MARCH 2010 FUTURE ORCHARD 2012 WALK

Indicators of Success

Prepared by John Wilton and Ross Wilson, AGFIRST

This presentation attempts to identify the critical factors to the success of a pipfruit business and individual block of trees. The data used to identify "success" has been derived from the 'Orchard Business Analysis" and Monitor Block program. These FO2012 data sets are now robust enough to draw some very real conclusions from real Australian data.

The first point is that we need to define what is meant by success for the Australian pipfruit grower.

From the data we have gathered over the life of the Future Orchards 2012 project it has been possible to rank the population of orchards studied on their cash orchard surplus per hectare. Within this group we can identify the top 25% as the upper quartile. The average performance of this group provides a good benchmark for measuring success.

The characteristics of this upper quartile group go a long way to providing the indicators of success we are looking for.

Upper Quartile (UQ) Compared to Average Cash Orchard Surplus

	Average $/ha	UQ $/ha	Av $/kg	UQ $/kg
Total Revenue	52825	82900	1.48	1.91
Less Orchard Gate Costs	20028	25876	0.55	0.54
Less Post Harvest costs	18752	21316	0.52	0.51
Equals Cash Operating surplus	14045	36708	0.39	0.86

Higher fruit value and greater yield are the factors that propelled these orchards into the upper quartile.

Note: There is little difference between the average and upper quartile in unit costs for either costs up to orchard gate, or in the post harvest costs, even though per hectare costs were higher for the upper quartile group.

Upper Quartile (UQ) Compared to Average Costs of Production				
	Average $/ha	Average $/ha	UQ $/ha	UQ $/kg
Labour	11778	0.32	15262	0.31
Working Expenses	5908	0.16	7775	0.17
Overheads	2341	0.06	2839	0.06
Total Orchard Gate Costs	20028	0.55	25876	0.54

Upper quartile growers spend more on their orchards, but because they have higher production this has not increased their unit costs.

Upper Quartile (UQ) Compared to Average Labour Costs				
	Average $/ha	Average $/kg	UQ $/ha	UQ $/kg
Harvesting	3545	0.10	5507	0.12
Pruning	1701	0.05	2003	0.04
Thinning	1702	0.05	2634	0.06
Other Wages	3363	0.09	3895	0.08
Total Labour	10311	0.28	14039	0.3

The upper quartile growers are spending 20% more per kg on harvesting. Is this helping them to get better pack outs than the industry average?

They also spend more per hectare on pruning and particularly hand thinning labour, two other critical crop husbandry practices that have a large impact on fruit quality. It is this attention to detail, which gives them higher cash orchard surplus.

As the focus for this series of orchard walks is Cripps Pink we will look at the data for this variety to illustrate the indicators for success.

Upper Quartile Orchard Pink Lady Performance			
	Gross Yield	% Class 1	Class 1 Return $/kg
Upper Quartile	59.7 t/ha	76	2.60
Average	39.5 t/ha	69	2.23

Upper quartile yield is almost 50% higher than the industry average. 10% more of the crop is class 1 and they receive higher prices by growing a better product. This is the benefit of attention to detail in the orchard.

We now turn our attention to the Monitor Block data, which has analysed over 100 individual blocks of trees over time. The data presented is the apple dataset unless otherwise specified.

The Link Between Yield and Profit

The graph below, taken from the Monitor Block data, shows average apple yield and profit per hectare by tree age.

