gross Margin Scatter Graph



The Yield verses Gross Margin scatter graph highlights the strong relationship between yield and gross margin even between these three different seasons. In the 1999/2000 season lower growing costs resulted in higher gross margins compared to similar yields in 1998/1999.

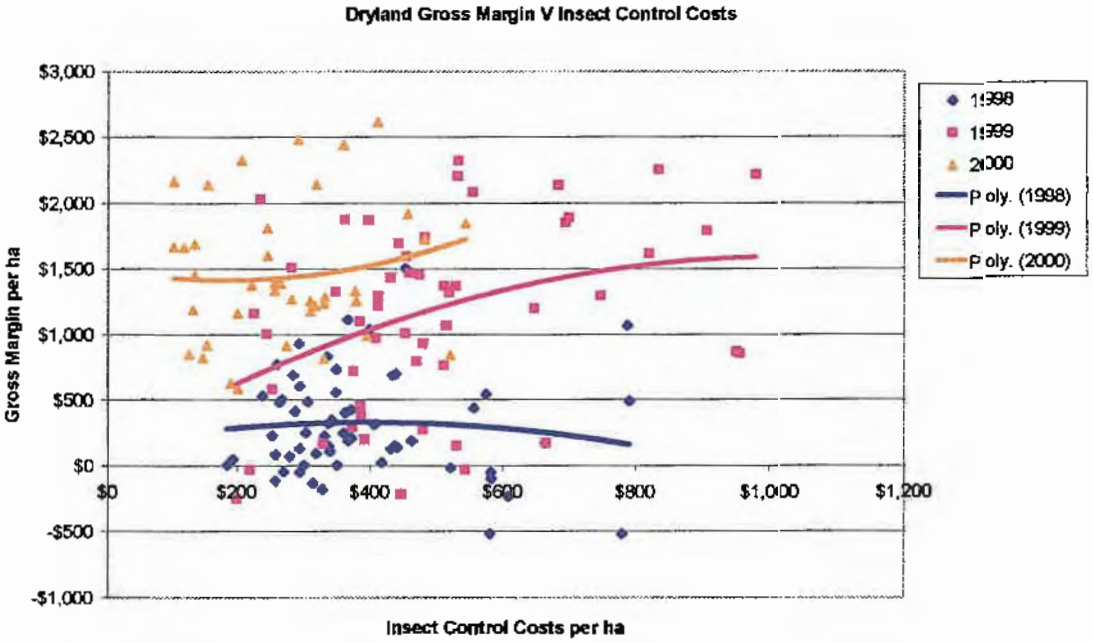
GRAPH 10 :- Yield and Insect Control Costs Scatter Graph



This graph shows the yield verses insect control costs of dryland fields in the group for the three seasons. The trend from 1998 to 2000 is for higher yields from the same insect control costs. The range of insect control costs in the 2000 season has also reduced to about half that of 1999.

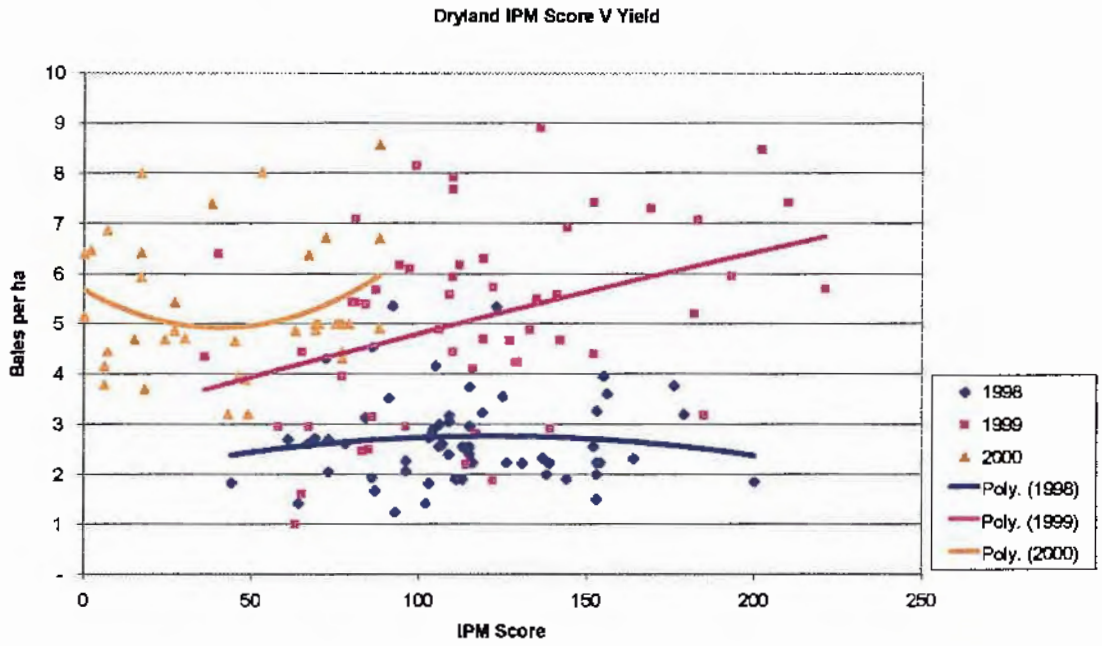
In each season there was a trend of higher insect control costs leading to higher yield. This was due primarily to these crops receiving more mid season rainfall and therefore continuing to produce fruit/yield and attract insect pests in stage 3 of the season. More available water also enabled higher yields.

