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Department of Business, Industry & Resource Development

**TECHNICAL BULLETIN**

**No. 301**

**THE PROFITABILITY OF MANGOES  
IN THE TOP END**

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## EXECUTIVE SUMMARY

This Technical Bulletin replaces Technical Bulletin No. 225 of the same name, which was prepared in 1994.

The objective is to provide potential mango growers in the Top End region of the Northern Territory with updated financial indicators regarding the profitability of the fruit. The revised budget is based on a more realistic yield range of 5.2 to 14.5 tonnes per hectare (or 4.5 to 12.5 trays/tree), rather than 8 to 19.5 tonnes/ha as in the previous Technical Bulletin. This is based on average yield achieved by commercial producers in the Top End region during the past few years who have adopted the best practice approach.

The costs of fertilisers, paclobutrazol, irrigation, pruning and pest and disease control have also been revised and updated according to current recommendation and normal industry practice.

Mango production in Australia and in the NT is projected to increase in the future as more trees mature. Consequently, unless export volume is increased substantially, domestic mango prices will be under further pressure in the future.

Based on road transport and excluding the cost of the principal residence, the internal rates of returns (IRR) in real terms of three orchard sizes at various marketable yields and wholesale prices are summarised below:

Major assumptions:	Darwin region				Katherine
	600 trees - contract pick and pack <sup>(*)</sup>	600 trees ñ pick and pack own fruit <sup>(*)</sup>	3,000 trees	5,000 trees	5,000 trees
<b>IRR (%): - assuming 9.3t/ha or 8trays/tree</b>					
IRR (%) at 9.3t/ha & \$16/tray	negative	negative	0.8%	2.7%	4.1%
<b>IRR (%) at 9.3t/ha &amp; \$18/tray</b>	<b>negative</b>	<b>-1.0%</b>	<b>5.3%</b>	<b>7.3%</b>	<b>8.7%</b>
IRR (%) at 9.3t/ha & \$20/tray	0.1%	1.2%	8.8%	10.9%	<b>12.2%</b>
IRR (%) at 9.3t/ha & \$22/tray	2.7%	3.2%	11.5%	13.9%	15.1%
<b>IRR (%): - assuming 14.5t/ha or 12.5 trays/tree</b>					
IRR (%) at 14.5t/ha & \$16/tray	negative	2.4%	8.7%	10.9%	12.2%
<b>IRR (%) at 14.5t/ha &amp; \$18/tray</b>	<b>2.1%</b>	<b>5.0%</b>	<b>12.8%</b>	<b>15.2%</b>	16.3%
IRR (%) at 14.5t/ha & \$20/tray	5.5%	7.3%	16.2%	18.7%	<b>19.6%</b>
IRR (%) at 14.5t/ha & \$22/tray	8.2%	9.3%	19.1%	21.7%	22.5%

<sup>(\*)</sup> For 600 tree blocks, picking and packing is assumed by contractors or casual labour. However, grower's own labour and management is not costed. The dark areas show the combinations of yields and prices which give an internal rate of return greater than the long term government bond rate of 5.6% per annum.

Returns from Katherine mango orchards are higher than those from the Darwin region because production costs in Katherine are lower and average prices are higher due to a better quality fruit and a lower proportion of second grade fruit.

The small orchard model with around 600 trees shows marginal profitability while larger orchards show more acceptable returns mainly due to their better economy of scale, especially if higher yields are achieved. The shaded area shows combinations of yields and prices and sizes of orchards which give better rates of returns.

In general, the profitability of a mango orchard can be improved if:

- A yield of around 14-15 tonnes per ha (mature trees) can be achieved.
- A wholesale southern price of \$18/tray or higher can be achieved (for high quality, earliness in the season).
- Orchards are large enough to obtain better returns through economies of scale resulting in lower production costs.
- Production costs can be reduced especially costs related to the picking, packing, transport and marketing.

- Returns could be improved by having mango orchards both in the Katherine region and the Darwin area, instead of just in the Darwin region. This will enable producers to take advantage of **high prices from early Darwin mangoes** and **better returns from Katherine mangoes** because of lower production costs and better weighted average prices **in the latter part of the mango season**.
- Larger volumes of mangoes could be channelled to alternative markets (especially overseas) to lessen the pressure on future prices.

## **1. INTRODUCTION**

The aim of this Technical Bulletin is to provide potential mango growers in the Top End region of the Northern Territory with general information on the prospects and potential profitability of the crop. The analysis is based mainly on whole-farm development models for a number of Kensington Pride mango orchards, which range from 600 trees (as second family income enterprises) to 3,000 to 5,000 trees (as dedicated commercial orchards). The spacing is assumed at 166 trees/ha (10 m x 6 m). The small family orchards can either use contract picking and packing or can pick and pack their own fruit using casual labour. The commercial orchards are assumed to use permanent as well as casual labour for picking and packing.

Mango trees usually take up to four to five years to bear a commercial crop. Investment in mango production is therefore a long-term proposition. Returns depend not only on yields and prices but also on how cost-effective growers are in managing their orchards. Since the harvest season can be as short as four to five weeks, labour for picking and packing can be a problem in the future when mango production in the NT peaks within the next five to ten years. This should be taken into account when planning a major new mango project.

Potential growers should carry out their own costings based on these general guidelines and should take into consideration their individual circumstances. Factors such as capital costs, soil types, irrigation requirements and marketing arrangements will probably differ from one grower to another, resulting in different cashflow and investment returns. If you require any assistance in preparing detailed costings and budgets, contact a private agricultural consultant or a DBIRD horticulture extension officer in your district.

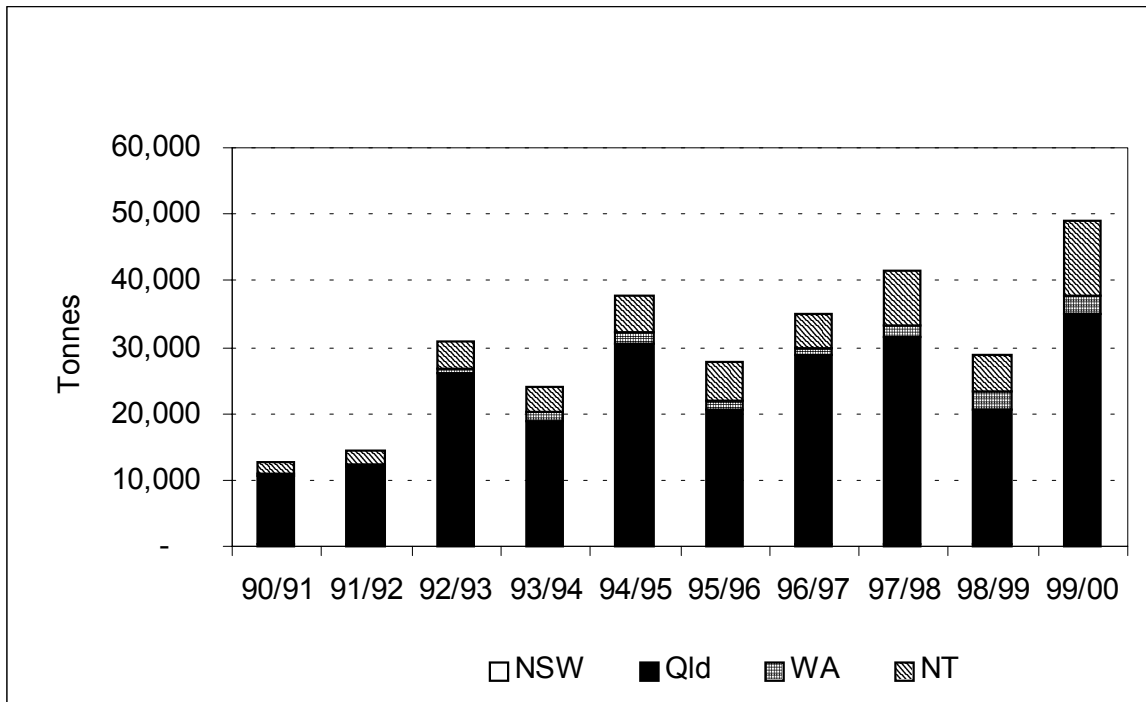
All prices and costs are in 2002 terms at the time of preparation of this report. Prices change over time and therefore should be assessed and re-valued by individual growers.

Note: The use of any chemical names in the budgets is for costing purposes only. It does not imply endorsement by DBIRD.

## **2. OVERVIEW OF THE AUSTRALIAN MANGO INDUSTRY**

Mango production in Australia has grown quickly over the last 10 years. According to the statistics of Horticulture Australia, in 1990/91 around 12,000 tonnes of mangoes were produced in Australia. By 1999/00, production has jumped to over 50,000 tonnes, an increase of more than four times. It has been estimated that within the next four to five years, a production level of 60,000 to 80,000 tonnes (or even higher) could be realised as planted trees become mature.





**Figure 1.** Australian mango production (t)

The estimated number of mango trees planted in different States is shown in Table 1.

