On-farm economic analysis in the Australian macadamia industry

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Department of Employment, Economic Development & Innovation

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FINAL REPORT

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HAL project number: MC03023

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Purpose of report:

This report provides an analysis of the economics of macadamia production in Australia, through to delivery of the nuts to the processor. It provides an analysis of the costs, revenue and profitability for different orchard sizes, ages, production regions and management systems. It also provides an understanding of the economics of macadamia production over the life of an orchard.

Date of Report: January 2010

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Disclaimer

The information included in this report should not be taken as financial advice. The use of different data inputs in analyses will yield different outcomes and as such all results expressed within this report are only relevant for the specific scenarios on which they are based. The discounted cash flow analysis results in this report are representations of typical industry scenarios that are based on aggregated industry data. The results from these analyses are therefore provided for the purpose of example only. Farm profile information should be tailored prior to analysis on a case by case basis to ensure that output is relevant to individual circumstances.

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1.0 Media summary

Good financial information is important for sound decision-making for both new growers and investors entering the macadamia industry and for existing growers investigating how they can improve their profitability. Only limited financial information was available to the industry prior to this project.

The "On-farm economic analysis in the Australian macadamia industry" is a joint project between the Department of Primary Industries and Fisheries, Queensland, the University of Southern Queensland and New South Wales Department of Primary Industries and is supported by the Australian Macadamia Society and Horticulture Australia Limited. The purpose of the project is:

- To develop a complete picture of the economics of macadamia growing over the life of an orchard, and
- To develop a financial planner to assist macadamia growers to examine profitability over the life of an orchard by varying yield, prices and costs.

Financial and production data was collected from 2003 to 2006 from 41 farms representing a cross-section of the industry. The data was collected using a standard chart of accounts, developed in conjunction with Rutherfords, accountants and financial advisers in Lismore, to ensure consistency in cost recording.

Revenue and profit per hectare increased with increasing farm size, tree age and productivity. Larger farms spent a greater proportion of their total costs on employment and management and less on repairs and maintenance of plant and improvements, fuel and contractors compared to smaller farms. Larger farms also had more investment in assets but fewer assets per hectare due to economies of scale. Bundaberg farms were on average younger, larger and more productive and profitable than northern New South Wales and south-east Queensland farms.

Average costs/ha gradually increased from 2003 to 2006 for farms older than 10 years. Revenue/ha moved more strongly depending on yield/ha and unit price. The profitability/ha trend closely followed the revenue/ha trend.

The data collected in this project has been used to develop example farm financial profiles in the planner to suit a broad range of situations. Growers and their advisers can vary information in the profiles and examine the effects on key financial indicators. Different analyses are provided in the planner to measure investment performance over time; to measure annual cash balances; to model the impact on variations in yield, kernel recovery, annual costs and price; and to compare and rank individual profiles according to key financial indicators.

2.0 Technical summary

There is strong demand from new macadamia growers and investors entering the macadamia industry for financial information about macadamia growing. Many growers with existing orchards are also seeking to benchmark their costs and returns and to investigate how they can improve their profitability. Only limited financial information was available to the industry prior to this project.

Financial and production data was collected and analysed from 41 farms from major growing districts in Queensland and New South Wales for 4 calendar years from 2003 to 2006. The sample represents a cross section of farms in the Australian macadamia industry for farm size, tree age, region, management structure, productivity and financial performance. The data was collected using a standard chart of accounts, developed in conjunction with Rutherfords, accountants and financial advisers in Lismore. This was to ensure consistency in the recording of costs.

Larger farms were more efficient at turning revenues into profit due to economies of size. Productivity (tonnes of nut-in-shell per hectare) increased with average tree age and farm size. Revenue and profit per hectare increased with increasing farm size, tree age and productivity. Costs per hectare also increased with increasing tree age and productivity.

There were major differences in the cost breakdowns between different farm sizes. Farms less than 15 hectares spent a greater proportion of their total costs on repairs and maintenance of plant and improvements, administration, fuel and contractors compared to larger farms. Farms greater than 15 hectares spent a greater proportion of their total costs on employment and management costs than the smaller farms.

The Bundaberg district farms were younger and larger and more productive on average than the northern New South Wales (NNSW) and south-east Queensland (SEQ) farms. The Bundaberg and NNSW farms had higher revenue/ha than the SEQ farms and the Bundaberg and SEQ farms had lower costs/ha than NNSW farms. The Bundaberg farms also had a higher profit/ha than the NNSW and SEQ farms.