GRAPH 11 :- Dryland Gross Margin and Insect Control Costs



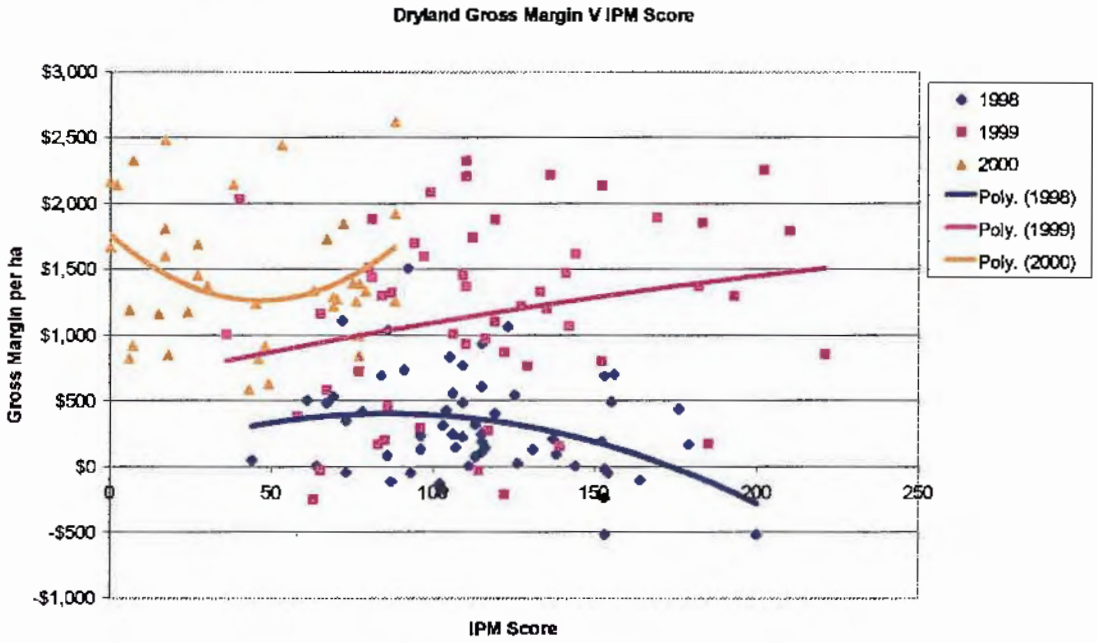
This graph reflects some of the trends from the above graph although the relationship of insect control costs with gross margin is flatter than for yield. It is the range of gross margins for the same insect control costs that is the most significant feature of this graph.

GRAPH 12 :- Spray IPM Score and Yield



This graph shows the relationship between the Spray IPM rating and yield. The 2000 season shows a much lower range of IPM scores with the highest score less than half the 1999 average. This was due an increase in the adoption of IPM and the increased availability of softer chemical options as well as lower insect pressure.

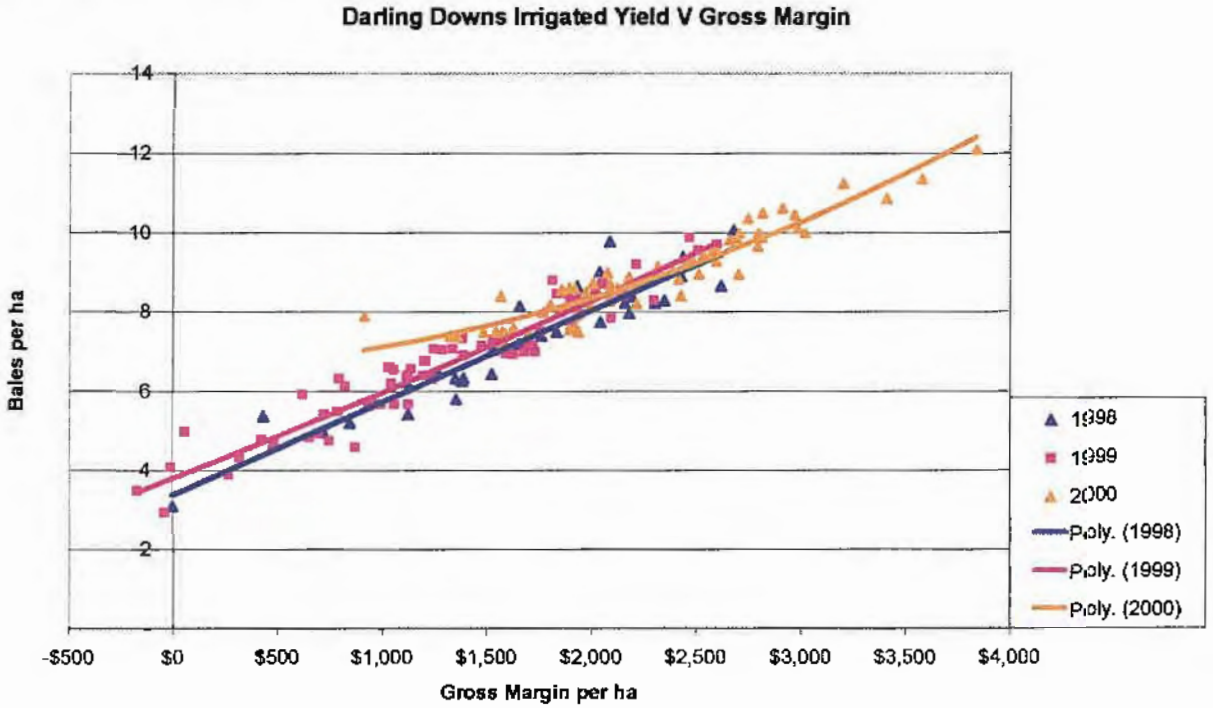
GRAPH 13 :- Spray IPM Score and Gross Margin



Once again the gross margin graph reflects a similar trend of the previous graph for IPM score and yield. However the trend lines are much flatter with the 2000 season having some high gross margin and low IPM score fields