**Table 1.** Estimated number of mango trees planted

	1993	2000
Northern Territory	134,000	750,000 (est) <sup>1</sup>
Queensland	709,000	1,295,000 (est) <sup>2</sup>
Western Australia	38,000	57,000 <sup>3</sup>
NSW (Northern)	36,000	23,000 <sup>3</sup>
Total	917,000	2,125,000

Sources: 1 = NT DBIRD Estimate (2001), 2 = Qld. DPI AgriLink, Mango Information Kit, 1999  
3 = ABS Catalogue 7113.0

Currently, new plantings are continuing in the NT, northern Queensland and WA (Carnarvon, the Kimberley); albeit at a slower pace than in the last few years, especially in the NT.

Around 90% of the commercially grown mangoes in Australia are Kensington Pride. The rest consist of other varieties such as Irwin, Nam Dok Mai, R2E2, Glenn, Tommy Atkins and Palmer.

### 3. OVERVIEW OF THE NORTHERN TERRITORY MANGO INDUSTRY

Current annual mango production in the NT is around 1.5 million trays or 10,500 tonnes, valued at around \$35 million (Figure 2). According to a DBIRD survey in 1992, the total number of trees planted in the NT at that time was around 150,000. By 2001, the number had increased to about 750,000. About half of these trees are under six years old. Mango production is therefore expected to increase significantly within the next five to eight years. Although they are currently enjoying premium prices because they are the earliest on the market, NT mangoes could face lower prices in the future. This is discussed further in Section 5.

Early fruit maturity (early October) is a crucial requirement for the Darwin region, not only to avoid competition from northern Queensland but also to escape the onset of the Wet during November which can seriously affect fruit quality. Early flowering in May-June ensures early fruit maturity around early

October whereas delayed flowering (e.g. in August) can delay fruit maturity up to late November. *Good quality fruit in late September/early October always ensures high prices.* For example, during 2000 and 2001, average mango prices for the first two weeks of October were from \$5 to \$18 per tray higher than those in the last two weeks of the month. Therefore, growers should pay attention to the manipulation of tree growth, flowering and fruit maturity to take advantage of these hikes in prices. For further information on these agronomic aspects, contact a DBIRD horticulture extension officer in your region.

In the warm tropical conditions of the Top End, excessive vegetative growth is a serious problem and is accentuated in the Kensington Pride variety, which has a tendency towards erratic flowering and hence erratic yields from one year to another. DBIRD, in conjunction with CSIRO and Queensland DPI and WA Agriculture, are collaborating in research efforts to breed better mango varieties for both the domestic and overseas markets.

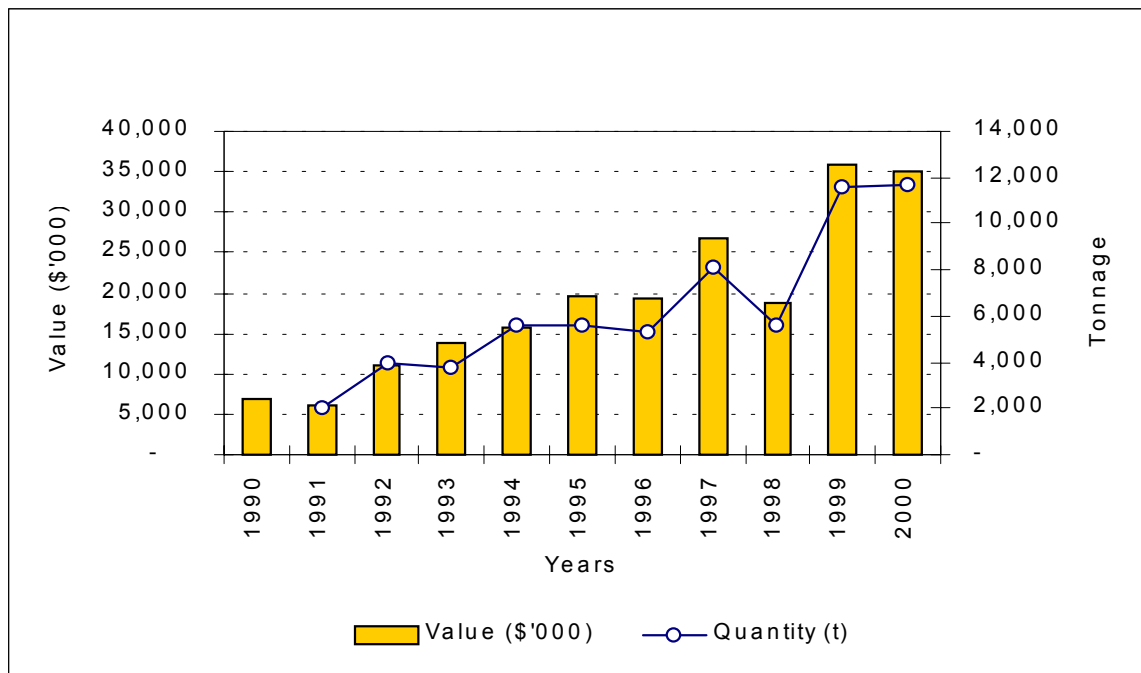


Figure 2. NT mango production and value, 1991 to 2000

#### 4. METHOD OF ANALYSIS

The criteria used to assess profitability in this report include:

- **Internal Rate of Return (IRR)** which is defined as the maximum interest rate the project can afford to pay and break-even. This real rate of return can then be converted to a nominal term by adjusting for the long term inflation rate in Australia, currently assumed at 3.5% per year. The nominal IRR can then be compared with returns from current long-term investment opportunities offered elsewhere to see if the project is financially attractive or not, taking into account risks associated with the project. One such long-term investment option, with which the nominal rate of return can be compared, is the 10-year Government bond, which is currently paying around 6% and is virtually risk-free.
- **Net Farm Income (NFI)** is defined as the income after allowance for depreciation but before interest costs on any borrowed money and income tax. This gives an indication of the possible level of taxable income per year which the project can generate for the potential grower after the orchard is fully mature.
- **Break-even Prices** are minimum long-term prices which will enable the income to just equal the production costs i.e. fixed and variable costs.

- **Peak Debt** is the greatest amount of money that will be owed by the project during its establishment phase.

## 5. INFORMATION AND ASSUMPTIONS USED IN THE ANALYSIS

### 5.1 Orchard Size and Spacing

In the past, the average NT mango orchard had under 1,000 trees. However, in recent years, the size of commercial orchards has increased to between 1,000 and 5,000 trees.

In this study, three orchard sizes (up to 600 trees - 3.6 ha), (3,000 trees -18 ha) and (5,000 trees -30 ha) are examined to compare the profitability and economy of scale between them. Planting density in the Top End varies widely from around 100 to 200 trees/ha. In this study, the spacing is assumed at 166 trees/ha or 10 m x 6 m. Heavy pruning in conjunction with the application of paclobutrazol is required to control vegetative growth and vigour to maintain manageable sized trees to facilitate picking and to induce greater early flowering

### 5.2 Establishment Costs

They include costs such as surveying, land clearing, planting materials, fertiliser application before planting, cost of planting and the replacement of lost trees. Planting is assumed to be carried out by casual labour at the rate of 25 trees per hour. The casual wage rate is assumed at \$12 per hour (plus on-costs). Details of the establishment costs are given in Appendix 1.

### 5.3 Capital Costs

Capital costs include all capital inputs necessary for the planting, maintenance and harvesting of the orchard, such as:

- Land;
- fencing;
- bore and irrigation system;
- tractor(s) and associated implements;
- vehicles;
- forced air cool room and cold storage room;
- packing shed;
- storage/workshop.

A summary of main capital items and total capital costs for each of the three types of orchards examined is presented in Table 2.

**Table 2.** Main capital costs used in the budgets (\$f000)

	<b>600 trees ñ contract pick and pack</b>	<b>600 trees ñ pick and pack own fruit</b>	<b>3,000 trees ñ pick and pack own fruit</b>	<b>5,000 trees ñ pick and pack own fruit</b>
Land	65.00	65.00	100.00	150.00
Irrigation system (including bore)	32.90	32.90	112.37	200.63
Packing sheds/workshop	15.00	40.00	100.00	130.00
Washing, grading equipment	-	35.00	37.00	43.00
Forced air cool room, cold storage facilities	-	30.00	60.00	60.00
Machinery and equipment	76.00	87.06	125.55	125.55
Other capital costs	20.00	28.94	62.52	97.37
<b>Total capital costs (first 3 years)</b>	<b>218.90</b>	<b>318.90</b>	<b>597.44</b>	<b>806.55</b>
<b>Average capital cost / ha</b>	<b>60.64</b>	<b>88.34</b>	<b>33.00</b>	<b>26.80</b>

More details are given in Appendix 6 for a 3,000 tree orchard model.

## 5.4 Field Maintenance Costs

Annual field maintenance costs for a mature orchard are summarised in Table 3. Field maintenance costs in Katherine are found to be lower than in the Darwin region because of lower humidity, requiring a fewer number of sprays to control insects/diseases. Also, pruning cost is estimated to be lower in Katherine because of a lesser vegetative growth in trees than in Darwin.

**Table 3.** Average annual field maintenance costs (from year 10 onwards)

Item	\$/ha ñ Darwin (for 5,000 tree orchard)	\$/ha ñ Katherine (for 5,000 tree orchard)
Weed control	65	65
Pest/disease control	422	353
Fertilisers	991	1,006
Irrigation (running costs)	300	300
Flowering management	805	805
Canopy management	435	315
Other costs	192	184
<b>Total per hectare</b>	<b>3,211</b>	<b>3,028</b>
Total per tree	19.34	18.24

The cost of fertilisers, pest/disease control, irrigation, flowering and canopy management accounts for over 90% of the total annual field maintenance costs. For details, refer to Appendix 3.