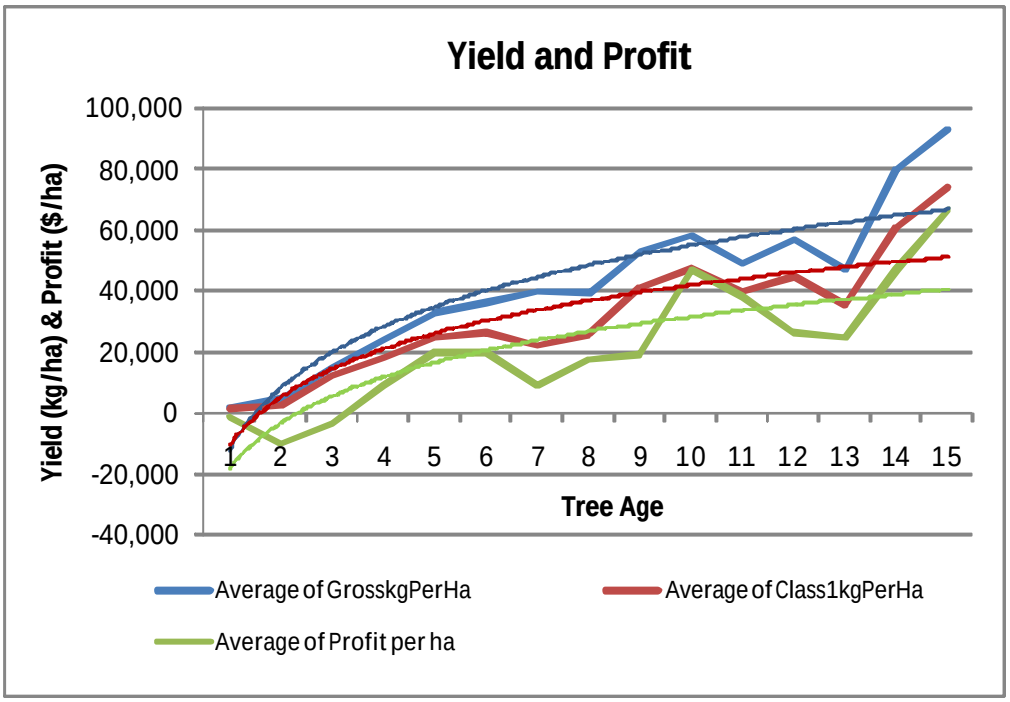

Figure 1

Figure 1 shows that once the production reaches the point where there is enough income to cover direct production costs, which from this data is the 4th leaf, profits begin to rise rapidly, then track gross yield fairly closely. When the trees are young, class 1 production is close to gross production, but as the trees age the percentage of class 1 fruit falls back.

Two factors could be influencing this reduction in class 1 content:

- Young blocks are likely to be higher coloured strains.
- As trees age canopies become denser so it is more difficult to achieve class 1 colour specification.

In this study the data for the older trees is more erratic. This is probably a function of sample size in these age groups, where because there are only small numbers of blocks in the older age groups, disaster in one season for a particular block, will influence age group averages much more than where there are many blocks.

The trend lines on this graph show that gross yield and also class 1 fruit continue to increase for at least the first 12 to 15 years of the orchard life. A key driver for success is the ability to bring new orchard production up quickly and then maintain it at a high level for the life of the orchard.

What drives yield?

Trunk cross sectional area (TCA) is one of the recognised measures for yield potential of tree crops.

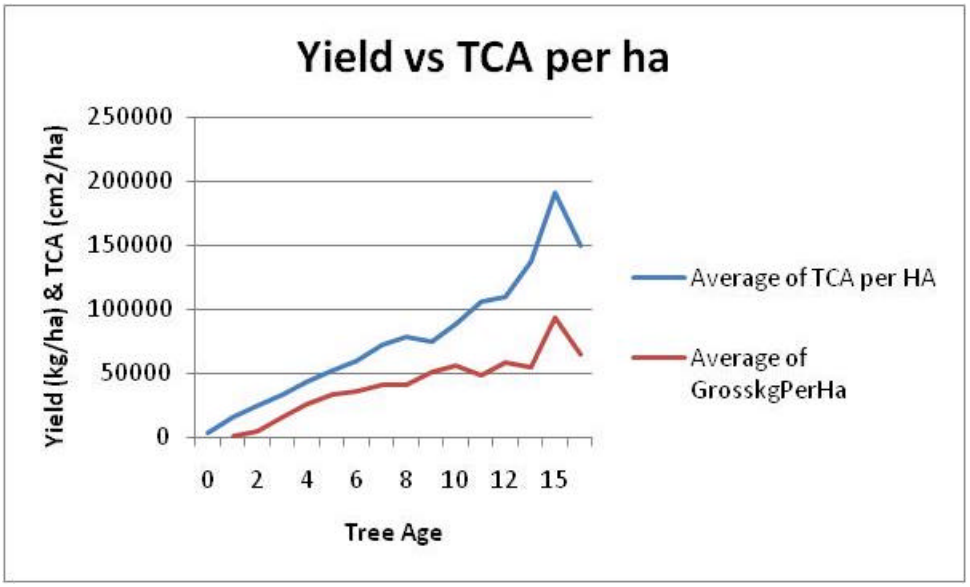

Figure 2

This graph shows the relationship between average TCA per hectare and gross kg per hectare of production.