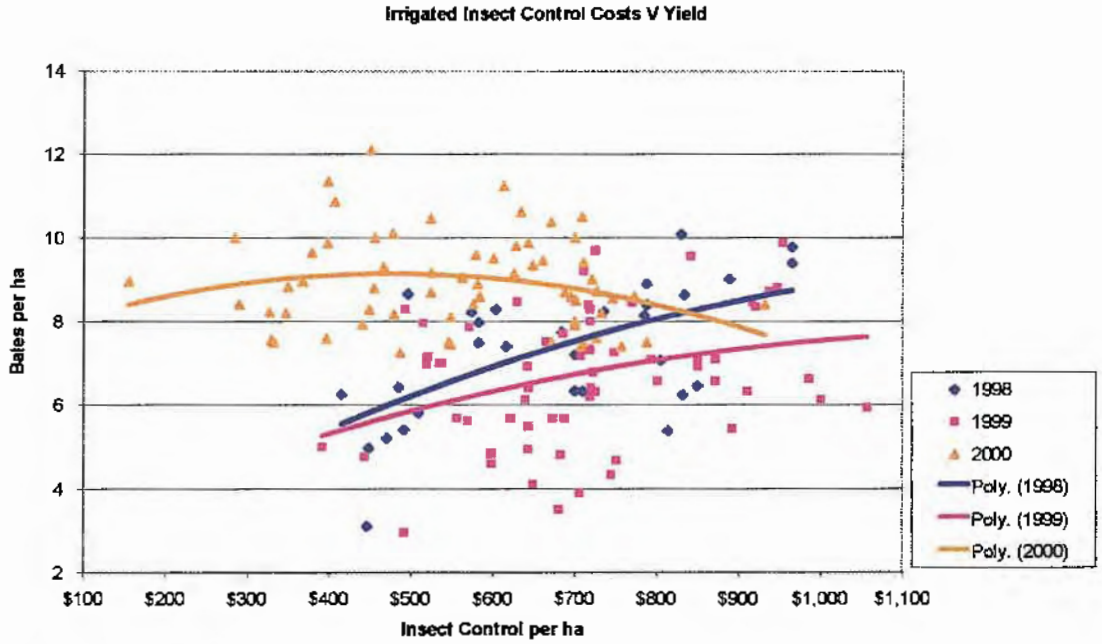
IRRIGATED SCATTER GRAPHS

GRAPH 14 :- Irrigated Yield and Gross Margin



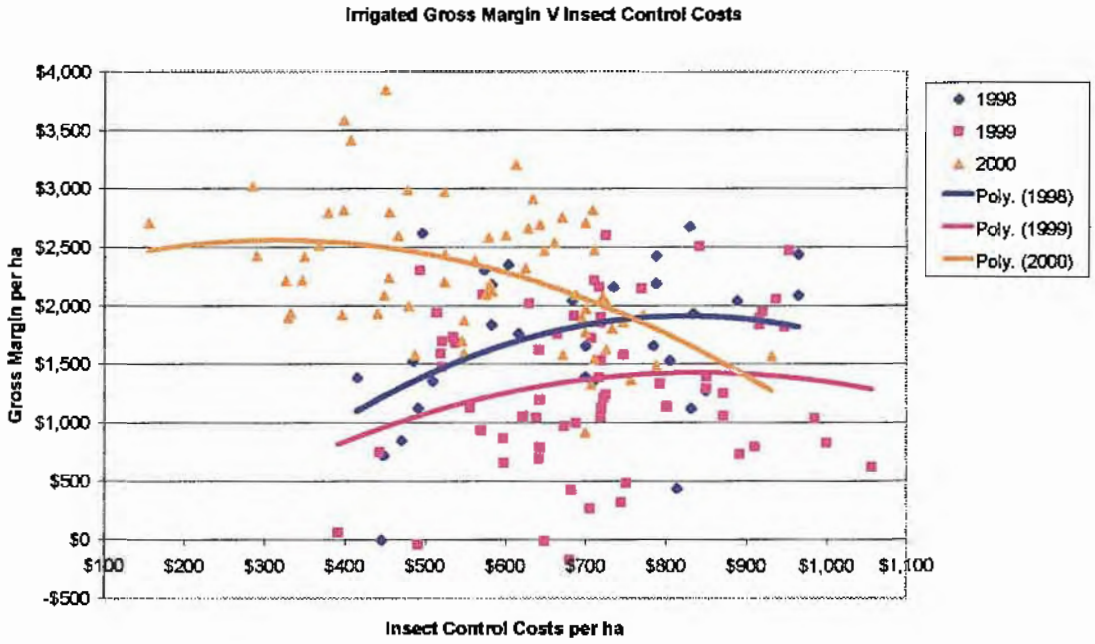
This graph shows the very close relationship between yield and gross margin for irrigated crops over the three seasons. It also shows that the 2000 season performed significantly better with higher yields and a smaller yield range.

GRAPH 15 :- Irrigated Yield and Insect Control Costs



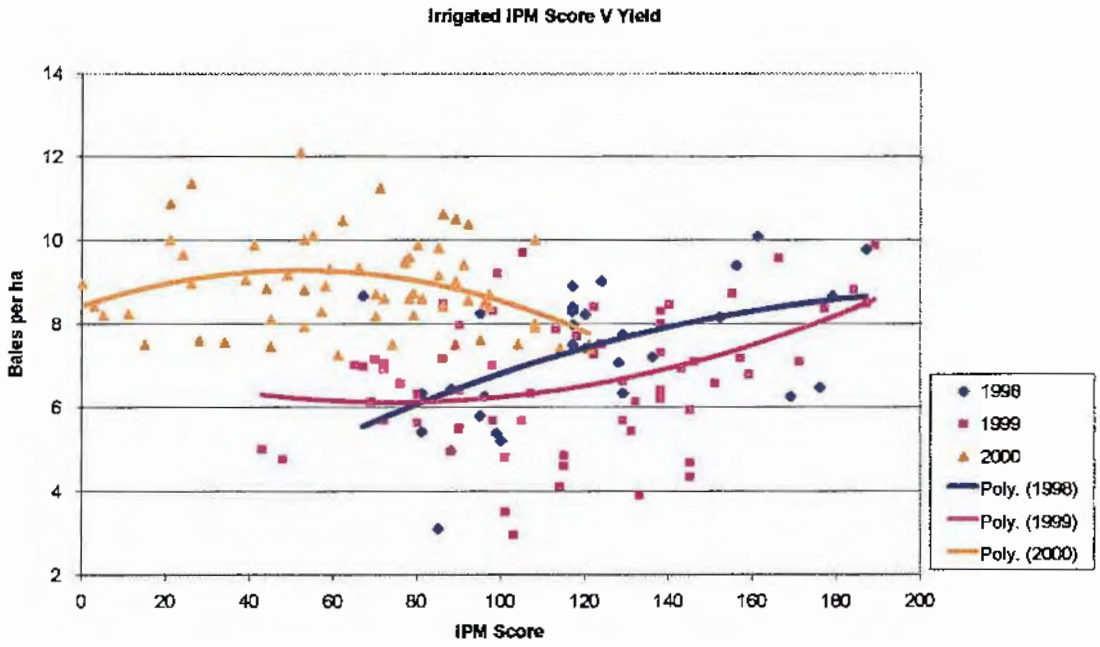
In the first two seasons of this report there was a trend of higher insect control costs and higher yields . The 2000 season did not repeat this pattern with a flat trend-line, perhaps also reflecting the increased percentage of Ingard fields.

GRAPH 16 :- Irrigated Gross Margin and Insect Control Costs



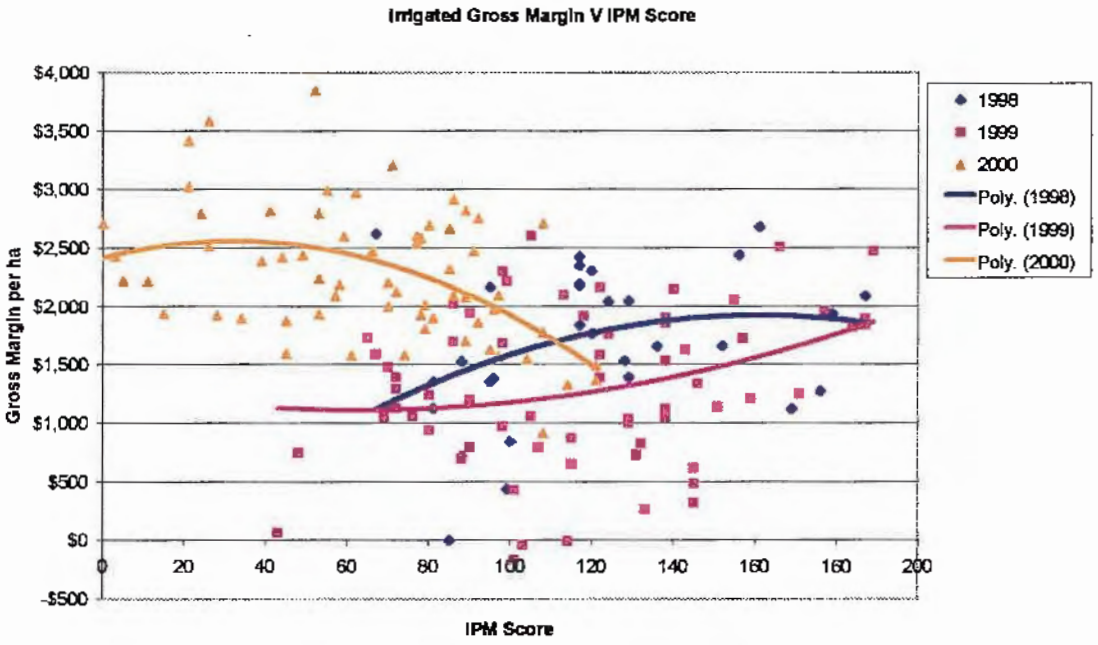
This graph shows a much flatter relationship between insect control costs and gross margin then for yield in the 1998 and 1999 seasons. In the 2000 season increasing insect control costs has a strong trend to decreasing gross margin.