## 5.5 Picking and Packing Costs

Picking and packing are undoubtedly the major cost items for a mango orchard. Based on local experience, a picking and packing rate of five trays per hour, at \$12 per hour (plus 15% overhead cost), is used in the analysis. For contract picking and packing, the current rate is \$7.50/tray. The total picking and packing costs have been found to account for approximately 40% of the total variable production costs.

## 5.6 Transport and Marketing Costs

The shortage in, and high cost of, air-freight has made it necessary for most mangoes from the NT to be transported by road in refrigerated trucks. Road freight rates may increase as demand for loading to southern markets increases. In this analysis, a road freight cost of \$300 per pallet (128 trays) is used. Transport cost represents about 20% of the total variable costs. Any further increase in transport cost would have a big impact on profitability. Commission for agents is the main marketing cost. It is usually around 12% to 13% of the sale value.

## 5.7 Fixed Costs

Fixed costs include costs such as permanent labour/on-site manager, telecommunications, general repairs and maintenance, office expenses, book-keeping/accounting, insurance and registration fees. For the calculation of net farm income, annual depreciation costs of all capital items are taken into account.

## 5.8 Yields

Table 4 provides revised yield estimates for Kensington Pride mangoes in the Top End of the Northern Territory, based on a 10 m x 6 m spacing.

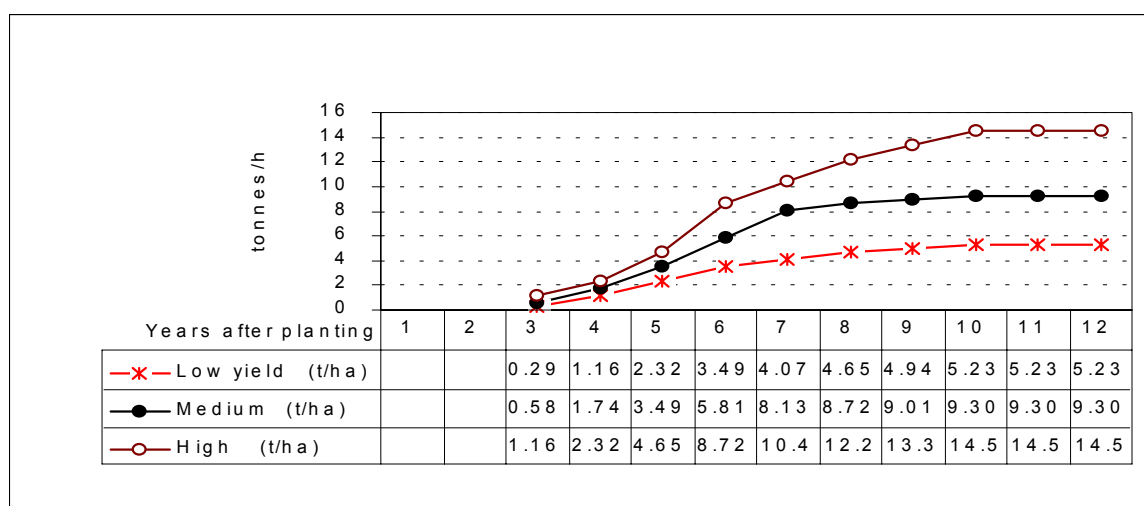
**Table 4.** Yield estimate of Kensington Pride mangoes, 166 trees/ha spacing

Year (after planting)	Low		Medium		High	
	trays/tree	t/ha	trays/tree	t/ha	trays/tree	t/ha
3	0.25	0.29	0.50	0.58	1.00	1.16
4	1.00	1.16	1.50	1.74	2.00	2.32
5	2.00	2.32	3.00	3.49	4.00	4.65
6	3.00	3.49	5.00	5.81	7.50	8.72
7	3.50	4.07	7.00	8.13	9.00	10.46
8	4.00	4.65	7.50	8.72	10.50	12.20
9	4.25	5.23	7.75	9.01	11.50	13.36
10 onwards	4.50	5.23	8.00	9.30	12.50	14.53

The medium yield is expected yield from good commercial practices or the industry's average (best practice) yield.

Due to Kensington Pride's erratic crop bearing pattern, yield in any one year could exceed or fall short of the above estimated levels. However, on average, the above marketable yields are considered achievable, based on current industry experience and knowledge.

Figure 3 gives an illustration of the three yield levels expected for mangoes in the NT Top End.



**Figure 3.** Profile of assumed Kensington Pride mango yield (t/ha) ñ 166 trees/ha 10 m x 6 m spacing

Estimated yields achieved in the NT are presented in Table 5.

**Table 5.** NT historical mango production and yield estimate

Year	NT Total production (trays)	Mature trees (6 year +)	Average yield (trays/tree)
1997	1,165,000	148,820	7.8
1998	808,000	165,000	4.9
1999	1,640,000	200,000	8.2
2000	1,760,000	260,000	6.8
2001	1,400,000	387,840	3.6
<b>5 yr industry average</b>			<b>6.3</b>

Notes: Tree numbers are from the 1997 and 2001 surveys. The numbers in italics are estimates. Source: Greg Owens, DBIRD

It should be noted that probably a significant proportion of (mature) trees may in fact still be maturing (e.g. in year 6, 7 or 8); hence future yield could improve.

## 6. MANGO PRICES AND MARKET PROSPECTS

### 6.1 Australian Mango Availability and Seasonal Factor

Australian mangoes are available on the domestic market from late September/early October till February/March. Top End mangoes are among the earliest on the market. This is illustrated in Table 6.

**Table 6.** Supply patterns of Australian mangoes

	October	November	December	January	February	March
Darwin	*****					
Katherine	*****					
Alice Springs				*****		
Kununurra (WA)	*****					
Broome (WA)		*****				
Carnavon (WA)			*****			
Gingin (WA)					*****	
Townsville		*****				
Burdekin		*****				
Bowen		*****				
Tablelands			*****			
Central Queensland				*****		
Burnett/North Moreton				*****		
Northern NSW					*****	

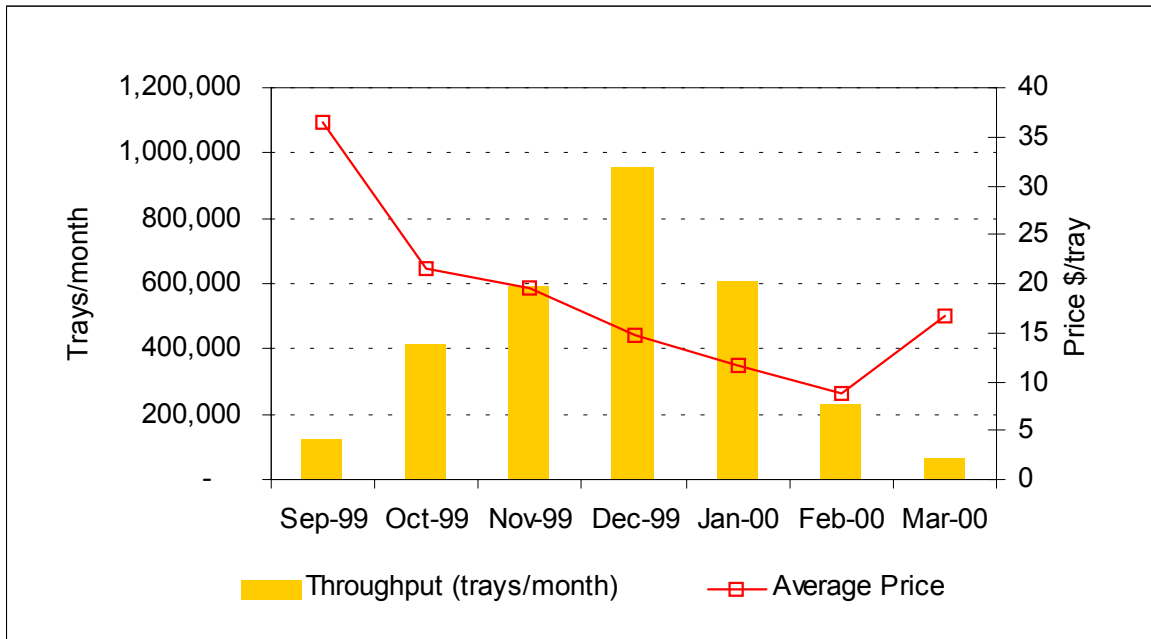
Source: Mango Manual (10/1987) by COD Queensland Mango Sub-Committee, DBIRD

Mango prices at the onset of the season and the end of the season are usually high as illustrated in Figure 4, using Sydney market price and throughput in 1999 as an example. At the end of the season, there is usually an upward swing. However, prices for late season mangoes are not expected to reach those of early season mangoes for the following reasons:

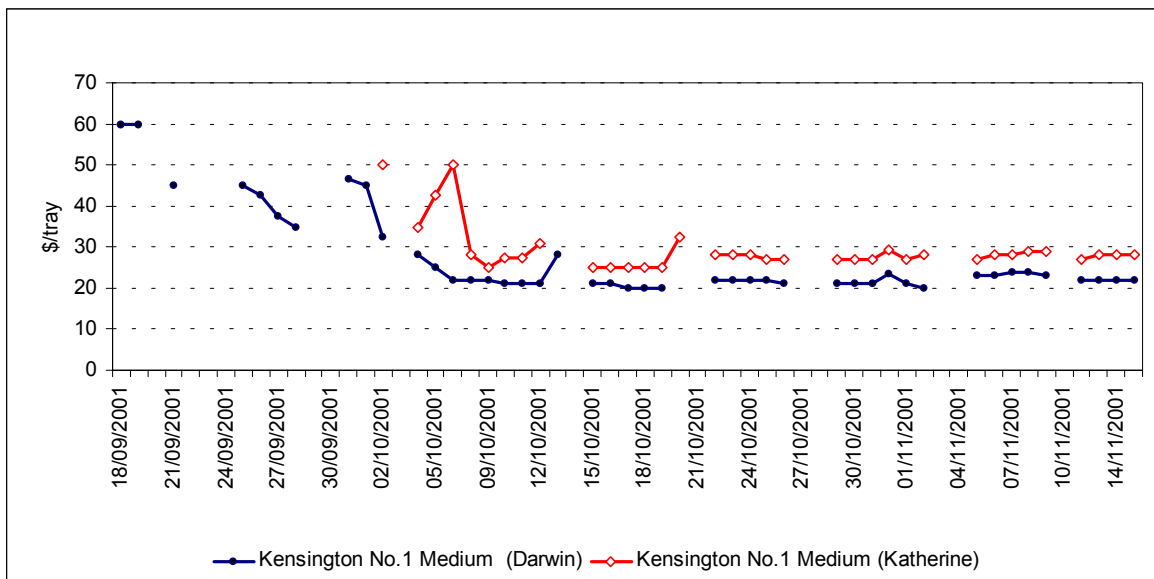
- (a) There is an abundant supply of other fruits at that time of the year.
- (b) Demand for late mangoes is expected to be low, after the Christmas and New Year period, because consumers have had mangoes during the previous three months as the bulk of the crop passed through the market, wearing off their "novelty/exotic nature".

Mangoes from the Katherine region generally command better prices as illustrated in Figure 5. This could be partly due to their better appearance and lower proportion of second grade fruit because of the lower humidity in the region, which reduces damage by pests.

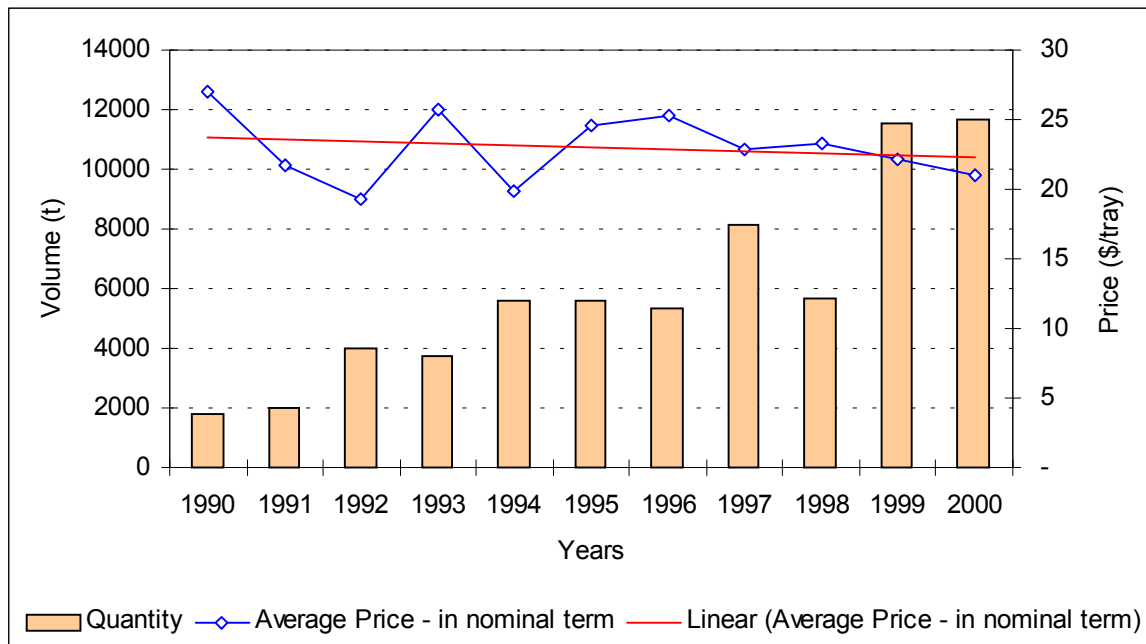
For the last 10 years from 1990 to 2000, average prices of NT mangoes at Sydney market which is the largest market for mangoes in Australia, have declined gradually as production increases (see Figure 6).



**Figure 4.** Sydney market: average monthly mango price and throughput, 1999 season



**Figure 5.** Average price (\$/tray) of Darwin and Katherine KP mangoes, September to mid-November 2001



**Figure 6.** NT mango production and average prices, 1990 - 2000

## 6.2 Prices of Mangoes and the Importance of Fruit Quality

The price differential between 1st and 2nd grade mangoes in the domestic market is substantial. Growers should therefore aim to produce best quality mangoes to achieve better returns. For example, average mango prices at Sydney market for the period from 1992 to 1997 were as follows:

1st grade	\$30.05/tray
2nd grade	\$16.30/tray

Source: Hortilink

Keeping the above price data in mind, if a grower produces 70% 2nd grade and 30% 1st grade, then the weighted average price received would be around \$20/tray. On the other hand, if a grower produces 70% 1st grade and only 30% 2nd grade, his/her weighted average price would be approximately \$26/tray, a \$6/tray improvement. The overall average price for 2nd grade mangoes for the last five years has been 54% of that for 1st grade mangoes. This shows the importance of producing good quality mangoes as well as having a quality control system in place to assure the product arriving at the markets is in top condition. Current QA systems include SQF 2000, ISO9000, HACCP, Freshcare and Approved Supplier Programs. Contact the Northern Territory Horticultural Association or the NT Mango Industry Association for further details on these programs.

## 6.3 Long Term Prices of Mangoes and the Vital Role of Mango Exports

Mango production in the NT is projected to increase substantially in the future as more young trees become mature. Consequently, unless significant amounts are exported to overseas markets (at least 60% of production), mango prices on domestic markets are expected to fall. This trend has been already evident in the past few years as shown in Figure 6.

The decline in prices will correlate with the volume of fruit available on the markets, especially when the season is shortened to less than four to five weeks as opposed to the normal six to seven weeks.

The key factor is therefore the ability of the industry to work together across Australia (north Queensland, the NT and WA) to export more mangoes to overseas markets to maintain a reasonable level of supply and demand to achieve a reasonable price for growers.

Currently, New South Wales is the largest market for NT mangoes, with over 60% of the total market share. However, it should be noted that some of the NT mangoes destined for Sydney may have been re-



directed to other markets such as Newcastle, Wollongong and Canberra and also to overseas markets. Unfortunately, data for such exports is not available. Victoria is the second largest market, taking in about 22% of the total crop. Queensland consumes an estimated 10% of the total crop. Other States such as SA, WA, Tasmania and overseas markets such as Hong Kong, Singapore, the Middle East and Europe account for the balance.

Exports of fresh mangoes from Australia vary from 2,000 to 3,000 tonnes or about 10% of the total volume, worth around \$9 million to \$10 million per year during the last three years (Table 7).

**Table 7.** Export of fresh mangoes from Australia, 1999-2000

Country	Tonnes	Value (\$'000)	\$A/kg (FOB)
Hong Kong	1,067	2,550	2.39
Singapore	1,107	2,628	2.37
Malaysia	136	290	2.13
Japan	489	3,674	7.51
United Arab Emirates	118	412	3.49
Saudi Arabia	110	390	3.55
France	85	401	4.72
Other Countries	114	391	3.43
<b>Total</b>	<b>3,226</b>	<b>10,736</b>	<b>3.33</b>

Source: The Australian Horticultural Statistics, Handbook 2000-01

## 6.4 Prices Used in the Study

The weighted average price for NT mangoes (including transport costs and agents' commission) over the last few years has been around \$20 per tray. However, as stated earlier, unless exports are increased substantially, domestic prices could fall in the face of over-supply in the future. For economic evaluation purposes in this report, the following long-term prices (in 2002 terms) are used:

Wholesale price	Low	Medium	High
\$/tray (7kgs/tray)	14.00	18.00	22.00
\$/kg	2.00	2.57	3.14

## 7. RESULTS OF ANALYSIS

### 7.1 Total Capital Investment Required

Total capital investment required (i.e. total cash deficits during the initial years of the project) to plant and operate the orchards is summarised in Table 8.