Production rises rapidly to around 50,000cm2. TCA per hectare then begins to fatten off although TCA is still climbing. The gap between TCA and yield widens as the orchard ages. This is because once full canopy is achieved yields begin to plateau, but trunk size continues to increase.

Planting Density

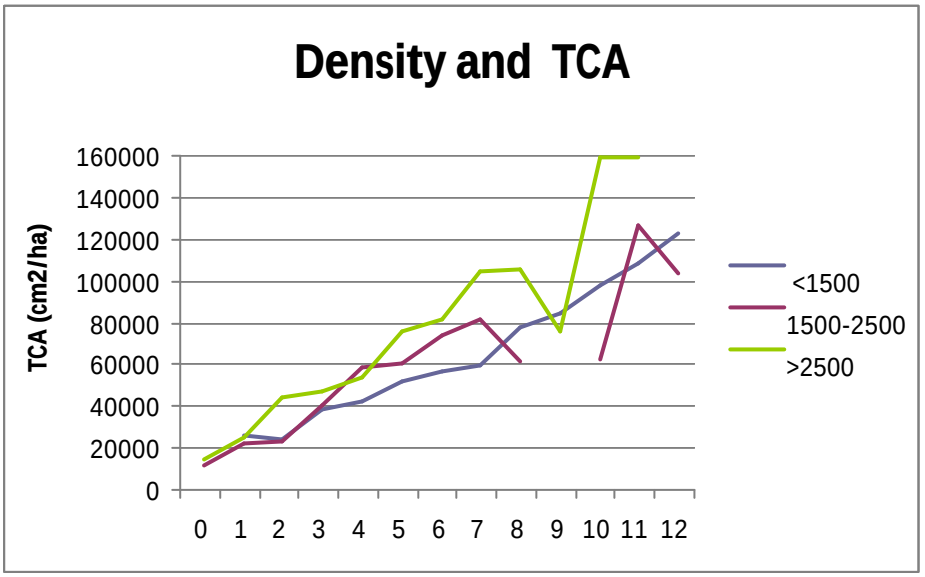

Figure 3

Figure 3 shows the impact of planting density on TCA per hectare. Orchards planted at high densities accrue TCA per hectare much faster than orchards planted at lower density.

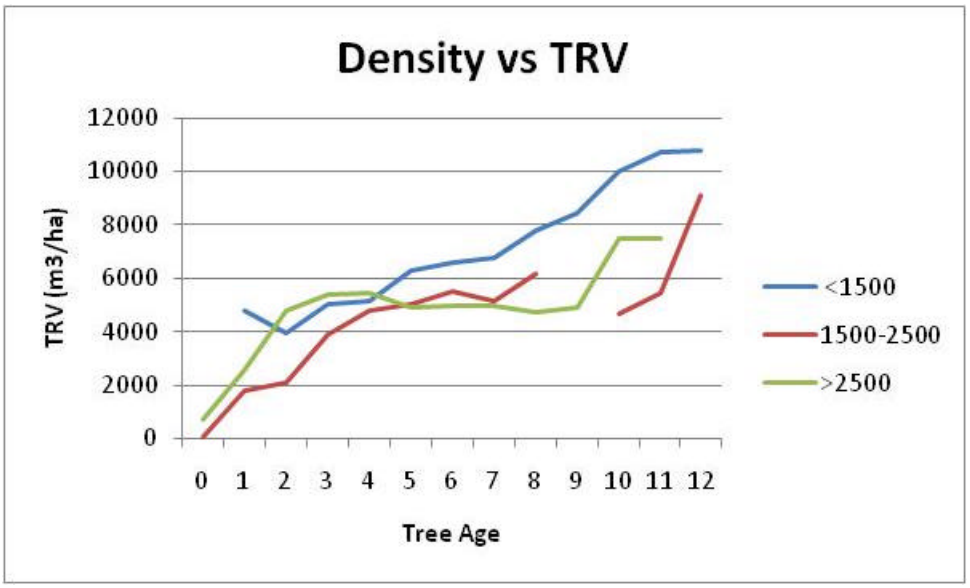

Figure 4

The impact of planting density on tree row volume (TRV) as the orchard ages.

Orchards planted at densities above 2500 trees / ha develop canopy volume very rapidly, then about the 3rd leaf plateaux. Lower planting densities take longer to build canopy with those planted at low densities on higher vigour rootstocks eventually growing the largest TRVs.