GRAPH 17 :- Irrigated Yield and IPM Score



This graph highlights the significant reduction in the use of disruptive insecticides in the 2000 season compared to the previous two years. As for the dryland fields the highest IPM score for 2000 is only half that of the previous two seasons.

GRAPH 18 :- Irrigated Gross Margin and IPM Score

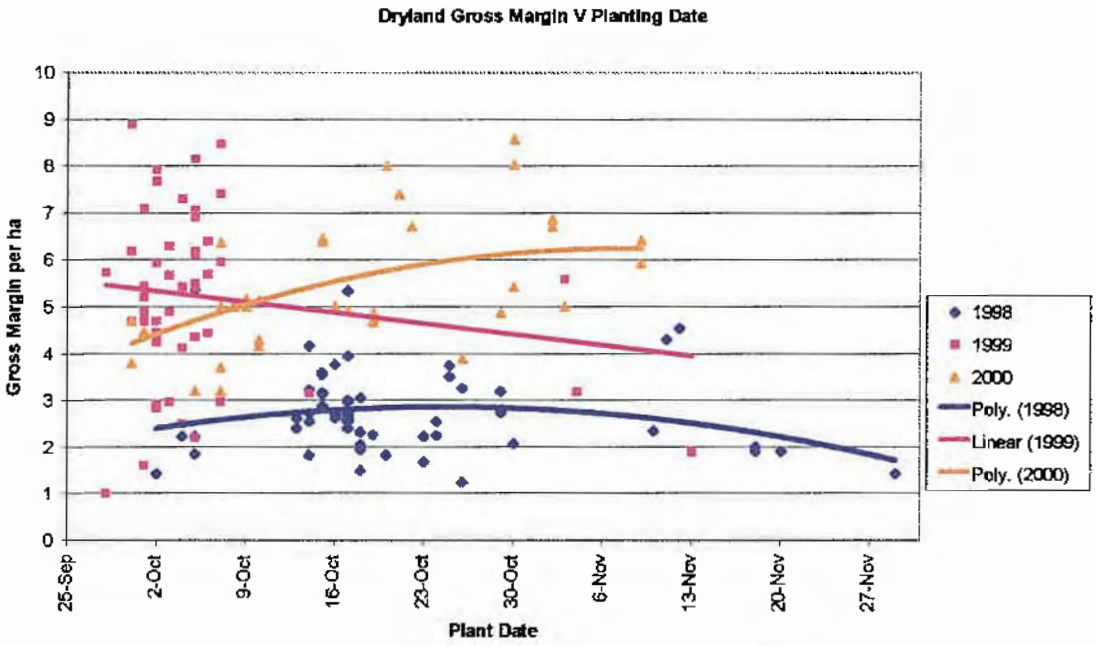


The gross margin and IPM score graph reflects the above graph for yield. The 2000 season shows a significant decline in gross margins as IPM score increases. As for all of these scatter graphs the variation within each season is one of the most significant features of the data.

DRYLAND PLANTING DATE

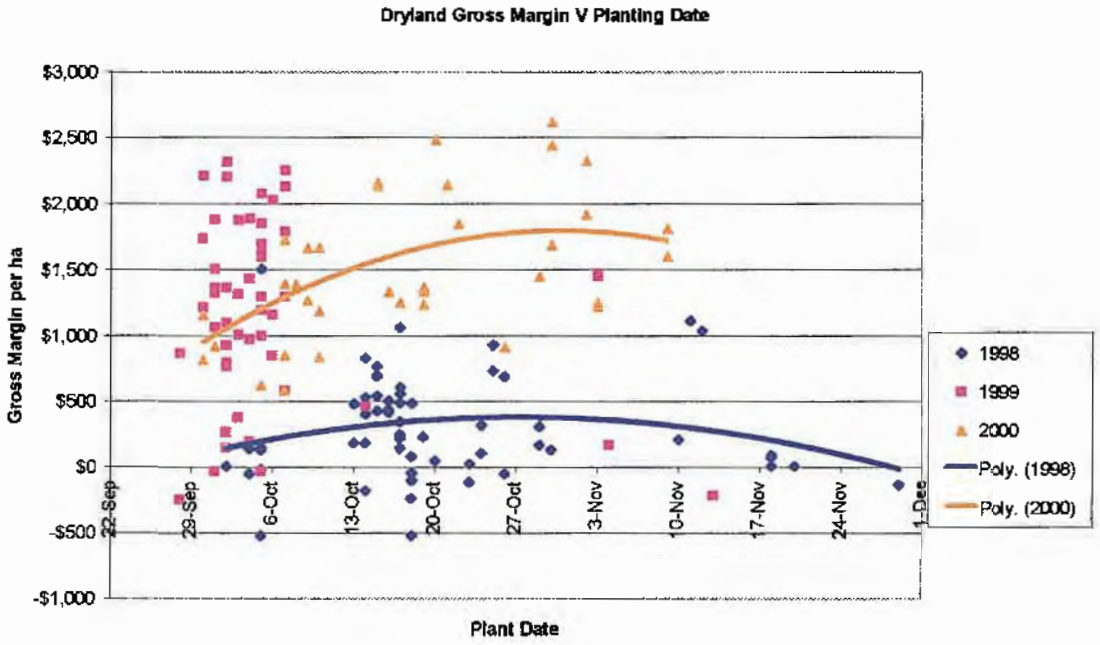
These graphs have plotted the dryland planting dates against yield and gross margin for the three seasons and for the overall combined results. Some of the later planted fields were replanted as a result of a poor initial strike or excessive rainfall after planting.