For farms older than 10 years, average costs/ha gradually increased from 2003 to 2006. Revenue/ha moved more strongly depending on yield/ha and unit price. The profitability/ha trend closely followed the revenue/ha trend. For early bearing farms between 6 and 10 years of age, average productivity, revenue and profit per hectare increased steadily as the orchards increased in age. Costs/ha increased more gradually.

Larger farms had a greater average investment in assets but fewer assets per hectare than the smaller farms due to economies of scale. Farms in the Bundaberg district also had lower average investment in assets/ha than the NNSW and SEQ farms.

The data collected in this project has been used to develop example farm financial profiles in the financial planner for macadamia software. These profiles can be modified to suit individual circumstances. The analyses (e.g. discounted cash flow analysis) in the financial planner provide a complete picture of the economics of macadamia growing over the life of a specified period for a farm. The cash flow situation will differ for each farm depending on individual circumstances. The financial planning software enables macadamia growers and their advisers to examine the effect on profitability over the life of an orchard by varying yields, prices and costs. It also enables current growers to examine the effect on profitability of changes to their business.

The latest stage in this project focused on the further development of the financial planner to meet the needs of the Australian macadamia industry. The financial planner now includes four analysis components:

- Investment analysis to evaluate the viability of investment alternatives over time.
- Cash budgeting analysis to measure projected cash balance of potential investments and examine the impacts of changes to management and financial plans on financial indicators.
- Sensitivity analysis to model variation in annual costs, kernel recovery, nut in shell price and yield and compare the relative impact on key financial indicators over time.
- Profile comparison analysis to compare and rank individual profiles according to key financial indicators.

3.0 Introduction

There is a strong demand from new macadamia growers and investors entering the industry for financial information about macadamia growing. This includes information about:

- How much does it cost to establish a macadamia farm?
- How much do macadamias cost to grow?
- How much revenue and profit can be expected to be made over the life of a farm?

Many growers with existing farms are also seeking to benchmark their costs and returns in order to investigate where they can improve their profitability and to analyse how changes in their operation affect financial performance.

Prior to this project, only limited financial information was available to answer these questions. Reilly and Bevan (1995) developed a computer model to assist growers to calculate the percentage return on their operation. Quinlan (2003) published gross margins for 3, 7 and 15 year old trees for a 20 hectare orchard in northern New South Wales. The "Macadamia grower's handbook – a growing guide" (2004) also includes a gross margin. This was also for a 20 hectare 15 year old farm in south-east Queensland or northern New South Wales. The model and gross margins include a sensitivity analysis for the effect of yield and price. All of these are for a limited range of situations and do not allow current and prospective growers to input or benchmark their own information.

Consultants within the Australian macadamia industry have also developed budgets for macadamia growing. These budgets are largely based on their own information and are not readily available to the Australian industry.

The project team has collected and analysed financial data from 41 macadamia farms from major growing districts in Queensland and New South Wales for 4 calendar years from 2003 to 2006. The farms represent a cross section of farms in the Australian macadamia industry for farm size, tree age, region, management structure, productivity and financial performance.

Analysis of the collected data has provided a much clearer picture of the costs, revenues and profitability associated with macadamia production. It has also provided a clearer picture of the cost breakdowns associated with different farms. This will enable better financial planning for new growers and investors and existing growers.

The data collected in this project has been used to develop financial planning software for macadamia. The financial information gathered in this project means that the investment analysis process in the software is based on real data rather than assumptions. An extension of this project to February 2010 was granted to enable further development of the software.

The information from this project was used to develop comprehensive financial orchard profiles for use in the planning software. These profiles can be modified to suit individual circumstances. The software and the profiles enable growers to analyse the effect on profitability and cash flow over the life of a farm by varying yields, prices and costs. They also enable new growers and investors and their financial advisers to analyse options for establishing an orchard or buying an already established farm.

A commercial delivery plan for the financial planner has been developed by the project team in consultation with the Australian Macadamia Society and Horticulture Australia Limited. The plan provides guidelines for both domestic and international distribution and support of the planner.

4.0 Materials and methods

4.1 Project industry steering group

A project industry steering group was formed to provide guidance and direction to the project team. The steering group comprised key members of the Australian Macadamia Society (AMS) executive and research and development (R&D) committee. The steering group met at the start of the project and then annually with the project team to review and validate methodology and results.

