

**A production and economic
comparison of different
intensive apple orchard
systems under Australian
conditions**

Paul James

&

South Australian Pome Fruit
Improvement Committee

Proverb

Tell me and I will forget

Show me and I may remember

Involve me and I will understand



South Australian Pome Fruit Improvement Committee Inc



South Australian Pome Fruit Improvement Committee Inc

Operating for over 30 years

Members elected by their fellow growers

2 life members

Role

- improved access to & use of varieties & rootstocks
- Orchard systems & information

Team Effort

Joint Learning

*“The beauty of this project is
there is as much value in doing
the project as there is in the
results”*

Kym Green - 2007

This project is being undertaken in 2
stages –

Stage 1 – The first 5 years

Stage 2 – The next 5 years

This presentation focuses on the
outcomes of stage 1

Project Objectives

- Demonstrate various high density production systems
- Capital investment requirements
- Various management & labour requirements
- Provide an economic comparison of each systems performance

Project Focus

Need to manage the “whole system” not individual components

Growers involvement maintains commercial relevancy

Fruit Quality

All management actions & labour activities focussed on

maximising commercial pack-outs

not total yields

Planting Layout

**2 Cultivars - Cripps Pink (Pink Lady™)
- Cripps Red (Sundowner™)**

4 Rootstocks - M.9, Ottawa.3, M.26, MM.106

3 Spacings (in row) - 0.75 m, 1.00 m, 1.25 m

**3 Different Orchard Systems –
Central leader/vertical axis
Closed V
Open V**

Row of 4th System - Super Spindle

76 Different Orchard Combinations



Tall Spindle



Closed V



Open V

Planting Densities

System	Spacing	Density
Standard	4 x 1.25	2000
Standard	4 x 1.00	2500
Standard	4 x 0.75	3333
Open V	4.5 x (1.25 x 2)	3559
Closed V	4 x (1.25 x 2)	4000
Open V	4.5 x (1.00 x 2)	4444
Closed V	4 x (1.00 x 2)	5000
Open V	4.5 x (0.75 x 2)	5917
Closed V	4 x (0.75 x 2)	6666
Super Spindle	4 x 0.50	5000

Nursery Tree Quality

- Trees for trial were propagated by SAPFIC and pruned to whips when planted.
- Nursery tree quality has had a significant impact on tree performance
- **Virus Freedom !!!!!**
- Better nursery quality trees could have
 - Increased early yields
 - Significantly improved profitability
 - Reduced training and vigour management costs
 - reduced tying down required