TRV does not correlate as well as TCA with yield and profit because large canopies in low density orchards are not particularly efficient due to within canopy shading problems. Other negative features of large canopies include:

- Requirement for higher spray volumes.
- Lower labour efficiency.
- With larger leaf surface areas may use more water.
- Much more difficult and expensive to cover with hail netting.

Growing an efficient compact canopy in the 8,000 – 10,000 M^3/ha TRV range is another indicator of success.

Tree Density effect on yield

In this project we have looked at yield by tree density. Figure 5 shows the average of this data by tree age and tree.

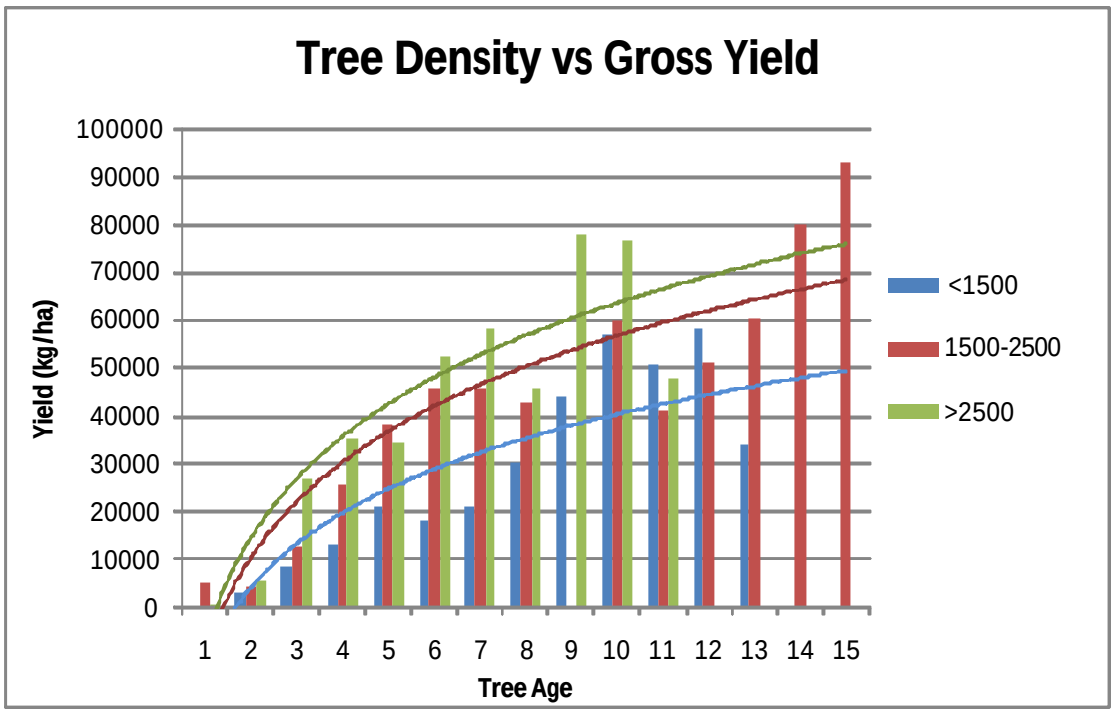

Figure 5

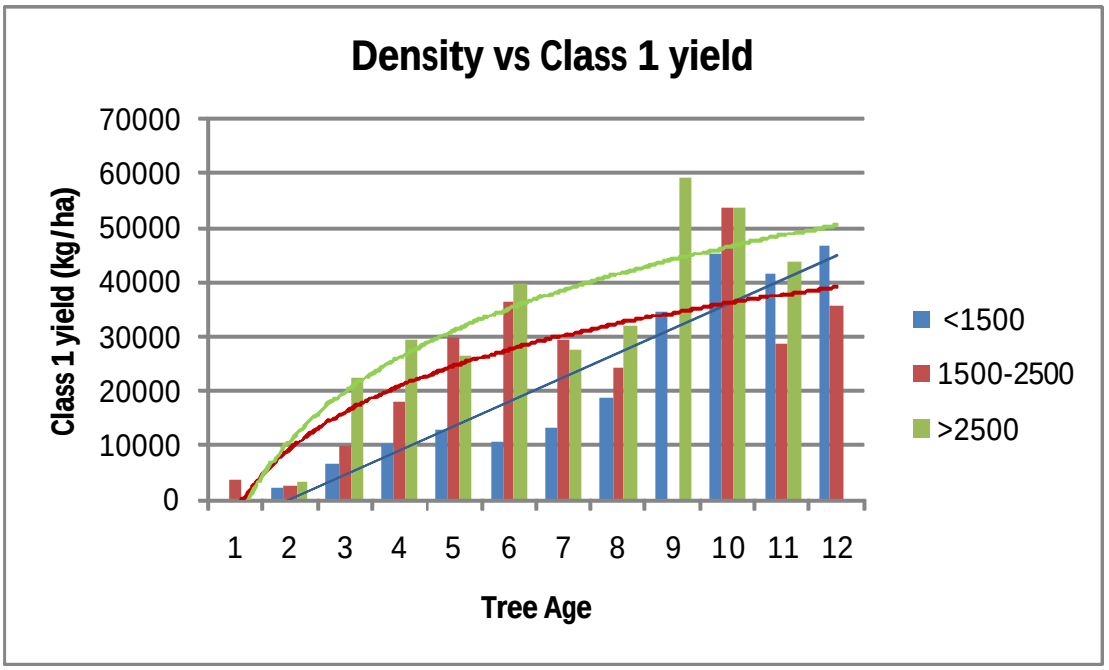

Figure 6

Figures 5 and 6 shows the highest yields have been produced on orchards planted at densities above 2500 trees per hectare. In general, orchards planted in this density range have outperformed both the medium density and lower density plantings. Note also the orchards planted at tree densities above 1500 trees per hectare are giving much more consistent production levels by age than the low density orchards.