**Table 8.** Investment capital required Unit: \$1

	600 trees orchard - contract pick and pack	600 trees orchard ñ pick own fruit	3,000 trees orchard	5,000 trees orchard
a. Capital costs	218,900	318,897	597,440	806,552
b. Other costs (operating cost shortfalls during the first 4/5 years)	61,490	48,813	177,889	280,359
<b>Total investment cost (a+b)</b>	<b>\$280,390</b>	<b>367,710</b>	<b>775,329</b>	<b>1,086,911</b>
Investment required per ha	78,500	101,733	42,902	36,085

### 7.2 Variable Costs and Gross Margin (for mature trees 10 years onwards)

Gross margin (GM) is a useful financial indicator to show the relative profitability between orchards of similar size and age. Table 9 gives a summary of variable costs and GM of three types of orchards at 9.3t/ha and a wholesale price of \$18/tray.

**Table 9.** Gross margin ñ mature trees (year 10 onwards) @ 9.3t/ha and \$18/tray Unit: \$1

	Darwin Region				Katherine
	600 tree orchard ñ contract pick and pack <sup>(*)</sup>	600 tree orchard ñ picking own fruit <sup>(*)</sup>	3,000 tree orchard	5,000 tree orchard	5,000 tree orchard
Total variable costs/year (whole orchard)	69,243	57,625	290,247	482,561	476,678
Variable cost:					
- \$ per ha	19,157	15,943	16,060	16,021	15,826
- \$ per tray	14.43	12.01	12.09	12.06	11.92
GM \$/ha	4,747	7,961	7,844	7,883	8,078
GM \$/tray	3.57	5.99	5.91	5.94	6.08

(\*) excluding grower's labour and management

### 7.3 Break-even Prices at Various Yield Levels

Break-even prices are minimum prices which will enable annual income to just equal the total production costs (i.e. variable costs *plus* fixed costs including depreciation). These are summarised in Table 10.

**Table 10.** Break-even prices of mangoes at expected medium yield of 9.3 t/ha

	Medium yield (9.3t/ha)
➤ 600 tree orchard - contract pick and pack	\$18.42/tray
➤ 600 tree orchard - pick, pack own fruit	\$15.69/tray
➤ 3,000 tree orchard	\$13.70/tray
➤ 5,000 tree orchard	\$13.60/tray

Break-even prices therefore, appear to be in the range of \$13.60 to \$15.70/tray, except in the case of contract picking and packing.

### 7.4 Internal Rates of Return and Net Farm Income at Various Scenarios

Internal rate of return, net farm income and pay-back period are useful financial indicators to measure the overall financial attractiveness of a project. Table 11 gives a summary of these financial indicators at various yield scenarios.

**Table 11.** Sensitivity analysis - main financial indicators for various sizes and yields of mango orchards at a price of \$18/tray (Darwin region)

	<u>Low yield</u> 5.23t/ha	<u>Medium yield</u> ** 9.3t/ha	<u>High yield</u> 14.5t/ha
<b>a) 600 tree orchard ñ contract pick and pack</b>			
IRR (%)	Negative	<b>Negative</b>	2.1%
Pay ñback period* (years)	Unable to repay	<b>Unable to repay</b>	>20 years
NFI (\$/yr from year 10 onwards)	-14,608	<b>-2,015</b>	14,174
<b>b) 600 tree orchard ñ pick and pack own fruit</b>			
IRR (%)	Negative	<b>-1.0%</b>	5.0%
Pay ñback period* (years)	Unable to repay	<b>&gt;20 years</b>	18 yrs
NFI (\$/yr from year 10 onwards)	-16,230	<b>5,949</b>	34,464
<b>c) 3000 tree orchard ñ pick and pack own fruit</b>			
IRR (%)	Negative	<b>5.3%</b>	12.8%
Pay ñback period* (years)	Unable to repay	<b>16 yrs</b>	11 yrs
NFI (\$/yr from year 10 onwards)	-6,260	<b>84,683</b>	201,610
<b>d) 5000 tree orchard ñ pick and pack own fruit</b>			
IRR (%)	Negative	<b>7.3%</b>	15.2%
Pay ñback period* (years)	Unable to repay	<b>14 yrs</b>	9 yrs
NFI (\$/yr from year 10 onwards)	-681	<b>150,891</b>	345,769

\*\* assuming no external borrowing

expected yield from good commercial practices or industryís average ñbest practiceñ yield

From Table 11 it appears that at a price of \$18 per tray, financial returns of mango projects are more acceptable if a yield of around 14t to 15t/ha can be achieved. Also, larger orchards tend to enjoy better returns, through economies of scale. Financial returns of low yielding smaller orchards, especially those using contract picking and packing, appear poor and probably not viable in the long term, unless they cater for special ñnicheñ markets with specialised high-priced products.

Currently, with prices still at a reasonably high level, with unpaid or family labour, especially during harvesting, owners of small orchards with low yields probably still enjoy a sense of ñprofitabilityñ. Small growers often do not take into account ñopportunity costsñ of capital items already available such as land, machinery and equipment. Consequently, if opportunity costs, family labour as well as growerís time and management are properly costed, the financial picture for small orchards would be very much different.

The rate of return for mango orchards in Katherine is found to be slightly ahead of that for the Darwin region by around 3% to 4%, mainly due to lower costs in controlling insects/diseases, pruning and more importantly, better weighted average prices received (due to lower percentage of second grade).

## 8. CONCLUSION

Future mango production in the NT as well as in Australia will increase, putting pressure on domestic markets. The industry would need to increase its efforts to export more in the future to keep demand/supply and price at a reasonable level for growers.

Compared to the (virtually risk-free) Commonwealth Governmentís 10 year bond rate of around 6%, the returns of a 600 tree orchard are at best marginal, at worst not viable (if using contract picking and packing). The returns for larger orchards appear to be better (up to 15% in real terms), if a higher yield (around 14.5t/ha) can be achieved. The rate of return for mango orchards in Katherine is found to be ahead of the Darwin region by around 3-4%. This is due to lower production costs (less number of sprays to control insects/diseases and pruning) and, more importantly, better average prices received in the latter part of the season (due to a generally lower percentage of second grade fruit).

In general, the profitability of a mango orchard could be improved if:

- A yield of around 14-15 tonnes per ha (mature trees) can be achieved.
- A wholesale southern price of \$18/tray or higher can be achieved (due to high quality, earliness in the season).
- Mangoes are grown in larger orchards to take advantage of economies of scale resulting in lower production costs.
- Production costs can be reduced especially costs of picking, packing, transport and marketing.
- Mangoes are also grown in the Katherine region instead of relying entirely on planting in the Darwin region. This is to take advantage of **high prices from early Darwin mangoes** and **better returns from Katherine mangoes** due to lower production costs and better weighted average prices **in the latter part of the mango season**.
- Larger volumes of mangoes can be channelled to alternative markets (especially overseas) to lessen the pressure on future prices.

## APPENDIX 1: ESTABLISHMENT COSTS PER HECTARE

OPERATION	TIMES REPLICATED	RATE	UNIT COST (\$)	COST PER HA (\$)
<b>1. LAND CLEARING AND PREPARATION:</b>				
Clear/rip/rake (Contract)	1	kg or L/ha		
Grading (contract)	1	2.5 hr/ha	480	480
<b>2. PLANTING COST:</b>				
Material cost - grafted mango	1.0	166	10	1660
Planting cost				
(25 trees/hr - 80% by casual labour)			12	64
Provision for tree losses (5%)				86
<b>3. FERTILIZER:</b>				
Single super	1	17	0.40	6.65
'Katherine Dolomite' (Darwin region only) (fertiliser put in the hole before planting)	1	33	0.31	10.20
<b>4. WEED CONTROL:</b>				
Roundup CT	1	0.80	5.21	4.16
Agral 600	1	0.02	7.56	0.15
Application (2 metre band sprayed along rows @ rate of 2 L/ha)	1		8.40	8.40
<b>5. PEST CONTROL:</b>				
Mirant (against termites - pre clearing)	1	15 tubes/ha	12.38	185.63
Chlopyrafos (against termites)	1	30 mL/hole	15.76	78.48
<b>TOTAL ESTABLISHMENT COSTS/ha</b>				<b>2,784</b>
<b>TOTAL ESTABLISHMENT COSTS/tree</b>				<b>16.77</b>

## APPENDIX 2: ESTIMATES OF IRRIGATION COSTS (BASED ON A 3,000 TREE ORCHARD ñ 18.1 HA)

ITEM OF EQUIPMENT	NEW PRICE (\$)	EXPECTED REPAIR AND MAINTENANCE (%)	EXPECTED LIFE (HOURS)	OPERATING COST (\$/HR)
Pump (including installation) - Power cost @ \$0.1458/KWH	15,076	30	20000	0.23 5.01
Mains, sub-mains and laterals (incl. installation)	72,289	20	40000	0.90
<b>TOTAL</b>				<b>6.14</b>

### MAIN ASSUMPTION OF THE IRRIGATION SYSTEM USED

System Block Size: 4.52 ha  
 No. shifts required: 4  
 No. of trees/ha: 166  
 No. of sprinklers/tree: 1  
 Sprinkler flow Rate: 90 L/hr  
 Assume bore flow capacity (L/hr): 60,000 (equiv. to 17 L/sec.)  
 Period trees are irrigated: 40 weeks in year 1 and 2  
 10 weeks per year in year 3 and thereafter