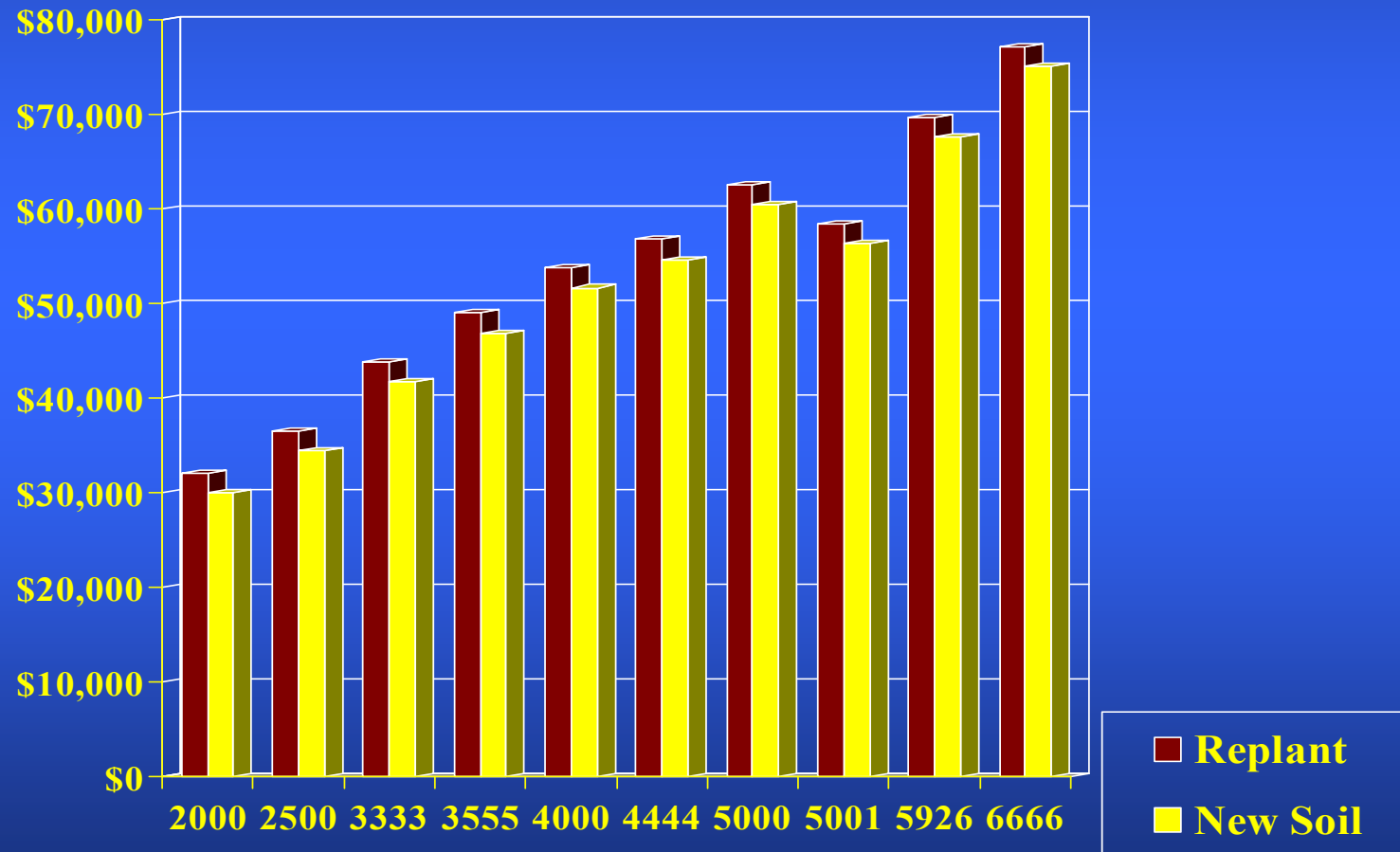
Results so
far

Orchard System's Comparison

- Establishment costs
- Yields
- Rootstocks
- Labour usage
- Labour efficiency
- Economic comparisons

Establishment Costs /ha @ Aus\$7.60/tree

(US\$ 6.85/tree)



Establishment Costs/ Ha

@ \$7.60 / tree (1999)

Density	System	Replant	New soil
2000	Vertical	32,105	29,975
2500	Vertical	36,505	34,375
3333	Vertical	43,835	41,705
3559	Open V	49,009	46,879
4000	Closed V	53,800	51,670
4444	Open V	56,797	54,667
5000	Closed V	62,600	60,470
5000	S/Spindle	58,505	56,375
5917	Open V	69,760	67,630
6666	Closed V	77,261	75,131

Important Considerations

- Establishment costs presented here based purely on tree density
- Other considerations
 - Sun nets
 - Bird nets
 - Hail nets
 - Other protective structures/investments etc
- The costs of these structures clearly have to be considered in any orchard investment
- They also clearly have to influence price – packout – yield (or all) to be economically viable