The project industry steering group comprised:

- Paul Chapman, Relationship Executive Agribusiness, Commonwealth Bank, Lismore, NSW, and member of the AMS R&D committee.
- Kim Jones, Industry Development Manager, AMS, Lismore, NSW, and member of the AMS R&D committee.
- Kim Wilson, farm manager and consultant, Clunes, NSW, and member of the AMS executive and R&D committee.
- Andrew Pearce, macadamia grower, Bundaberg, Qld, and member of the AMS executive and R&D committee.
- Phil Montgomery, macadamia grower, Gympie, Qld and member of the AMS executive.
- David Bell, macadamia grower, Beerwah, Qld and member of the AMS R&D committee.
- Chris Searle, farm management consultant, Bundaberg, Qld, and member of the AMS R&D committee.
- Andrew Starkey, macadamia grower, Brooklet, NSW, and member of the AMS executive and R&D committee.

In addition, focus groups of key industry members were facilitated in Queensland and New South Wales to trial and guide the development of the financial planner for macadamia.

The Queensland focus team comprised:

- Chris Searle.
- Scott Norval, farm manager, Bundaberg.
- Mike Hochen, farm financial manager, Bundaberg.
- Les Gain, macadamia grower, Gympie.
- Tim Salmon, farm management consultant, Gympie.

The New South Wales focus team comprised:

- Paul Chapman.
- Kim Wilson.
- Andrew Starkey.
- Matt Colahan, macadamia processor, Brooklet.
- John Robertson, farm manager, Yarrahapinni.

4.2 Data collection and analysis

4.2.1 Data collection

The initial data collection for this project was undertaken in conjunction with the "Adoption of Quality Management Systems in Macadamia" project. This project examined the relationship between on-farm management practices and nut quality.

A standard chart of accounts was developed initially by the project team in conjunction with Mr Neil Rushforth and Mr Michael Ellis from Rutherfords, accountants and financial advisers in Lismore. The chart of accounts was developed to ensure that the cost categories and individual costs being obtained were interpreted as the same items from business to business. This enables growers to reconcile their costs in a standardised format. This chart has since been incorporated into the MacMan farm recording software.

A questionnaire was then developed to gather quarterly financial and production data from each farm (Appendix 1).

While the standardised chart of accounts provides consistency in the recording of costs, it was also found that obtaining consistent financial data across the sample would be problematic and time consuming as the quality and comprehensiveness of records varied quite significantly. This was due to variations in business structures and the use of accrual versus cash based accounting. As some businesses were using accrual based accounting and others cash based it was decided that converting accrual based records to cash was the most effective way of obtaining comparable financial data across the sample.

Determining the value of equity and assets for each property was more difficult. This was due to the various stages of depreciation of assets and their book value often being far below market value, making the value of assets erroneous (Australian Society of Certified Practising Accountants 2002). To obtain a closer measure of market values, we asked growers for the insured values of their assets for each of the four years. While this is subjective in that growers have to estimate the values for insurance purposes it does provide a consistent proxy on which to base asset values.

Growers were selected for their ability, where possible, to supply comprehensive records over the 4 years of data collection, their interest in the project and willingness to cooperate. Growers were invited to participate via the network of MacMan best practice groups, the MacMan-net discussion group, the Australian Macadamia Society annual conferences, articles in the Australian Macadamia Society News Bulletin and personal contact.

Growers were also selected from across Queensland and New South Wales growing districts. The sample represented a cross-section of farms in the Australian macadamia industry for farm size, tree age, region, management structure, productivity and financial performance.

Data was collected from farms in the Bundaberg, south-east Queensland and northern New South Wales regions. The south-east Queensland sub-sample includes farms in Gympie and Glasshouse Mountains growing districts. The northern New South Wales sub-sample includes farms from Lismore and Nambucca growing districts. Only limited data was able to be collected from the Atherton Tablelands due to the effect of Cyclone Larry in March 2006.

Each participant was visited initially and data collected during a face-to-face interview using a structured questionnaire (See Appendix 1). This enabled the participants to meet the researchers and also allowed the researchers to obtain written permission to collect and use their financial data as a part of the project.

Privacy agreements for guaranteeing the confidentiality of an individual's information as set out by the DPI&F Queensland, The University of Queensland and the University of Southern Queensland were explained to participants and ongoing participation was sought for the life of the project.

Once the initial visit had been made and the first year of data (2003) collected, participants were then contacted on a six monthly basis by phone, e-mail and letter to obtain financial and production data from the previous two financial quarters.

Financial and production data has now been collected from 31 growers and 41 farms from 2003 to 2006. Some growers supplied data from more than one farm. Most of the growers supplied data for the full 4 calendar years. Some farms were unable to supply the full 4 years (e.g. due to change of ownership).

Gathering data on a quarterly basis enabled data to be analysed on both a financial and calendar year basis. The project industry steering group's preference was that analysis be conducted on a calendar year basis as this more closely followed the Australian macadamia production cycle.