### ANNUAL IRRIGATION COSTS

Year	1	2	3	4	5	6	7	8	9	10
Litres/tree/week	240	480	700	950	1100	1350	1550	1900	2000	2000
Litres/18 ha/week	720000	1440000	2100000	2850000	3300000	4050000	4650000	5700000	6,000,000	6,000,000
Litres/18 ha/irrigation (3 times/week)	240000	480000	700000	950000	1100000	1350000	1550000	1900000	2,000,000	2,000,000
Running hours required per irrigation	4	8	12	16	18	23	26	32	33	33
Running hours required per year	482	964	351	477	552	678	778	954	1004	1004
Irrigation cost (\$/6 ha/yr)	2960	5921	2159	2930	3392	4163	4780	5859	6167	6167
Irrigation cost (\$/ha/yr)	164	328	119	162	188	230	264	324	341	341

## APPENDIX 3: FIELD MAINTENANCE ñ INPUT DATA ñ 600 MANGO TREES (3.61 HA) ORCHARD ñ DARWIN REGION

	Unit	Unit Cost	RATE OF APPLICATION/HA AND NUMBER OF APPLICATIONS												
			YEAR												
			1	2	3	4	5	6	7	8	9	10+			
<b>FERTILISER:</b> • Single Superphosphate (cu, zn) Total Costs (whole orchard) \$	kg or L/tree up to 1.2 kg/tree	\$/kg or \$/L 0.40	0	0	0	199	288	199	288	199	288	199	288	199	288
• Katherine Dolomite Rate of application kg/ha/yr	1-2 kg/tree	0.31	1.00	166	166	2.00	332	332	2.00	4.00	4.00	4.00	4.00	4.00	4.00
Total costs (whole orchard) \$		0.69	1.00	186	186	372	372	744	744	1.20	1.20	1.20	1.20	1.20	1.20
• NPK (14:14:12) kg/ha/yr	0.6 to 1 kg/tree 2 applications/yr	0.69	1.00	166	166	100	100	199	199	100	100	199	199	100	100
Total costs (whole orchard) \$		0.28	414	414	248	248	2.00	2.00	2.00	4.00	4.00	4.00	4.00	4.00	4.00
• Gypsum kg/ha/yr	2-4 kg/tree	0.28	0	0	0	332	332	664	664	332	332	664	664	332	332
Total costs (whole orchard) \$		0.67	0	0	0	330	330	660	660	0.60	0.60	1.20	1.20	1.20	1.20
• Muriate of Potash kg/ha/yr	0.6-1.2 kg/tree	0.67	0	0	0	100	100	199	199	100	100	199	199	100	100
Total costs (whole orchard) \$		0	0	0	0	240	240	480	480	240	240	480	480	240	240
• Potassium nitrate Rate of application	25 g/tree, three times/yr	1.05	0	0.00	0.00	29.05	29.05	29.05	29.05	29.05	29.05	29.05	29.05	29.05	29.05
Total costs (whole orchard) \$		1.06	0.050	33.20	33.20	0.050	33.20	332	332	0.100	0.100	66.40	66.40	0.100	0.100
• Zinc Sulphate Heptahydrate Rate of application	50-100 g/tree (fertiligation)	1.06	127	127	127	253	253	505	505	253	253	505	505	253	253
Total costs (whole orchard) \$		4.5	0.01	0.01	0.02	0.02	0.02	0.02	0.02	3.32	3.32	54	54	3.32	3.32
• Solubor kg/ha/yr	10-50 g/tree/yr (fertiligation/spray)	4.5	27	27	27	54	54	1807	1807	54	54	1807	1807	54	54
Total costs (whole orchard) \$		500	0	0	0	0	0	0	0	1988	1988	2187	2187	2405	2911
Flowering management: (Paclobutrazol application)	\$500-\$800/ha														
<b>WEED CONTROL:</b> • Roundup CT Rate of application	L/ha	6.48	2.40	2.40	2.40	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
No of applications		3	3	3	3	3	3	3	3	3	3	3	3	3	3
Total costs (whole orchard) \$		189	169	169	141	141	141	141	141	141	141	141	141	141	141
• Agral (wetting agent) Rate of application	L/ha	5.88	0.02	0.04	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
No of applications		3	3	3	3	3	3	3	3	3	3	3	3	3	3
Total costs (whole orchard) \$		1.3	2.6	2.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
<b>PEST CONTROL:</b> • Dimethoate (Rogor) Rate of application	L/ha	8.39	0.20	0.40	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
No of applications		6	6	6	6	6	6	6	6	6	6	6	6	6	6
Total costs (whole orchard) \$		36	73	73	136	136	136	136	136	136	136	136	136	136	136
• Carbaryl Rate of application	L/ha	12.90	0.00	0.00	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
No of applications		0	0	0	0	5	5	5	5	5	5	5	5	5	5
Total costs (whole orchard) \$		0	0	0	0	466	466	466	466	466	466	466	466	466	466

RATE OF APPLICATION/HA AND NUMBER OF APPLICATIONS												
● Copper Oxychloride												
Rate of application	L/ha	4.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No of applications			0	0	0	0	0	0	0	0	0	0
Total costs (whole orchard)			0	0	0	0	0	0	0	0	0	0
● Mirant (contingency)												
Rate of application	tube/ha	12.38	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
No of applications			1	1	1	1	1	1	1	1	1	1
Total costs (whole orchard)			268	268	268	268	268	268	268	268	268	268
● Agral (wetting agent)												
Rate of application	L/ha	5.88	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
No of applications			3	3	3	3	3	3	3	3	3	3
Total costs (whole orchard)			6	6	6	6	6	6	6	6	6	6
● Slashing	ha	8.27	5	5	5	5	5	5	5	5	5	5
No of applications			149	149	149	149	149	149	149	149	149	149
Total costs (whole orchard)			150	150	150	150	150	150	150	150	150	150
Canopy management:	hrs/ha	12										
● Topping/Hedging (contractors 0.5hr/ha @ \$150/hr)												
● Internia pruning (30hrs/ha@\$12/hr)												
Total costs (whole orchard)			0	0	0	0	0	0	0	0	0	0
			629	943	1,101	1,258	1,415	1,572	1,729	1,886	2,043	2,200

### APPENDIX 4: FIELD MAINTENANCE ñ SUMMARY OF ANNUAL COSTS - 600 MANGO TREE (3.61 HA) ORCHARD ñ DARWIN REGION (\$)

Year	1	2	3	4	5	6	7	8	9	10 and after
Fertiliser:										
- Materials	753	753	753	2,117	2,117	2,117	3,389	3,389	3,389	3,389
- Application	179	179	179	179	179	179	179	179	179	179
Flowering management	0	0	0	0	1,807	1,988	2,187	2,405	2,646	2,911
Weed control:										
- Materials	170	171	145	145	145	145	145	145	145	145
- Application	92	92	92	92	92	92	92	92	92	92
Pest and disease control:										
- Materials	311	348	411	1,156	1,156	1,156	1,156	1,156	1,156	1,156
- Application	350	350	350	350	350	350	350	350	350	350
Slashing and mulching	149	149	149	149	149	149	149	149	149	149
Pruning (casual labour)	0	0	472	629	943	1,101	1,258	1,415	1,572	1,729
Irrigation	451	903	329	447	517	635	729	893	1,034	1,128
Sundries (5% total costs)	123	147	144	263	373	396	482	509	536	554
<b>TOTAL FIELD COSTS</b>	<b>2,579</b>	<b>3,092</b>	<b>3,025</b>	<b>5,528</b>	<b>7,830</b>	<b>8,308</b>	<b>10,115</b>	<b>10,683</b>	<b>11,248</b>	<b>11,625</b>
<b>FIELD COSTS/HA</b>	<b>714</b>	<b>856</b>	<b>837</b>	<b>1,529</b>	<b>2,166</b>	<b>2,298</b>	<b>2,799</b>	<b>2,956</b>	<b>3,112</b>	<b>3,216</b>



## APPENDIX 5: HARVEST AND FREIGHT COSTS - 600 MANGO TREE (3.61 HA) ORCHARD ñ DARWIN REGION (\$)

	Year									
	1	2	3	4	5	6	7	8	9	10 & after
Median Yield (t/ha)	0.00	0.00	0.58	1.74	3.49	5.81	8.13	8.72	9.01	9.30
Picking aid costs	0	0	0	540	540	540	607	607	607	607
Tractor costs	0	0	0	567	567	567	567	567	567	567
Post-harvest treatment (materials)	0	0	53	158	315	525	735	788	814	840
Self picking and packing (5 trays/hr @ \$12/hr (plus 15% on -costs)	0	0	828	2,484	4,968	8,280	11,592	12,420	12,834	13,248
Packaging material @ \$1.90/tray ñ 2 pieces, including insert materials	0	0	570	1,710	3,420	5,700	7,980	8,550	8,835	9,120
Transport (road \$300/pallet 128 trays)	0	0	703	2,109	4,219	7,031	9,844	10,547	10,898	11,250
<b>TOTAL FREIGHT AND HARVEST COSTS</b>	<b>0</b>	<b>0</b>	<b>2,154</b>	<b>7,567</b>	<b>14,028</b>	<b>22,643</b>	<b>31,324</b>	<b>33,478</b>	<b>34,555</b>	<b>35,632</b>
<b>HARVEST AND FREIGHT COSTS/HA</b>	<b>0</b>	<b>0</b>	<b>596</b>	<b>2,094</b>	<b>3,881</b>	<b>6,264</b>	<b>8,666</b>	<b>9,262</b>	<b>9,560</b>	<b>9,858</b>