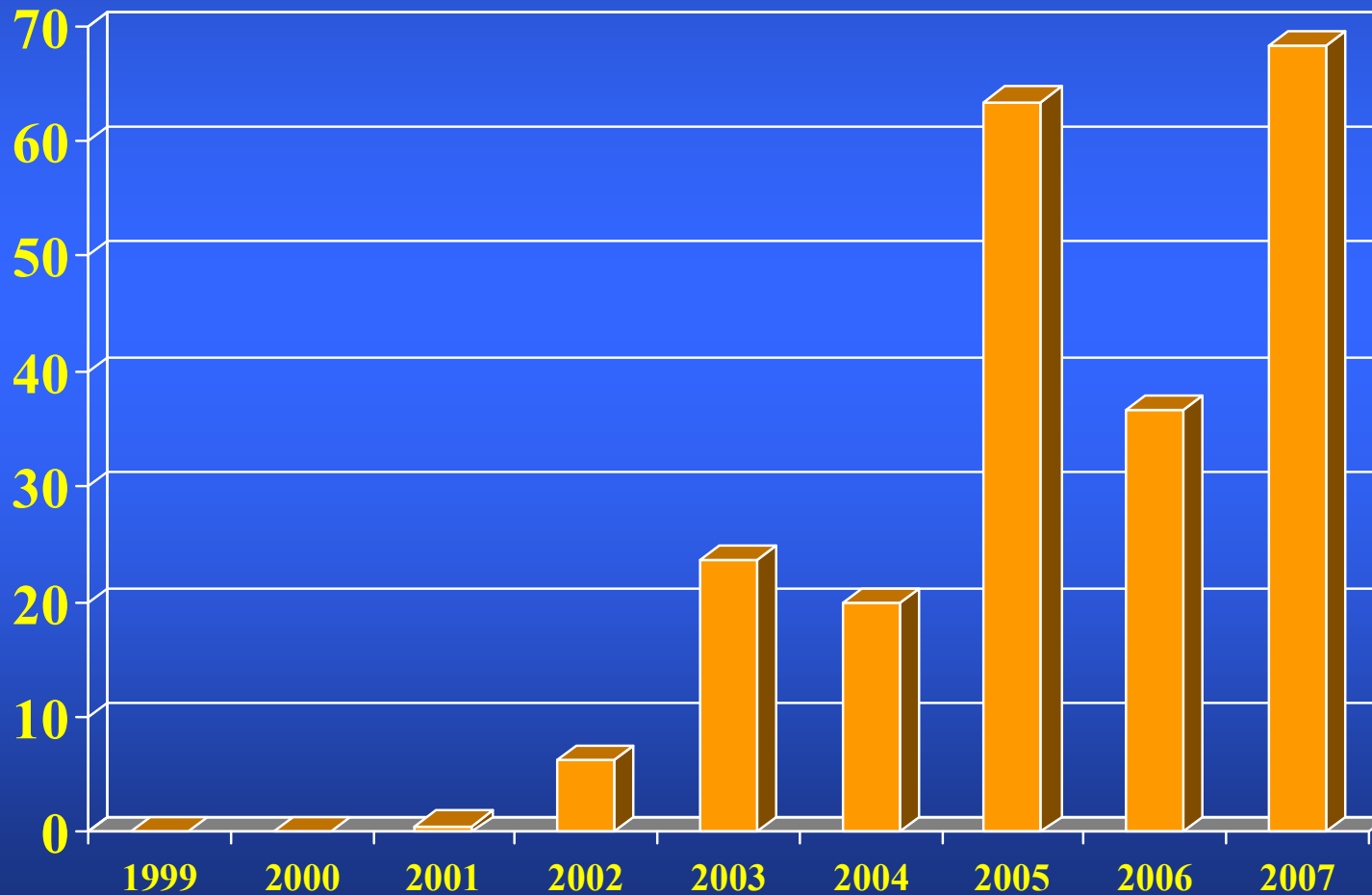
Inter relationship

Income

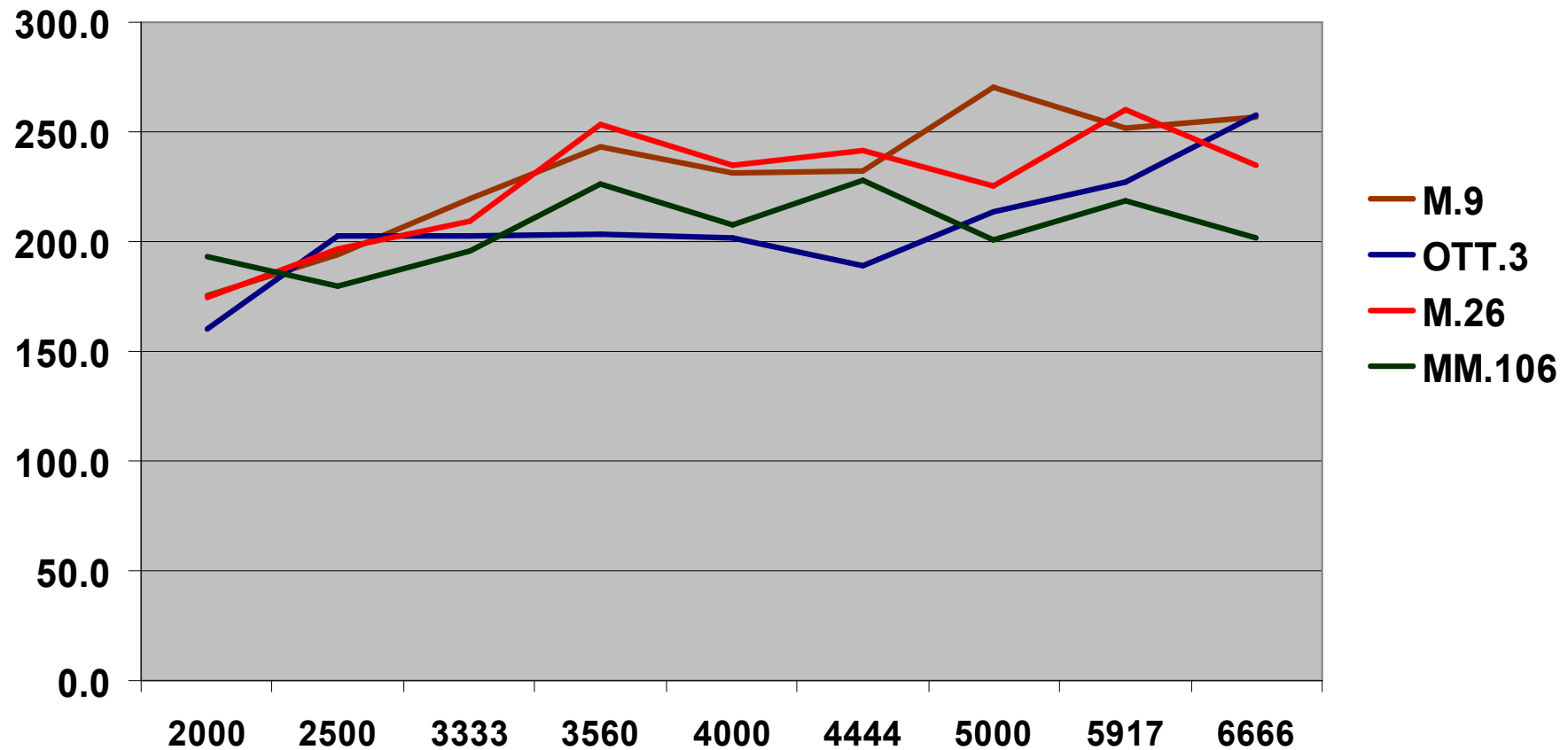


Cripps Pink - Average Yields

Since planting (average all combinations)