GRAPH 19 :- Yield and Planting Date Year by Year



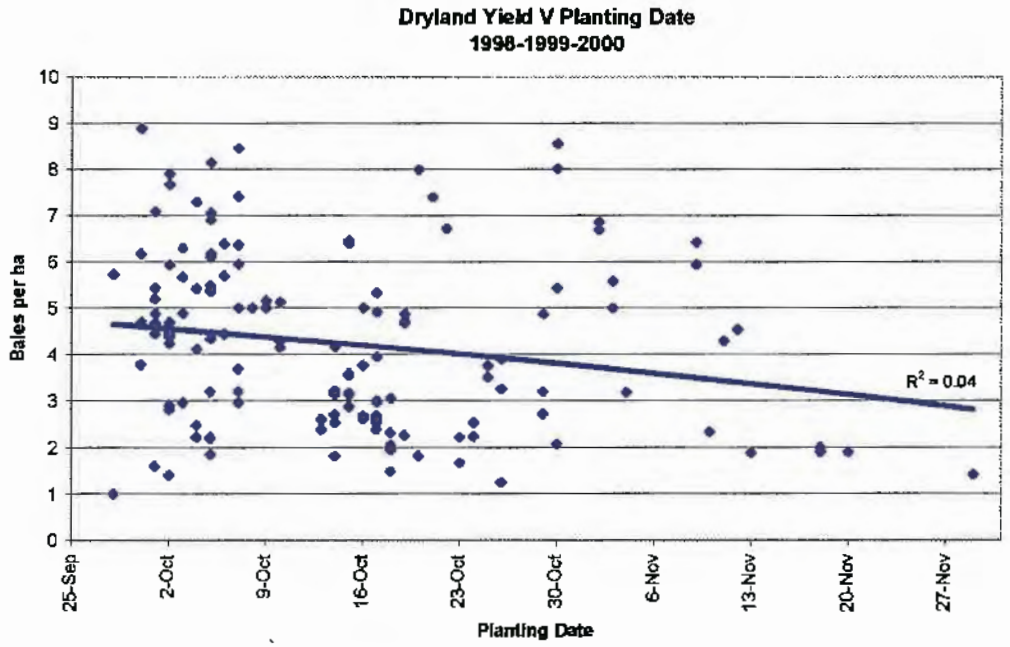
This graph highlights the spread of dryland planting dates for each season as planting rains have differed across the group (note the close window in 1999). Other then for the particularly late planted fields in 1998 and 1999 there is more variation for the same planting date rather than between planting dates.
The graph also shows the effect of beneficial late season conditions for the 2000 crop.

GRAPH 20 :- Gross Margin and Planting Date Year by Year



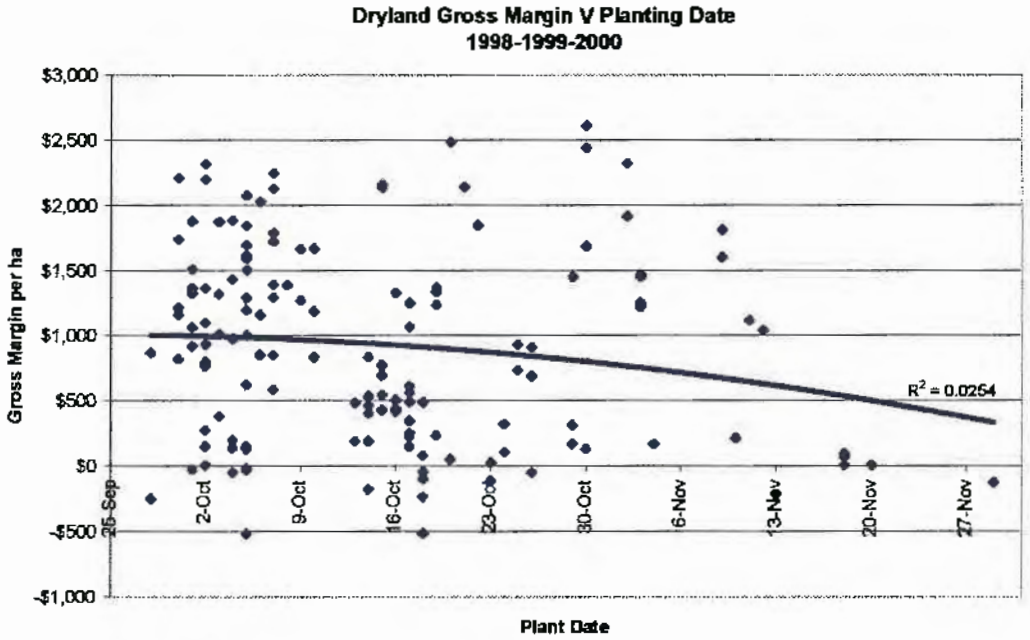
This graph of gross margin reflects the trend of the above yield graph with generally more variation for the same planting times rather than between dates.

GRAPH 21 :- Yield and Planting Date Combined Years



The graph combines the three seasons of dryland and irrigated planting dates. It shows the majority of crops have been planted in the first three weeks of October and reinforces the trend that factors other then planting date have a greater effect on yield. The other factors include the seasonal conditions and overall crop management.