## APPENDIX 6: CAPITAL INVESTMENT SCHEDULE (BASED ON A 3,000 TREE ORCHARD) (\$)

	Plant and Equipment: Life and Trade-in Values										YEAR									
	Initial Cost	Yr 1 <sup>st</sup> purchase	Est Life (yrs)	Trade-in Value (%)	Trade-in Value (\$)	0	1	2	3	4	5	6	7	8	9	10				
																	100,000	100,000	100,000	100,000
<b>LAND AND BUILDING</b>																				
Land	100,000	0	100	100	100,000	0	0	0	0	0	0	0	0	0	0	0				
Managers residence	0	0	50	50	0	0	0	0	0	0	0	0	0	0	0	0				
Packing shed/workshop	100,000	3	20	40	40,000	0	0	0	100,000	0	0	0	0	0	0	0				
Forced-air cool room, cold storage	60,000	3	20	30	18,000	0	0	0	60,000	0	0	0	0	0	0	0				
<b>TOTAL LAND AND BUILDING</b>	<b>260,000</b>				<b>158,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>16,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>				
<b>PLANT AND EQUIPMENT</b>																				
Utility/van	25,000	0	5	30	7,500	0	0	0	0	0	0	0	0	0	0	0				
Washing, grading equipment	37,000	3	15	30	11,100	0	0	0	37,000	0	0	0	0	0	0	0				
Tractor with front end loader (49 kw)	53,000	0	10	30	15,900	0	0	0	0	0	0	0	0	0	0	0				
Trailer	3,500	0	10	20	700	0	0	0	0	0	0	0	0	0	0	0				
Slasher 1.8M	3,000	0	8	10	300	0	0	0	0	0	0	0	0	0	0	0				
PTO spray unit	2,774	0	12	10	277	0	0	0	0	0	0	0	0	0	0	0				
Air blast sprayer	20,000	0	12	10	2,000	0	0	0	0	0	0	0	0	0	0	0				
Picking aids	14,500	8	10	15	2,175	0	0	0	0	0	0	0	0	0	0	0				
Other capital costs (motorbikes, forklift)	15,000	3	10	20	3,000	0	0	0	15,000	0	0	0	0	0	0	0				
Fencing (material only)	7,500	0	25	10	750	0	0	0	0	0	0	0	0	0	0	0				
Power connection (estimate)	8,000	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0				
Irrigation system:																				
-Bore (including power)	25,000	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0				
-Pump (30 kW)	15,076	0	10	20	3,015	0	0	0	0	0	0	0	0	0	0	0				
-Mains/sprinklers/valves (incl installation)	72,289	0	12	20	14,458	0	0	0	0	0	0	0	0	0	0	0				
<b>TOTAL PLANT AND EQUIPMENT COSTS</b>	<b>301,640</b>				<b>61,176</b>	<b>235,140</b>	<b>0</b>	<b>0</b>	<b>52,000</b>	<b>0</b>	<b>0</b>	<b>17,500</b>	<b>0</b>	<b>14,500</b>	<b>2,700</b>	<b>0</b>				

## APPENDIX 7: MACHINERY OPERATING COST ASSUMPTIONS

Item	Fuel costs \$/hr	Repair and Maintenance cost (tractor and implement) \$/hr	Total operating cost \$/hr
<b>For small orchard 600 trees: (with smaller tractor)</b>			
Slashing	4.91	3.36	8.27
Spraying (weed control)	5.23	3.21	8.45
Spraying (pest and disease control)	5.23	5.54	10.77
Harvesting aid	3.92	2.82	6.75
Harvesting (tractor)	3.92	2.82	6.75
<b>For larger orchard 3,000 - 5,00 trees: (with larger tractors)</b>			
Slashing	6.49	4.66	11.15
Spraying (weed control)	6.92	4.51	11.43
Spraying (pest and disease control)	6.92	6.83	13.76
Harvesting aid	5.19	4.12	9.31
Harvesting (tractor)	5.19	4.12	9.31

Note: Fuel price (GST exclusive, net of diesel fuel rebate: \$0.58/L)

## APPENDIX 8A: 600 TREE (3.61 HA) MANGO ORCHARD CASHFLOW BUDGET ñ DARWIN REGION

Expected median case: 9.3t/ha (8 trays/tree at 166 trees/ha, pick and pack own fruit) and \$18/tray Unit: \$1

YEAR	0	1	2	3	4	5	6	7	8	9	10	15	20
<b>INCOME:</b>													
Mango yield (trays/tree/year)	0.00	0.00	0.00	0.50	1.50	3.00	5.00	7.00	7.50	7.75	8.00	8.00	8.00
Total no. of trays (7kg)	0	0	0	300	900	1,800	3,000	4,200	4,500	4,650	4,800	4,800	4,800
Price \$/tray (wholesale, Southern markets)		18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Mango sales (total area)		0	0	5,400	16,200	32,400	54,000	75,600	81,000	83,700	86,400	86,400	86,400
Other income (salvage value)													250,000
<b>TOTAL INCOME</b>		<b>0</b>	<b>0</b>	<b>5,400</b>	<b>16,200</b>	<b>32,400</b>	<b>54,000</b>	<b>75,600</b>	<b>81,000</b>	<b>83,700</b>	<b>86,400</b>	<b>86,400</b>	<b>336,400</b>
<b>COSTS:</b>													
<b>VARIABLE COSTS</b>													
Field costs		2,579	3,092	3,025	5,528	7,830	8,308	10,115	10,683	11,248	11,625	11,625	11,625
Harvesting and freight		0	0	2,154	7,567	14,028	22,643	31,324	33,478	34,555	35,632	35,632	35,632
Agents commission (12% of sale value)		0	0	648	1,944	3,888	6,480	9,072	9,720	10,044	10,368	10,368	10,368
<b>TOTAL VARIABLE COSTS</b>	<b>0</b>	<b>2,579</b>	<b>3,092</b>	<b>5,827</b>	<b>15,039</b>	<b>25,746</b>	<b>37,430</b>	<b>50,512</b>	<b>53,881</b>	<b>55,847</b>	<b>57,625</b>	<b>57,625</b>	<b>57,625</b>
<b>OVERHEAD COSTS</b>													
Permanent part-time labour		0	0	0	0	0	0	0	0	0	0	0	0
Labour on-costs		0	0	0	0	0	0	0	0	0	0	0	0
General repairs and maintenance		1,900	2,200	2,500	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Telecommunications		1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Book keeping/accounting		1,500	2,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Sundries/contingencies		2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
<b>TOTAL OVERHEAD COSTS/TRAY</b>		<b>7,400</b>	<b>8,200</b>	<b>9,000</b>	<b>9,500</b>	<b>9,500</b>	<b>9,500</b>	<b>9,500</b>	<b>9,500</b>	<b>9,500</b>	<b>9,500</b>	<b>9,500</b>	<b>9,500</b>
<b>TOTAL CAPITAL COSTS</b>													
Establishment costs	10,001												
Land and buildings	105,000	0	0	30,000	0	0	0	0	0	0	0	0	30,000
Plant and equipment	108,896	0	20,000	45,000	0	0	14,000	0	0	2,700	0	0	45,000
<b>TOTAL CAPITAL COSTS</b>	<b>223,897</b>	<b>0</b>	<b>20,000</b>	<b>75,000</b>	<b>0</b>	<b>0</b>	<b>14,000</b>	<b>0</b>	<b>0</b>	<b>2,700</b>	<b>0</b>	<b>0</b>	<b>75,000</b>
<b>TOTAL COSTS</b>	<b>223,897</b>	<b>9,979</b>	<b>31,292</b>	<b>89,827</b>	<b>24,539</b>	<b>35,246</b>	<b>60,930</b>	<b>60,012</b>	<b>63,381</b>	<b>68,047</b>	<b>67,125</b>	<b>67,125</b>	<b>142,125</b>
<b>NET CASHFLOW</b>	<b>-223,897</b>	<b>-9,979</b>	<b>-31,292</b>	<b>-84,427</b>	<b>-8,339</b>	<b>-2,846</b>	<b>-6,930</b>	<b>15,588</b>	<b>17,619</b>	<b>15,653</b>	<b>19,275</b>	<b>19,275</b>	<b>194,275</b>
<b>CUMMULATIVE CASHFLOW</b>	<b>-223,897</b>	<b>-223,876</b>	<b>-265,168</b>	<b>-349,595</b>	<b>-357,934</b>	<b>-360,779</b>	<b>-367,710</b>	<b>-352,121</b>	<b>-334,502</b>	<b>-318,849</b>	<b>-299,574</b>	<b>-280,298</b>	<b>-28,756</b>

Internal rate of return      Real terms:      -1.0%

Net farm income before interest and income tax (yr. 10 onwards)      Nominal terms:      n/a

Break-even Price:      \$/kg wholesale Southern markets      \$5,949

Peak debt (yr 6):      \$/tray wholesale Southern markets      \$16.76 per 7 kg tray