Whether or not planting densities above 2500 trees per hectare will give a better return on investment than medium density orchards is debatable because of their higher

establishment costs. Earlier in the orchards 2012 programme Dr Terrance Robinson presented excellent data on the impact of planting density on orchard profitability. This data showed planting densities around 2100 to 2500 trees / ha to give the best return on investment.

To some extent initial tree vigour and planting density are interchangeable provided the canopy management skills are appropriate for the tree density, tree vigour situation. The high performance of medium density orchards for years 5-8 are an example of higher vigour rootstocks being well managed at tree densities approaching 2000 tress / ha.

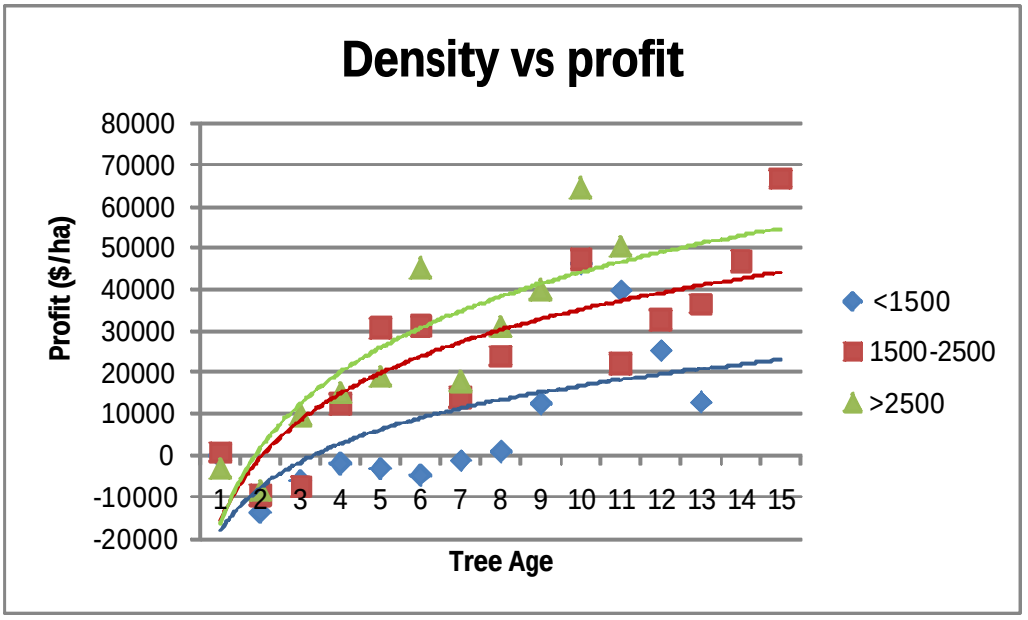

Figure 7

Figure 7 shows tree density versus profit by tree age. Profit follows yield very closely. This shows that high density planting may come into profit a little earlier than the medium density plantings. Lower density orchards produce less profit and their profits are much more erratic than medium and high density plantings.