GRAPH 22 :- Gross Margin and Planting Date Combined Years

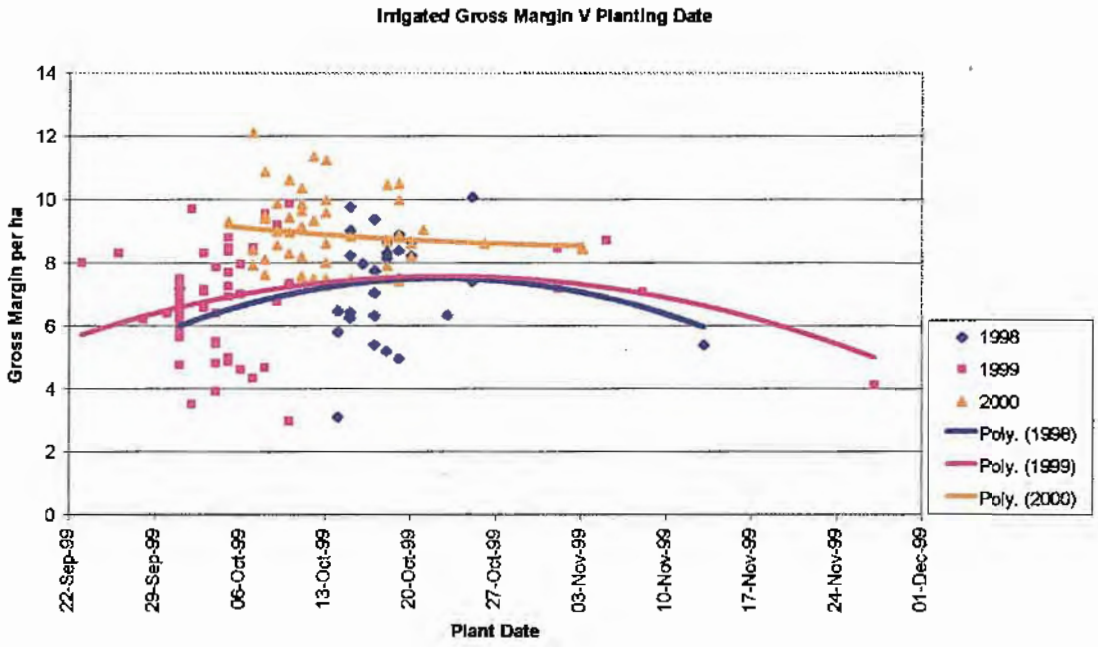


This graph of the combined three seasons does show a trend to lower gross margins from later planting dates. However it also shows that the highest gross margins crops were planted around the end of October. Factors other then planting date have a bigger influence on gross margin, particularly how the seasonal conditions unfold for each year.

IRRIGATED PLANTING DATE

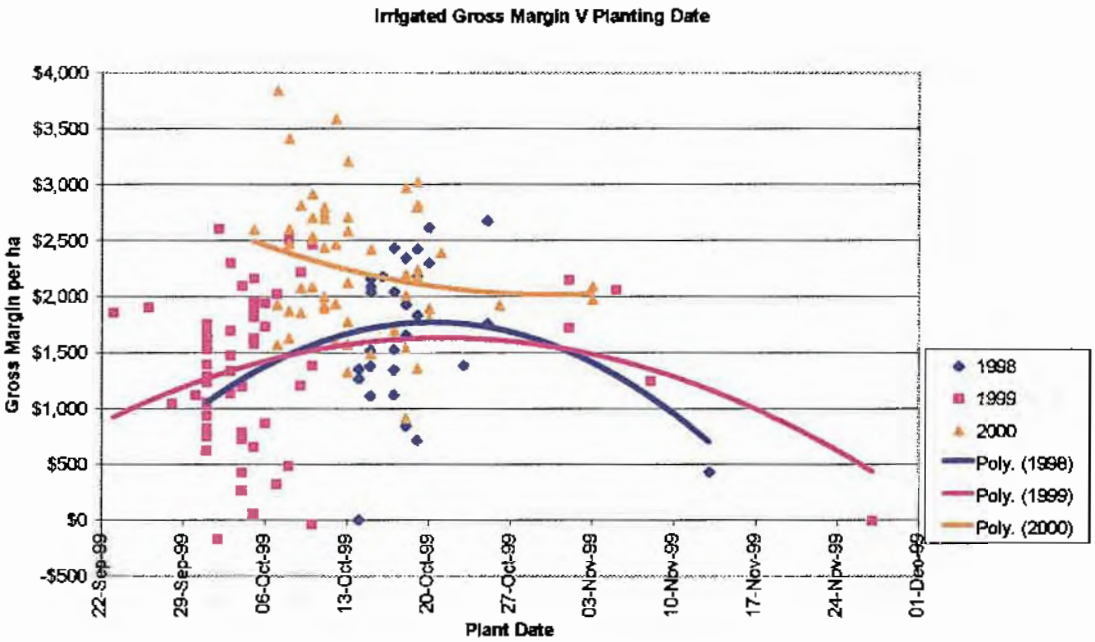
These graphs have plotted the irrigated planting dates against yield and gross margin for the three seasons and for the overall combined results. Some of the later planted fields were replanted as a result of a poor initial strike or excessive rainfall after planting.

GRAPH 23 :- Yield and Planting Date Year by Year



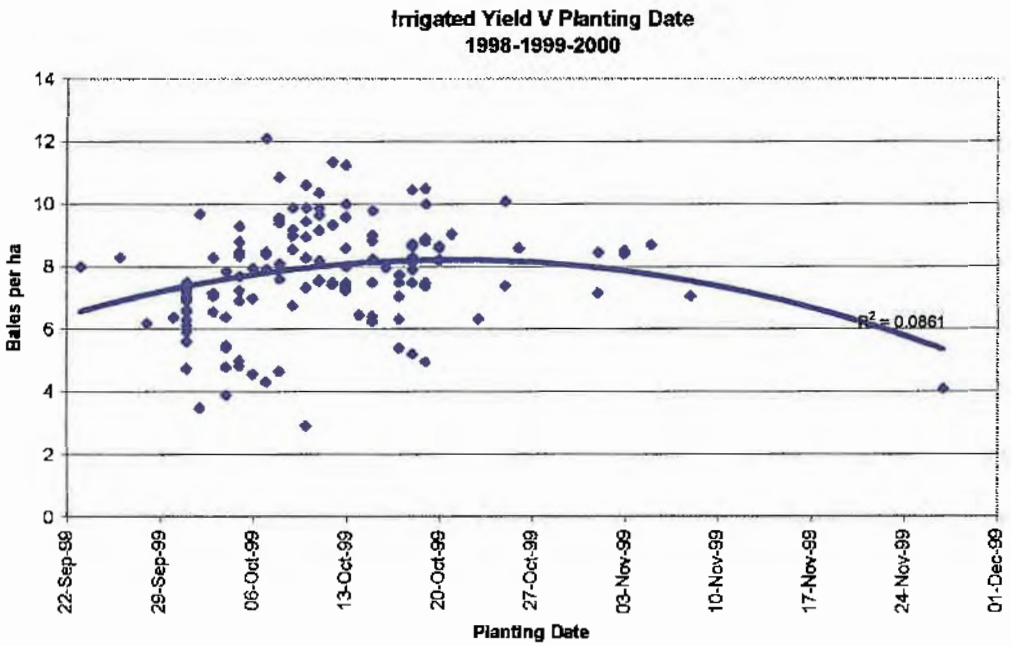
The relationship between planting date and yield for the irrigated fields is much flatter and with a smaller range then for the dryland fields. As for the dryland factors other then planting date are having a greater impact on yield.