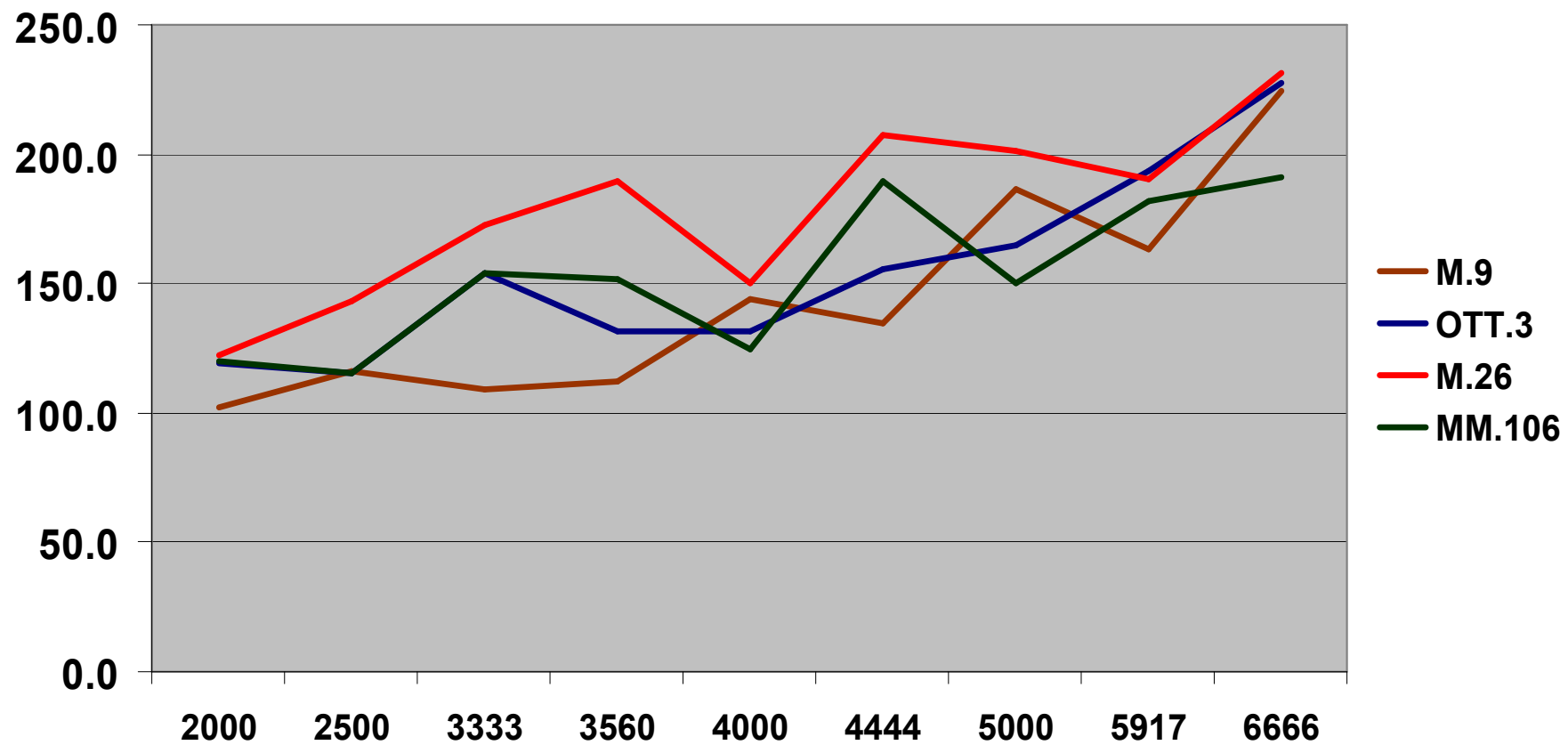


Cripps Pink Cumulative Yields 2000 - 2007
t/ha



Cripps Red - Cumulative Yields 2001 - 2007

t/ha



Rootstock Performance

- Cripps Pink – M9 & M.26 best performers
- Cripps Red – M.26 best performer
- MM.106 performed early but now worst performer
 - Excessive vigour, Labour, Fruit size, Lower yields
 - **Problems are compounded at higher densities**
- Ottawa.3 – not as well performed at lower densities but improves with increasing density
 - **Hand thinning costs**