Effect of Packout on Profit

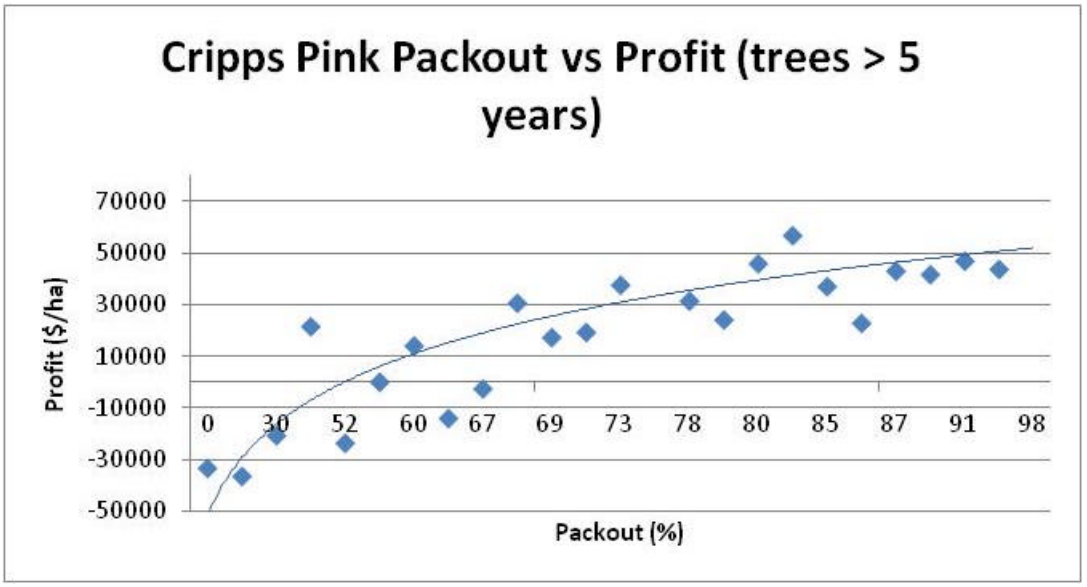

Figure 8

Figure 8 shows profit level increases as class 1 packout rises. The blocks diverging markedly from the trend line will be mainly due to yield differences, although fruit value may have also had some impact, albeit at a much lesser level than the yield effects.