GRAPH 24 :- Gross Margin and Planting Date Year by Year



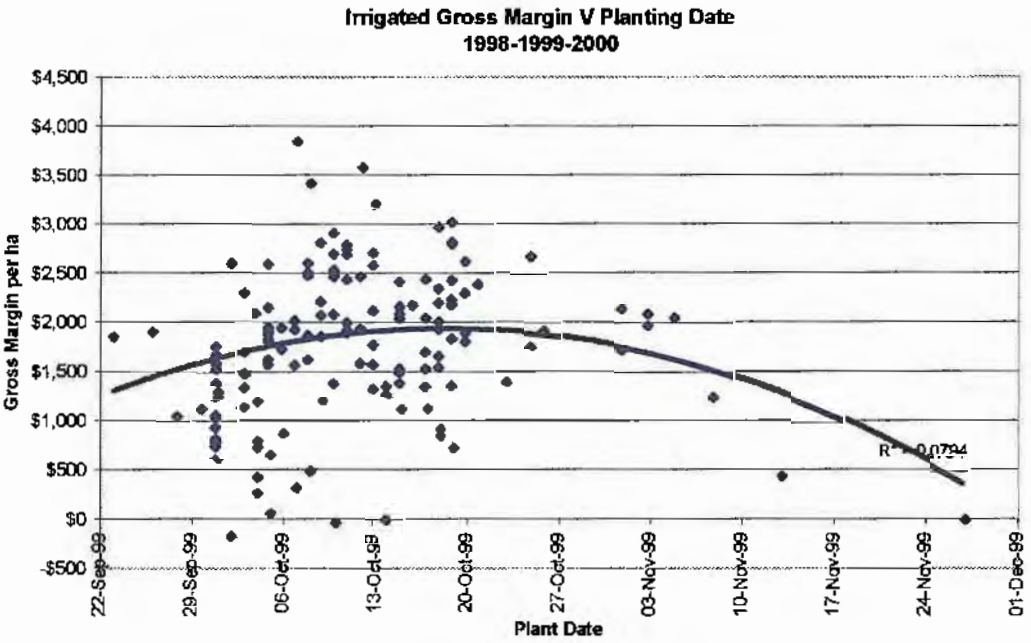
Once again the most significant variation is between years and the same planting date rather then for different planting dates. This graph however does show that later planted crops have their gross margin reduced by higher growing costs as well as lower yield.

GRAPH 25 :- Yield and Planting Date Combined Years



The majority of irrigated fields in these three seasons have been planted in the first two weeks of October.

GRAPH 26 :- Gross Margin and Planting Date Combined Years



The combined gross margin and planting date trend line shows that the prime planting time for irrigated fields has been the middle of October.

CONCLUSION

The results of the three years of this benchmarking data demonstrate that participating growers are increasing their implementation of Integrated Pest Management. The evidence of this is in the significant falls in the field IPM scores for spray programs in the 1999/2000 season.

The reasons for this increase in adoption include:

- More availability of less disruptive or softer insecticides (eg. Gemstar, Tracer).
- Higher efficacy Ingard varieties.
- Benchmarking Group and other reports showing the economic benefits of IPM in the previous seasons.
- More cooperation between growers and consultants as to how pests are managed.

As well as being generally more financially rewarding the shift towards IPM has also been personally rewarding for the growers and consultants involved. Growing a high yielding and profitable crop without the pressure of constant and regular chemical applications is very satisfying to those involved, more than just a financial reward for good management.

However successfully implementing IPM is not without its problems. Some growers have experienced yield and profit losses in fields where there were extended periods of close to threshold pest pressure, pest hot spots within fields or less then optimal spray applications.

The challenge is to solve these problems. To achieve the right balance in IPM of chemical and non-chemical insect management options. To ensure that insect scouting and spray application techniques are meeting the extra demands of an IPM system. To work with neighbours and spray applicators to reduce unwanted disruptions to beneficial insects.

The way to meet these challenges is through the ongoing research into IPM and the continued communication between growers and consultants in groups such as the existing AWM groups. The outcome will be a cotton production system that is sustainably profitable.

Acknowledgment

The report's author gratefully acknowledges the support of the cotton growers and consultants in the Darling Downs Cotton Management Group for providing their cotton production information over the last three years.

APPENDIX 1: SPRAY IPM RATING

One of the measures used in this report is that of the Spray IPM Rating or Score. This is a rating based on extensive work by Cotton Researchers including Lewis Wilson, Robert Mensah and others on the disruptiveness of insecticides on beneficial insects. The chart with the rating of each insecticide is shown below.

TABLE 3: Spray IPM Rating/Score

Insecticide	Overall Impact	% reduction in beneficials after application	Score
Food Sprays	positive	promotes beneficials	-1
Spray Additives (Wetters, PBO etc) Seed Treatments (Semiven)	no impact	0%	0
Bt Sprays NPV Aldicarb (Temik)	very low	<10%	1
Pirimicarb (Pirimor, Aphidex) Propargite (Comite) Spinosad (Tracer)	low	10-15%	2
Diafenthiuron (Pegasus)	low-moderate	20%	3
Amitraz (Ovasyn) Chlorfenapyr (Intrepid) Endosulfan Fipronil (Regent) Imidacloprid (Confidor)	moderate	20-40%	4
---	moderate-high	40-50%	5
Methomyl (Lannate, Marlin etc) Organophosphates (Dimetholate, Folimat, Curacron, Predator etc) Thiodicarb (Larvin)	high	40-60%	6
Pyrethroids	very high	>60%	7

Source: An economic assessment of Insecticide Resistance Management strategies in the Australian Cotton Industry by Ziall Hoque, Bob Farquharson, Martin Dillon and Greg Kauter.

When calculating the Spray IPM rating for a particular spray application the score of all insecticides used are added together. For example an Endosulfan (4) plus Ovasyn (4) spray would have a score of 8. In this report the spray IPM score for each field is used to compare the relative hardness of spray programs.

Group Gross Margin Summary

Northern Downs 1998

T - Top 20% of Fields
M - Middle 60% of Fields
B - Bottom 20 % of Fields

(all numbers are $ per Ha unless otherwise indicated)

	Total Ha	Yld b/Ha	Gross Price $/b	Premium	Net Price $/b	Net Income	Seed	Fert	Herbs	Insecticides Gr	Su	St1	St2	St3	Ing	Total	Ops	Gr Reg	Defol	Cons	Chip	Ins	Irrig	Trans &Tarp	Total Costs	Gross Margin
Dryland Fields																										
T	735	3.74	500	-2	485	1813	22	34	70	5	1	23	139	137	29	333	342	8	49	37	5	36	0	38	976	837
M	1983	2.64	500	-14	474	1253	23	54	67	7	2	42	152	107	5	315	351	7	53	36	9	25	0	28	969	284
B	635	1.86	500	-25	465	868	28	37	73	11	1	55	172	130	3	372	340	9	45	38	11	18	0	22	994	-126
Gp Av:	**3352**	**2.73**	**500**	**-13**	**474**	**1303**	**23**	**47**	**69**	**7**	**1**	**40**	**153**	**118**	**10**	**330**	**347**	**8**	**51**	**37**	**9**	**26**	**0**	**29**	**975**	**328**
Irrigated Fields																										
T	389	8.57	500	0	487	4169	35	204	54	12	1	57	204	280	31	585	505	10	85	37	7	83	110	71	1787	2383
M	963	7.62	500	-11	478	3634	50	239	73	20	2	87	210	257	49	625	503	10	89	40	28	70	84	76	1886	1748
B	332	5.45	500	-8	478	2612	41	249	61	1	0	141	197	187	9	534	496	9	81	43	51	52	47	49	1714	899
Gp Av:	**1684**	**7.41**	**500**	**-8**	**480**	**3556**	**45**	**233**	**66**	**15**	**1**	**90**	**206**	**249**	**37**	**598**	**502**	**10**	**86**	**40**	**28**	**69**	**83**	**70**	**1829**	**1727**