Pay back period:      >20 years      \$367,710

Total planting and maintenance costs (excluding capital costs) to end of year 5:      \$8,868 per hectare or \$53.40 per tree

Total investment costs/ha (including all capital costs and any shortfall in operating costs):      \$101,733 per hectare

## APPENDIX 8B: 3,000 TREE MANGO ORCHARD CASHFLOW BUDGET ĩ DARWIN REGION

Expected median yield case: 9.3t/ha (8 trays/tree at 166 trees/ha) and \$18/tray Unit: \$1

YEAR	0	1	2	3	4	5	6	7	8	9	10	15	20
<b>INCOME:</b>													
Mango yield (trays/tree/year)	0.00	0	0.00	0.50	1.50	3.00	5.00	7.00	7.50	7.75	8.00	8.00	8.00
Total no. of trays (7 kg)	0	0	0	1,500	4,500	9,000	15,000	21,000	22,500	23,250	24,000	24,000	24,000
Price \$/tray (wholesale, Southern markets)		18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Mango sales (total area)		0	0	27,000	81,000	162,000	270,000	378,000	405,000	418,500	432,000	432,000	432,000
Other income (salvage value)		0	0	27,000	81,000	162,000	270,000	378,000	405,000	418,500	432,000	432,000	450,000
<b>TOTAL INCOME</b>		<b>0</b>	<b>0</b>	<b>27,000</b>	<b>81,000</b>	<b>162,000</b>	<b>270,000</b>	<b>378,000</b>	<b>405,000</b>	<b>418,500</b>	<b>432,000</b>	<b>432,000</b>	<b>882,000</b>
<b>PRODUCTION COSTS:</b>													
<b>VARIABLE COSTS</b>													
Field costs		15,391	18,698	17,421	31,556	41,744	44,328	53,502	56,609	59,021	60,409	60,409	60,409
Harvesting and freight		0	0	10,768	34,767	67,072	113,389	156,461	167,229	172,613	177,997	177,997	177,997
Agents commission (12% of sale value)		0	0	3,240	9,720	19,440	32,400	45,360	48,600	50,220	51,840	51,840	51,840
<b>TOTAL VARIABLE COSTS</b>		<b>15,391</b>	<b>18,698</b>	<b>31,429</b>	<b>76,043</b>	<b>128,256</b>	<b>190,117</b>	<b>255,323</b>	<b>272,438</b>	<b>281,854</b>	<b>290,247</b>	<b>290,247</b>	<b>290,247</b>
<b>OVERHEAD COSTS</b>													
Permanent labour (1 part time)		20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Vehicle running cost		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
General repairs and maintenance		2,000	3,000	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Telecommunications		1,500	1,500	2,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Book Keeping/accounting		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Other sundries		2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
<b>TOTAL OVERHEAD COSTS</b>		<b>34,000</b>	<b>35,000</b>	<b>36,000</b>	<b>36,500</b>	<b>36,500</b>	<b>36,500</b>	<b>36,500</b>	<b>36,500</b>	<b>36,500</b>	<b>36,500</b>	<b>36,500</b>	<b>36,500</b>
<b>CAPITAL COSTS</b>													
Establishment costs	50,372												
Land and buildings	100,000	0	0	160,000	0	0	0	0	0	0	0	0	160,000
Plant and equipment	235,140	0	0	52,000	0	0	175,000	0	14,500	2,700	0	0	52,000
<b>TOTAL CAPITAL COSTS</b>	<b>385,512</b>	<b>-</b>	<b>-</b>	<b>212,000</b>	<b>-</b>	<b>-</b>	<b>17,500</b>	<b>-</b>	<b>14,500</b>	<b>2,700</b>	<b>-</b>	<b>-</b>	<b>212,000</b>
<b>TOTAL COSTS</b>	<b>385,512</b>	<b>49,391</b>	<b>53,698</b>	<b>279,429</b>	<b>112,543</b>	<b>164,756</b>	<b>244,117</b>	<b>291,823</b>	<b>323,438</b>	<b>321,054</b>	<b>326,747</b>	<b>326,747</b>	<b>538,747</b>
<b>NET CASHFLOW</b>	<b>-385,512</b>	<b>-49,391</b>	<b>-53,698</b>	<b>-252,429</b>	<b>-31,543</b>	<b>-2,756</b>	<b>25,883</b>	<b>86,177</b>	<b>81,562</b>	<b>97,446</b>	<b>105,253</b>	<b>105,253</b>	<b>343,253</b>
<b>CUMMULATIVE CASHFLOW</b>	<b>-385,512</b>	<b>-434,903</b>	<b>-488,601</b>	<b>-741,030</b>	<b>-772,573</b>	<b>-775,329</b>	<b>-749,445</b>	<b>-663,269</b>	<b>-581,707</b>	<b>-484,261</b>	<b>-379,008</b>	<b>-36,298</b>	<b>727,969</b>

Internal rate of return

Real terms: 5.3%

Nominal terms: 8.8% (assuming a long term inflation rate of 3.5%)

Net farm income before interest and income tax (yr. 10 onwards) \$84,683 per year

Break-even price \$/kg, wholesale Southern markets: \$1.96 per kg

Peak debt (yr 5): \$/tray, wholesale Southern markets \$13.70 per 7kg tray

Pay back period: \$775,329

Total planting and maintenance costs (excluding capital costs) to end of year 5: 16 years.

Total investment cost/ha (including all capital costs and any shortfall in operating costs): \$9,693 per hectare or \$58.40 per tree

\$42,902 per hectare

## APPENDIX 8C: 5,000 TREE MANGO ORCHARD CASHFLOW BUDGET ĩ DARWIN REGION

Expected median yield case: 9.3t/ha (8 trays/tree at 166 trees/ha) at \$18/tray Unit: \$1

YEAR	0	1	2	3	4	5	6	7	8	9	10	15	20
<b>INCOME:</b>													
Mango yield (trays/tree/year)	0.00	0.00	0.00	0.50	1.50	3.00	5.00	7.00	7.50	7.75	8.00	8.00	8.00
Total no. of trays (7kg)	0	0	0	2,500	7,500	15,000	25,000	35,000	37,500	38,750	40,000	40,000	40,000
Price \$/tray (wholesale, Southern markets)		18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Mango sales (total area)		0	0	45,000	135,000	270,000	450,000	630,000	675,000	697,500	720,000	720,000	720,000
Other income (salvage value)		0	0	45,000	135,000	270,000	450,000	630,000	675,000	697,500	720,000	720,000	1,370,000
<b>TOTAL INCOME</b>		0	0	45,000	135,000	270,000	450,000	630,000	675,000	697,500	720,000	720,000	1,370,000
<b>PRODUCTION COSTS:</b>													
<b>VARIABLE COSTS</b>													
Field costs		24,570	29,451	28,123	51,517	68,398	72,541	87,700	92,648	96,602	98,918	98,918	98,918
Harvesting and freight		0	0	20,293	56,187	110,028	189,562	261,350	279,296	288,270	297,243	297,243	297,243
Agents commission (12% of sale value)		0	0	5,400	16,200	32,400	54,000	75,600	81,000	83,700	86,400	86,400	86,400
<b>TOTAL VARIABLE COSTS</b>		24,570	29,451	53,816	123,904	210,826	316,103	424,649	452,944	468,572	482,561	482,561	482,561
<b>OVERHEAD COSTS</b>													
Permanent labour/on-site manager (full time)		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Vehicle running cost		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
General repairs and maintenance		2,000	3,200	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Telecommunications		1,500	1,500	2,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Book keeping/accounting		3,500	4,000	4,000	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
Other sundries/contingencies		2,500	2,500	3,000	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
<b>TOTAL OVERHEAD COSTS</b>		54,500	56,200	58,000	59,500	59,500	59,500	59,500	59,500	59,500	59,500	59,500	59,500
<b>CAPITAL COSTS</b>													
Establishment costs	83,935												
Land and buildings	150,000												
Plant and equipment	324,709												
<b>TOTAL CAPITAL COSTS</b>	558,644												
<b>TOTAL COSTS</b>	558,644	79,070	85,651	359,816	183,404	270,326	393,103	484,149	512,444	530,772	542,061	542,061	790,061
<b>NET CASHFLOW</b>	-558,644	-79,070	-85,651	-314,816	-48,404	-326	56,897	145,851	162,556	166,728	177,939	177,939	579,939
<b>CUMMULATIVE CASHFLOW</b>	-558,644	-637,714	-723,365	-1,038,181	-1,086,584	-1,086,911	-1,030,013	-884,162	-721,607	-554,879	-376,940	259,635	1,551,330

Internal rate of return

Real terms:

Nominal terms:  
 Net farm income before interest and income tax (yr. 10 onwards):  
 Break-even price  
 Peak debt (yr 5):  
 Pay back period:

7.3%  
 10.8% (assuming a long term inflation rate of 3.5%)  
 \$150,891 per year  
 \$1.94 per kg.  
 \$13.60 per 7kg tray  
 \$1,086,911  
 14 years

Total planting and maintenance cost (excluding capital costs) to end of year 5:

Total investment cost/ha (including all capital costs and any shortfall in operating costs):

\$9,495 per hectare or \$57.20 per tree.  
 \$36,085 per hectare