Labour

Comprehensive analysis of all labour inputs

2 categories of labour costs

- **“Fixed”**

Irrespective of density

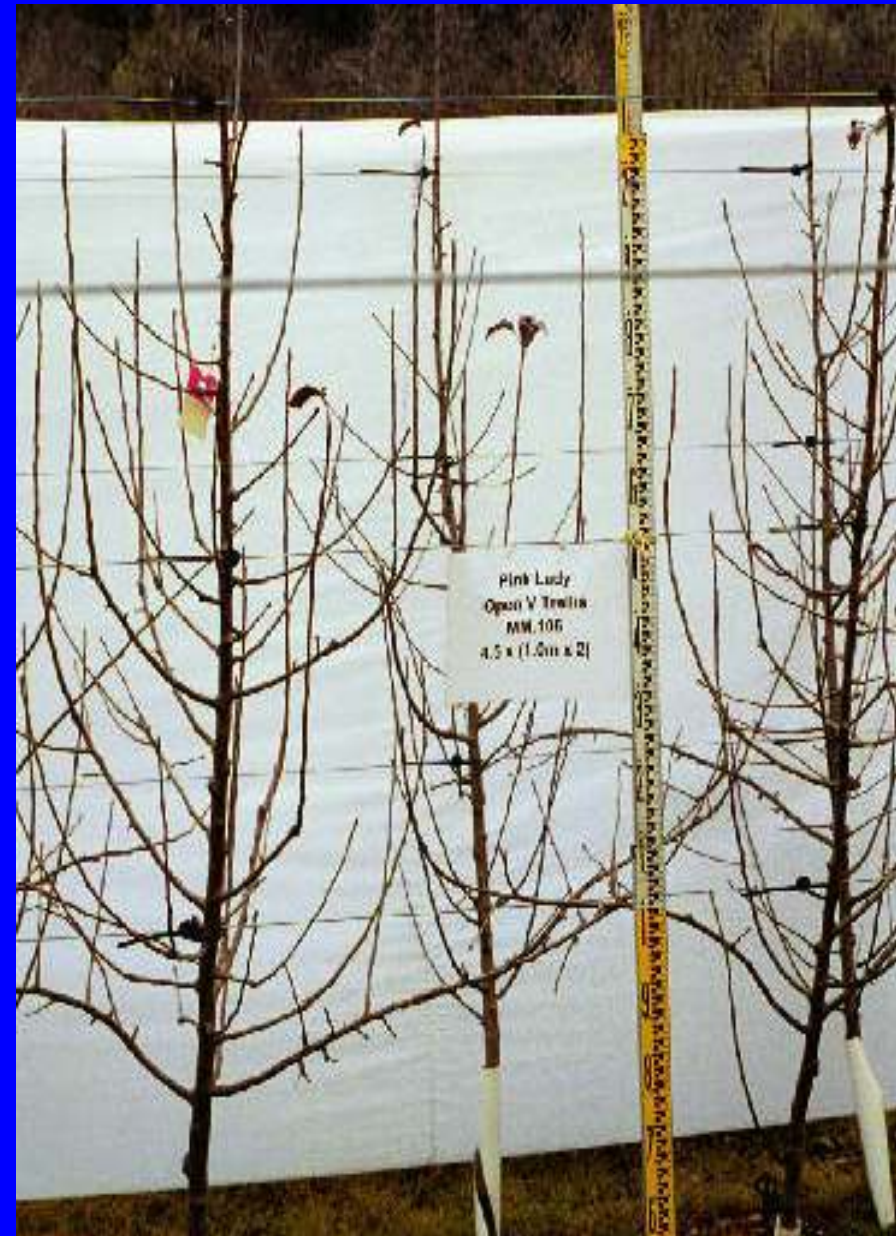
mowing, spraying, weed control etc

- **“Variable”**

Tree training, tree support, leader management, winter pruning, tying down, thinning, summer pruning



M.9 (4 x 0.5m)



MM.106 (4.5 x (1.0 x 2))

Labour

- Similar labour requirements /tonne of fruit between all systems
- but large variations in where the labour is used within the different systems