Gathering data on a six monthly basis also enabled data to be periodically entered and checked for accuracy as the project progressed. Data was validated by regular meetings of the project team. This enabled any issues regarding data accuracy to be worked through and resolved in a systematic and timely manner.

Initially the data from the quarterly questionnaires was entered into a Microsoft Excel spreadsheet and checked for accuracy as it was collected. Once the four years' data was collected and validated, it was then transferred into a database specifically built to house all data for each farm year. Note that a farm year equates to an individual farm for a single year. A farm that has participated for the entire project and provided financial and production data for four years will therefore have records for four farm years. A farm that has participated for two years will have records for two farm years and so on. A total of 154 farm-years of data were collected.

4.2.2 Data analysis

There are many data analysis methods that can be employed to summarise and interpret data. However, it is the appropriateness of methods used in relation to data validity that is important. Data validity is the extent to which a data analysis method measures what it is intended to measure (Heiman 2001). The data analysis methods in this report have been selected based on appropriateness and their ability to provide an accurate representation of the underlying sample (Patton 1990). The necessity for data validity in conjunction with the need for people with a broad range of backgrounds to synthesise and make use of the information presented in this report has therefore shaped the types of analysis methods employed. While the statistical analysis undertaken is relatively simple, its intention is to provide clear insights into a range of key variables that have, through past research and experience by the research team, shown themselves to be highly relevant to macadamia growers and financial professionals associated with the industry. The data analysis methods used to frame this report are summarised below.

In undertaking the analysis of financial data, we have purposely focused on cash revenues and cash costs of macadamia production. While the opportunity cost of an owner operator's time needs to be considered in financial planning, we have purposely not examined the opportunity costs of unpaid labour. We have not imputed any costs of labour (that is applying an estimated salary costs to owner operators who do not pay themselves wages) as this does not represent a cash flow and would distort industry realties. We have however compared managed farms and owner operated farms to identify any differences in variables such as revenues and costs per hectare. In this sample the number of farms is evenly divided between the two categories.

The majority of financial and production data analysis was undertaken on a per hectare basis. This is because hectares remained relatively consistent for most farms over the four years of data analysed. Per tonne analysis was performed by taking an average from the four study years, due to the variability in production from year to year and difficulties in matching costs and revenues to actual production for all farms for a given season. Relevant per tonne analyses for the four years are presented in the appendices.

Summary statistics were initially used to give an overview of the sample which is consistent with Kenkl (1989). Farms were split into two age categories: farms with an average tree age between 6 and 10 years of age and those with trees greater than 10 years of age. These two categories were chosen because the younger trees typically have lower production than trees greater than 10 years of age. The younger trees also have lower production costs. The production costs tend to rise steeply between 6 and 10 years of age and then level out after 10 years.

The two age groups have been further broken down into three size categories:

1. Greater than 15 hectares; N = 52
2. Greater than or equal to 5 hectares and less than 35 hectares; N= 53
3. Greater than or equal to 35 hectares: N= 49

The size category cut off points were chosen to give three relatively even farm size groups for comparison and reflect common size groupings used in the industry. Based on age and farm size categories, pie charts showing the breakdown of the costs of production were created.

This is followed by time series trend charts showing the relationship between revenue, costs, profit and production given farm size and age over the four years examined. Revenue, costs and profit are then compared with farm age using cross tabulations.

To establish consistent cut-offs for the cross tabulations, the revenue and cost data has been divided into three groups based on percentiles, the bottom 25%, the middle 50%, and the top 25%. Percentiles are a measure of 'relative standing' of an observation within a data set. This is a consistent and unbiased way of splitting the data into groups for descriptive analyses (Kenkl 1989).

When categorising profitability however, it was apparent that several farms had made losses in some years. As such, we deviated from the percentile approach for loss making farms in order to separate them from profitable farms. As such, loss making years for farms were placed in the bottom group. The top group was then determined using the 75^{th} percentile (top 25%) as with revenues and costs, with the remainder falling by default into the middle group. This provided a simple division between negative returns and positive returns.

Following the summary statistics, correlations are used to identify significant relationships between key variables such as tree age and sound kernel recovery. The two age groups and managed and owner managed farms have then been compared using t-tests to identify significant differences. This allows significant differences in key variables such as NIS production, sound kernel recovery (SKR) profit etc. to be identified and explained. An explanation of the t-test statistic is provided in the data analysis section.

Least significance tests (LSD) have then been used to identify significant differences in variables such as production, quality, revenues and costs for given farm sizes and regions. The LSD test is used to compare variables between three or more groups. LSD is a post-hoc test used with ANOVA (analysis of variance).