Group Gross Margin Summary

Northern Downs 1999

T - Top 20% of Fields
M - Middle 60% of Fields
B - Bottom 20 % of Fields

(all numbers are $ per Ha unless otherwise indicated)

	Total Ha	Yld b/Ha	Gross Price $/b	Prem ium	Net Price $/b	Net Income	Seed	Fert	Herbs	Insecticides Gr	Su	St1	St2	St3	Ing	Total	Ops	Gr Reg	Defol	Cons	Chip	Ins	Irrig	Trans &Tarp	Total Costs	Gross Margin
Dryland Fields																										
T	510	7.36	480	-4	468	3451	30	103	65	8	1	14	204	197	13	437	439	15	95	37	15	69	0	80	1385	2066
M	1618	5.23	480	-2	469	2455	29	46	65	7	3	30	230	140	13	422	407	8	77	39	7	48	0	61	1208	1247
B	618	2.48	480	-6	466	1162	27	55	55	12	3	26	202	129	6	377	361	5	53	37	6	24	0	32	1032	131
Gp Av:	**2746**	**5.01**	**480**	**-3**	**468**	**2349**	**28**	**58**	**63**	**8**	**3**	**26**	**219**	**148**	**11**	**415**	**402**	**9**	**75**	**39**	**8**	**47**	**0**	**58**	**1201**	**1148**
Irrigated Fields																										
T	815	8.55	480	1	473	4042	50	242	84	17	0	32	272	236	45	602	500	14	103	40	6	81	54	79	1855	2187
M	1970	6.92	480	-4	468	3235	47	207	103	18	12	35	304	216	49	634	493	13	96	40	30	66	58	68	1854	1381
B	678	4.51	480	-18	454	2040	53	168	85	7	2	31	275	232	66	613	482	12	97	41	26	41	49	47	1715	325
Gp Av:	**3463**	**6.83**	**480**	**-5**	**466**	**3191**	**49**	**208**	**95**	**16**	**7**	**33**	**291**	**224**	**51**	**622**	**493**	**13**	**98**	**41**	**24**	**64**	**55**	**66**	**1827**	**1364**

Group Gross Margin Summary

Downs Dryland 2000

T - Top 20% of Fields
M - Middle 60% of Fields
B - Bottom 20 % of Fields

(all numbers are $ per Ha unless otherwise indicated)

	Total Ha	Yld b/Ha	Gross Price $/b	Premium	Net Price $/b	Net Income	Seed	Fert	Herbs	Insecticides Gr	Su	St1	St2	St3	Ing	Total	Ops	Gr Reg	Defol	Cons	Chip	Ins	Irrig	Trans &Tarp	Total Costs	Gross Margin
Conventional Fields																										
T	273	7.49	475	0	461	3453	26	88	42	13	1	1	44	281	0	341	442	11	86	45	15	69	0	90	1256	2198
M	738	4.96	475	-3	458	2274	22	79	39	6	2	15	86	137	0	247	407	2	47	45	0	45	0	60	993	1281
B	201	3.92	475	5	466	1824	25	84	30	3	2	23	63	196	0	286	400	7	52	45	4	36	0	47	1017	807
Gp Av:	**1213**	**5.36**	**475**	**-1**	**460**	**2465**	**24**	**82**	**38**	**7**	**2**	**13**	**73**	**180**	**0**	**275**	**414**	**5**	**57**	**45**	**4**	**49**	**0**	**64**	**1056**	**1409**
Ingard Fields																										
T	144	7.21	475	0	461	3326	20	62	35	26	9	0	1	82	107	225	346	4	67	45	7	67	0	87	964	2363
M	555	5.79	475	5	466	2695	26	66	39	6	10	0	0	41	99	157	383	9	53	45	10	54	0	69	912	1783
B	180	4.22	475	-33	428	1809	31	78	34	2	5	3	20	36	97	164	353	3	46	45	0	36	0	51	839	970
Gp Av:	**878**	**5.70**	**475**	**-4**	**457**	**2617**	**26**	**67**	**37**	**9**	**9**	**1**	**4**	**47**	**100**	**169**	**371**	**7**	**54**	**45**	**8**	**52**	**0**	**68**	**906**	**1711**

Group Gross Margin Summary

Downs Irrigated 2000

T - Top 20% of Fields
M - Middle 60% of Fields
B - Bottom 20 % of Fields

(all numbers are $ per Ha unless otherwise indicated)

	Total Ha	Yld b/Ha	Gross Price $/b	Premium	Net Price $/b	Net Income	Seed	Fert	Herbs	Insecticides Gr	Su	St1	St2	St3	Ing	Total	Ops	Gr Reg	Defol	Cons	Chip	Ins	Irrig	Trans &Tarp	Total Costs	Gross Margin
Conventional Fields																										
T	262	10.98	475	0	461	5063	49	205	54	26	19	65	102	297	0	508	573	11	123	45	29	101	109	132	1939	3124
M	1305	8.93	475	1	462	4125	50	173	77	11	10	54	129	274	0	479	569	5	106	45	20	83	122	107	1835	2290
B	420	7.42	475	-5	456	3385	49	194	69	18	30	46	104	308	0	506	579	7	110	45	29	68	100	89	1845	1540
Gp Av:	**1988**	**8.88**	**475**	**-1**	**461**	**4093**	**49**	**182**	**72**	**15**	**16**	**54**	**120**	**284**	**0**	**489**	**572**	**6**	**109**	**45**	**23**	**82**	**116**	**107**	**1851**	**2242**
Ingard Fields																										
T	193	10.67	475	1	462	4929	57	200	68	30	27	0	10	139	155	361	511	2	91	45	10	99	116	128	1687	3243
M	848	8.74	475	0	461	4033	53	180	72	16	8	7	24	176	150	380	529	3	114	45	24	81	117	105	1703	2330
B	320	7.87	475	0	461	3629	54	205	82	10	6	46	76	312	155	605	556	22	127	45	21	73	101	94	1986	1643
Gp Av:	**1361**	**8.81**	**475**	**0**	**461**	**4065**	**54**	**189**	**73**	**16**	**10**	**15**	**35**	**203**	**152**	**430**	**533**	**8**	**114**	**45**	**22**	**81**	**113**	**106**	**1768**	**2298**