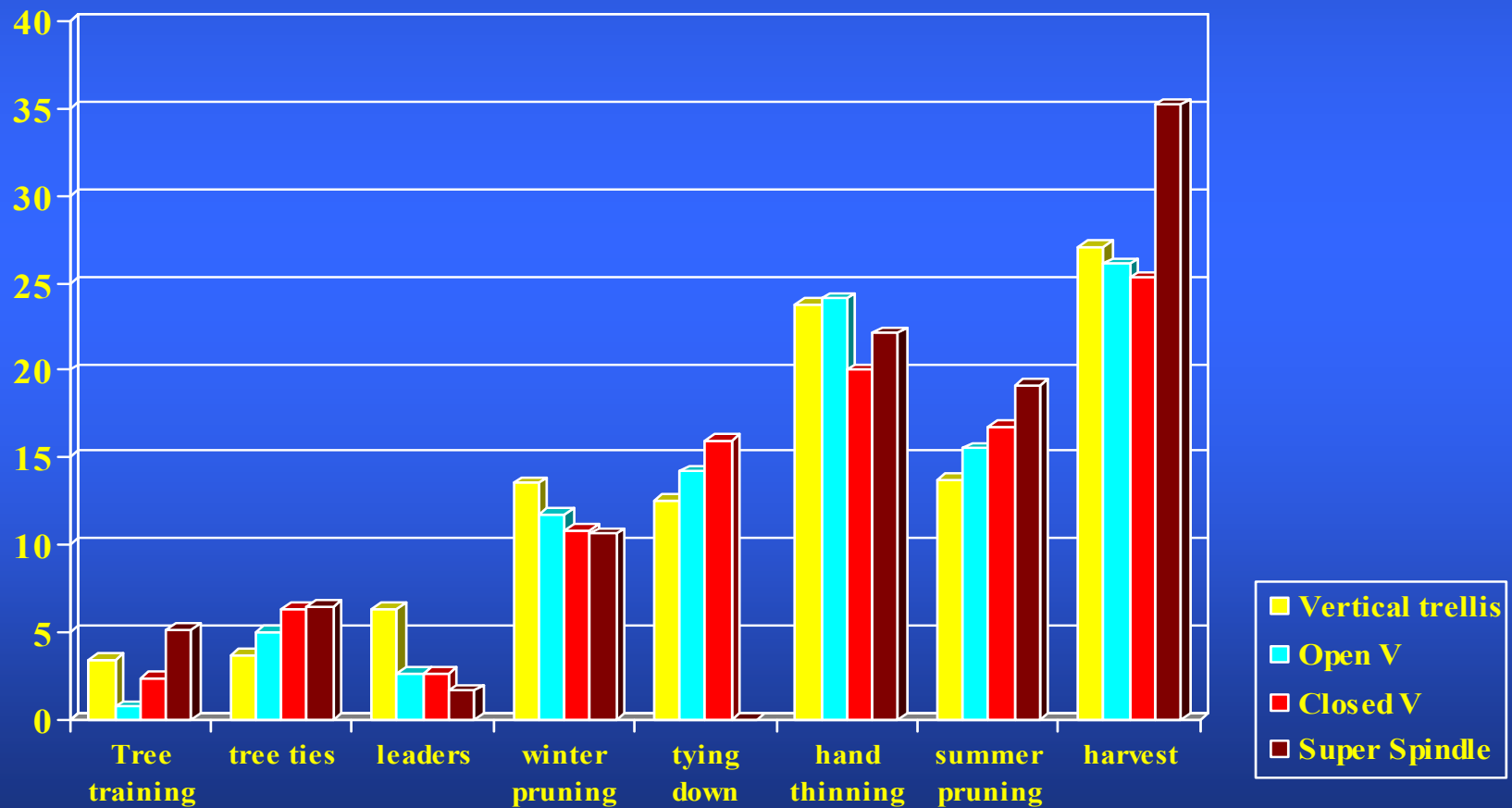
Labour Efficiency

= Man hours / tonne fruit harvested
(over life of orchard)

Improves with increasing density
linked to increased tonnages from higher densities

% of Labour Hours

Cripps Pink x M.26 (2001-2005)



Variable Labour hours / Tonne

Cripps Pink (Pink Lady™)

Establishment – 2005

System	Trees/ha	M.9	Ott.3	M.26	MM.106
VT	2000	8.7	9.5	8.7	9.2
VT	2500	9.2	9.1	8.1	10.2
VT	3333	7.9	9.7	8.5	8.8
OV	3555	9.4	9.6	8.9	11.2
OV	4444	9.0	11.2	8.8	9.9
OV	5926	9.0	8.9	8.6	10.7
CV	4000	7.9	10.4	8.7	10.5
CV	5000	7.5	9.4	9.3	10.8
CV	6666	8.2	9.0	9.2	10.5
SS	5000	7.3		6.5	

Economic Comparison

**What does this all mean for the
Apple Growers hip pocket?**

Economic Evaluation

- 4 different “scenarios” for a 20 ha orchard evaluated
- Net Present Values (NPV) and Internal Rates of return (IRR).
 - 1. Within an existing business
 - 2 “Greenfield's” investment
 - starting from beginning – all capital costs included.
 - 3. @ 10 years
 - early removal (worst case scenario)
 - 4. @ 15 year
 - assumed commercial life for the block.

Economics - Main Assumptions

- Economic unit – 20 ha
- Economic orchard life – 15 years
- Land price – Aus \$45,000 /ha (US\$40,500)
- O/Hs - Aus\$15,000/ha (US\$13,500)
- Interest rate – 8%
- Actual costs & returns used (“nominal”) up to yr 6 – then 3yr average
- 1.5% inflation factor
- Packing & marketing costs – Lenswood Coop, SA
- Wooden bins
- Access to storage space @ Aus \$115/bin (US\$104)

Internal Rate of Return (IRR)