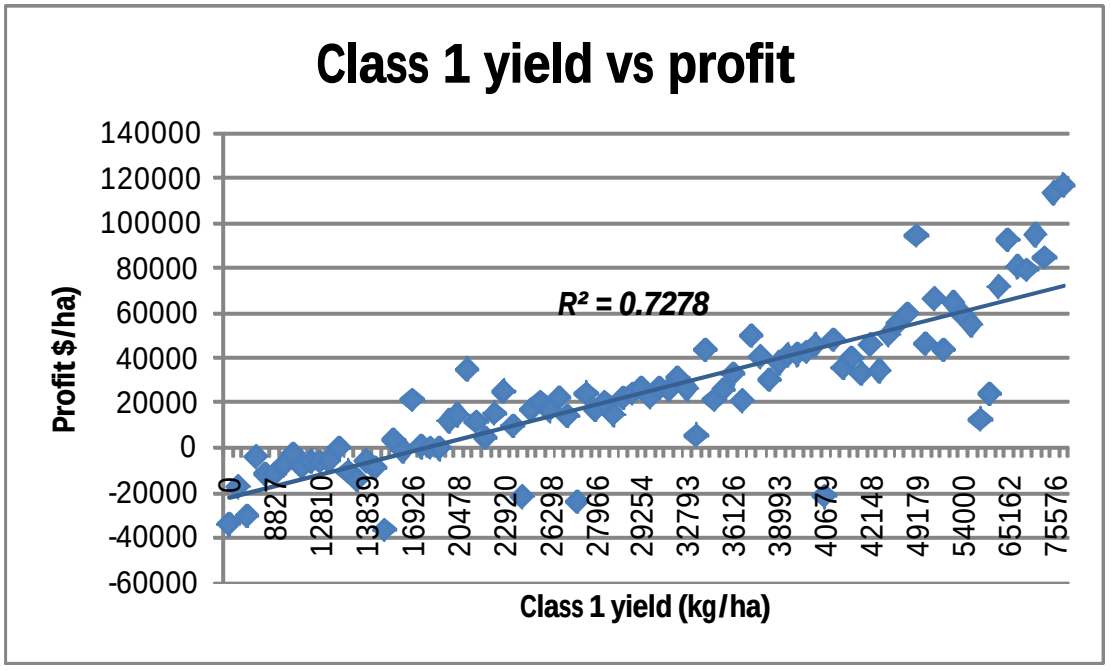

Figure 9

Figure 9 shows the very strong relationship between Class 1 production and profit. The r2 value is 73%, which is very high for a dataset such as this.

Planting density trends

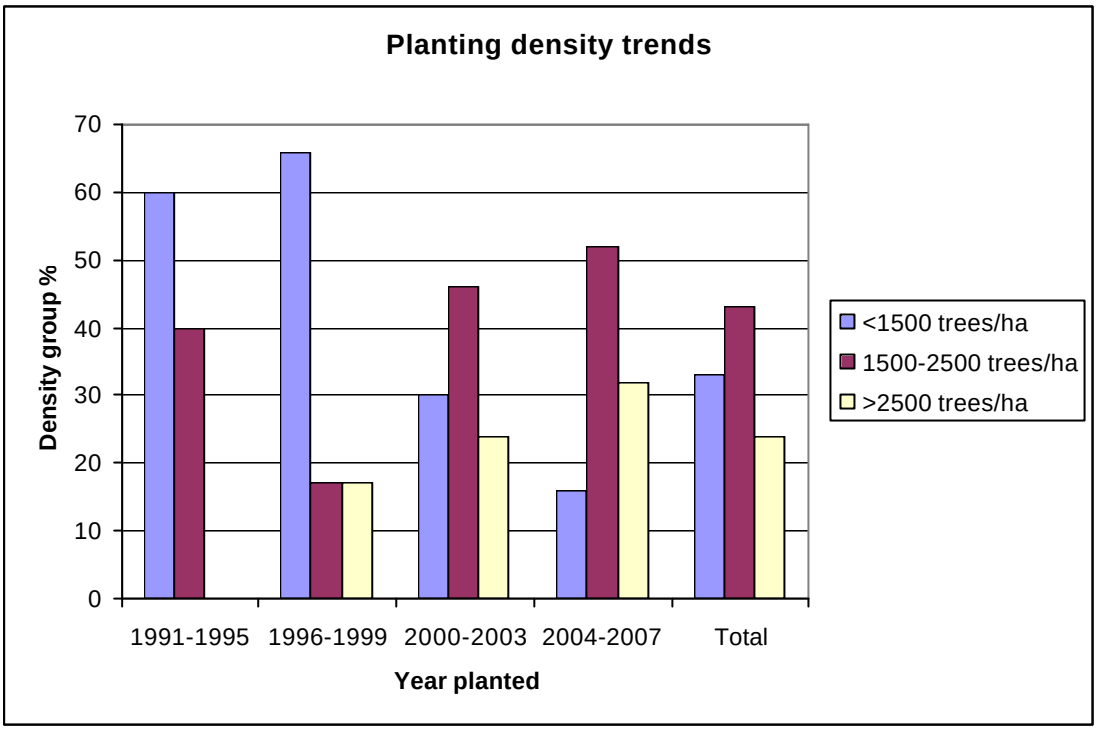

Figure 10

Figure 8 shows the percentage of orchards in each density band by years of plantings. This shows that orchards in the survey planted between 1991 and 1999 were predominantly low density orchards, whereas the youngest age group had only 16% of low density plantings. Medium density plantings were represented right through the age range and dominated plantings between 2000 and 2007. The first high density orchards appeared in 1998 and showed an increasing trend in the later plantings.

Conclusions

The main indicators of success are:

1. Rapid canopy establishment – this can be achieved by either planting at medium densities and making the trees grow well or planting at higher densities on dwarf rootstocks.

2. Achieving early and high yields.

3. Growing a high proportion of the crop to class 1 quality standard.

4. The focus has to be on maximising orchard income, rather than minimising per hectare production costs.

5. Attention to detail is the key to high orchard performance