Measure of comparing long term
investments

IRR's

Greenfield
10 yr

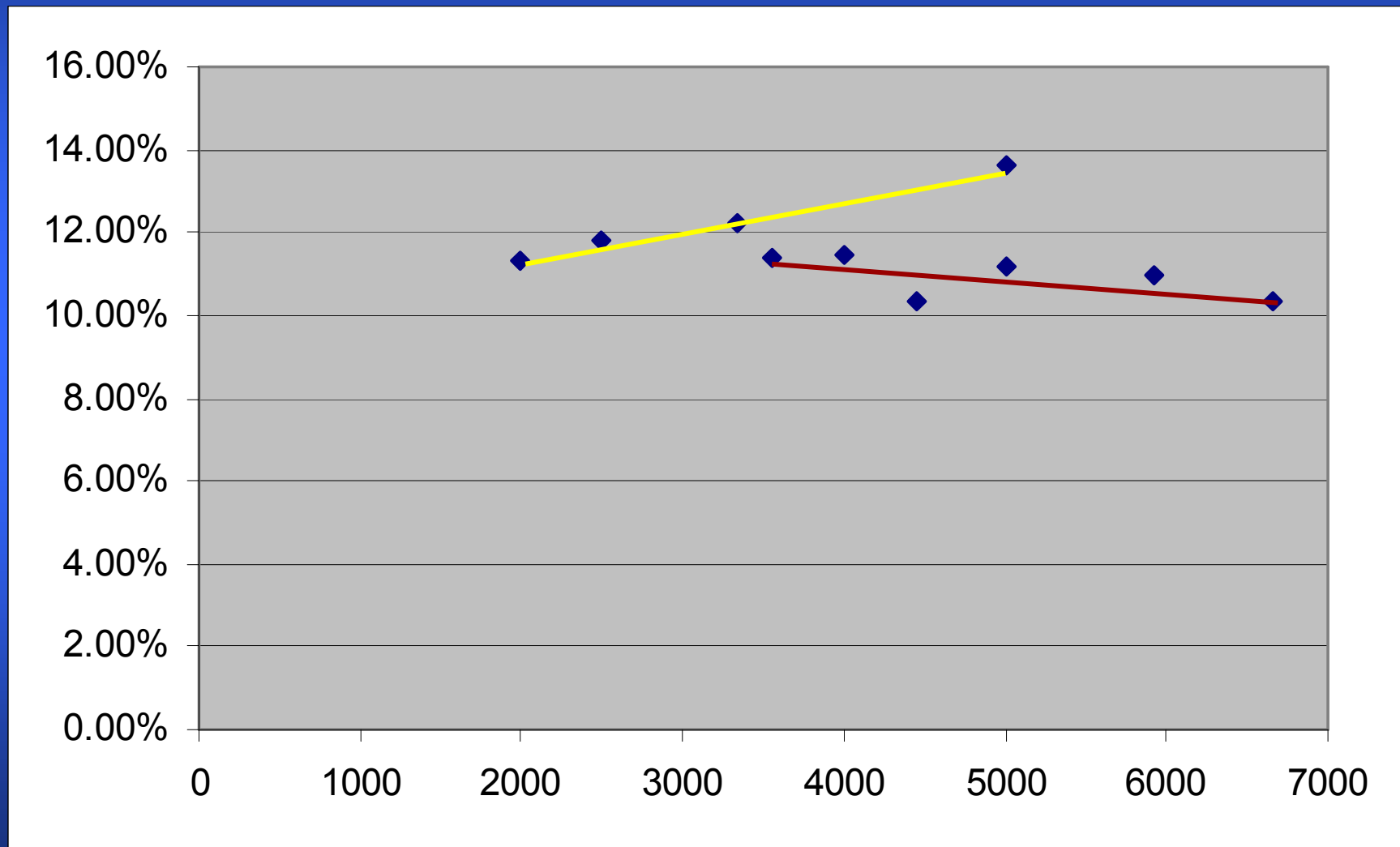
Within Existing Orchard
10 yr

2000	11.3%
2500	11.8%
3333	12.2%
3555	11.4%
4000	11.5%
4444	10.4%
5000	11.2%
5000	13.7%
5926	11.07%
6666	10.3%

2000	26.8%
2500	26.6%
3333	25.7%
3555	23.9%
4000	22.7%
4444	21.0%
5000	21.3%
5000	25.9%
5926	20.7%
6666	18.9%

IRR @ 10 years – Pink Lady™

“Greenfield”



Cripps Red - Sundowner™

- Appreciably lower economic performance than Pink Lady™
- Large variation in performance of individual system combinations
- Best economic performance when planted as part of an existing business – would not consider for “Greenfield” situation.

Overall Profitability Summary

Based on the work we have undertaken using
actual costs, yields and returns

High density orchards can be highly profitable

Project Observations

- **Got to have an orchard “Vision” & ability to achieve it**
- **Currently no major economic advantage or disadvantage using V systems over single row systems – personal preference**
- **Most economic & lowest risk densities are 2000 –3500 trees per hectare**
- **Further refined to 2500 –3500 trees/ha because of tree management/training issues with in row spacings > 1.0m**
- **Tree spacings < or 1m easier to manage**
 - **Compromise decisions**
 - **Light**
- **Careful rootstock selection per site and variety is essential**

Preliminary Observations

- **Similar total labour requirements between systems (early years) – large variations where labour utilised**
- **Economically total orchard production costs /ha not as crucial to profitability as fruit pack-outs and price**
- **Storage/packing and marketing costs have more significant impacts on profitability than orchard production costs**
- **Saving a \$ in the orchard is not necessarily good economics**
- **Spend a \$ to make more \$ - aim for best quality fruit possible**

Project Partners

**South Australian Pome Fruit Improvement
Committee Inc**

PIRSA

SARDI

Rural Solutions SA

Queensland Department of Primary Industries

Horticulture Australia Ltd

Australian Federal Government

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Thankyou

Thankyou

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