4.3 Financial planning software for macadamia

Development of the financial planning software commenced in 2007, following the data collection stage of the project. A steering group comprised of industry members was formed to guide the development process. Input was also directly sought from a range of professionals and stakeholders associated with the macadamia industry including growers, processors, consultants, accountants and bankers.

Development initially focussed on a discounted cash flow analysis to measure investment viability. This analysis includes standard financial indicators such as Net Present Value (NPV) and Internal Rate of Return (IRR) to evaluate the viability of investment alternatives over time. It also provides annual summaries of cash flow, periodic capital expenditure and present values (PV).

Following development of the investment analysis, industry feedback directed emphasis towards creation of a cash budgeting component to allow existing growers to analyse their annual cash balance as well as examine how changes to their management and financial plans impact on profitability. This analysis includes cash on hand at the start and end of each year, tax payable, periodic capital and net cash flows. It also provides a range of performance indicators including interest coverage ratio, farm operating surplus and debt to income ratio. Supporting data also includes annual debt, principal and interest, production and taxable income.

The project steering group also proposed a facility for analysing the impact of a range of specific criteria over time, such as annual costs, kernel recovery, nut in shell price and yield. A sensitivity analysis was developed to allow users to model variation in each of these criteria and compare their relative impact on profitability over time. Users can adjust threshold values for any two of these criteria across two different scenarios to compare outcomes in each case. This allows, for example, comparison of best and worst case scenarios, with results displayed against a control scenario to determine the range of impact. Several performance measures can be charted including production, profit, cumulative cash flow, nut price and revenue, operating expenses and present value.

For detailed comparison of more complex farm business scenarios, a profile comparison analysis was also developed. This facility allows simultaneous comparison of up to 10 individual profiles and includes ranking of these according to key performance indicators such as net present value and internal rate of return. A range of performance measures can also be charted annually, similar to that of the sensitivity analysis.

Each analysis can run for between 3 and 30 years, providing several performance measures on an annual basis as well as over the life of the analysis. Results are presented in tabular and graphical form and can be printed or exported for use in other programs.

Underpinning analyses in the financial planner is a set of profiles, each of which describes a unique farm business scenario. Each profile contains all of the information required by the analyses, as shown in table 4.1.

Profile data	
Criteria	**Details**
Analysis term	An analyses term can be set to between 3 and 30 years
Inflation rate	Annual costs are automatically indexed for inflation
Depreciation method	For depreciation of capital items. Both straight line and reducing balance methods are supported. Used for calculating taxation cash flows and the residual amounts recoverable on capital items at the end of the investment term.
Business model	Used for taxation purposes. Options include partnership, sole trader, company or custom taxation rate. Taxation can be excluded by selecting a custom taxation rate of zero.
Initial investment costs	Investment costs can be itemised with optional depreciation of each as required.
Initial and final values	Initial and final value of the asset at the beginning and end of the analysis term
Required rate of return	The rate of return that is required to make the investment project acceptable. This is used in conjunction with the discounted cash flow analysis, part of the investment module.
Tree plantings	Includes tree counts, spacing, age, growth pattern, life span, optimum yield potential and kernel recovery. There is no limit on the number of plantings that can be defined in a profile.
Nut prices	Includes both current and future price estimates. Future pricing is based on fully customisable price models.
Industry levies	Based on a rate payable in cents per kilogram of kernel produced.
Annual costs	Includes fixed and variable costs for both non bearing and bearing trees and standard and custom cost categories. Variable costs can be expressed as dollars per hectare or dollars per tonne.
Periodic expenditure	Includes both purchases and leases. Purchases include both cash and finance with full amortisation of finance and depreciation. Leases include support for recurring leases as well as payout, financing and depreciation of residuals.
Finance	Includes both cash and borrowings with support for non-taxable owner contributions and withdrawals. Supports full amortisation of finance.

Table 4.1 Information contained in profiles

A set of default profiles, known as templates, is provided with the financial planner as a starting point for users to create and customise their own profiles. Each profile template is based on a typical business scenario that has been constructed from industry data collected during the first stage of the project. Users can derive their own profiles from these templates and customise them to suit their specific business requirements simply by changing the relevant information within. Additional profile templates can be sourced within the program via the Internet as they become available.

A set of yield response curves is also integrated into the planner, providing models of yield potential for each year of tree age. This is related to optimum mature yield to determine annual yield for trees that are not yet fully mature. Users can easily create their own curves to model the performance of their trees. Similarly, a set of nut price models is built into the planner, allowing users to choose a future price scenario that reflects what they believe will be future price trends. Users can easily create and customise

their own price models if required. The relationship between each of the major components in the financial planner is shown in figure 4.1.

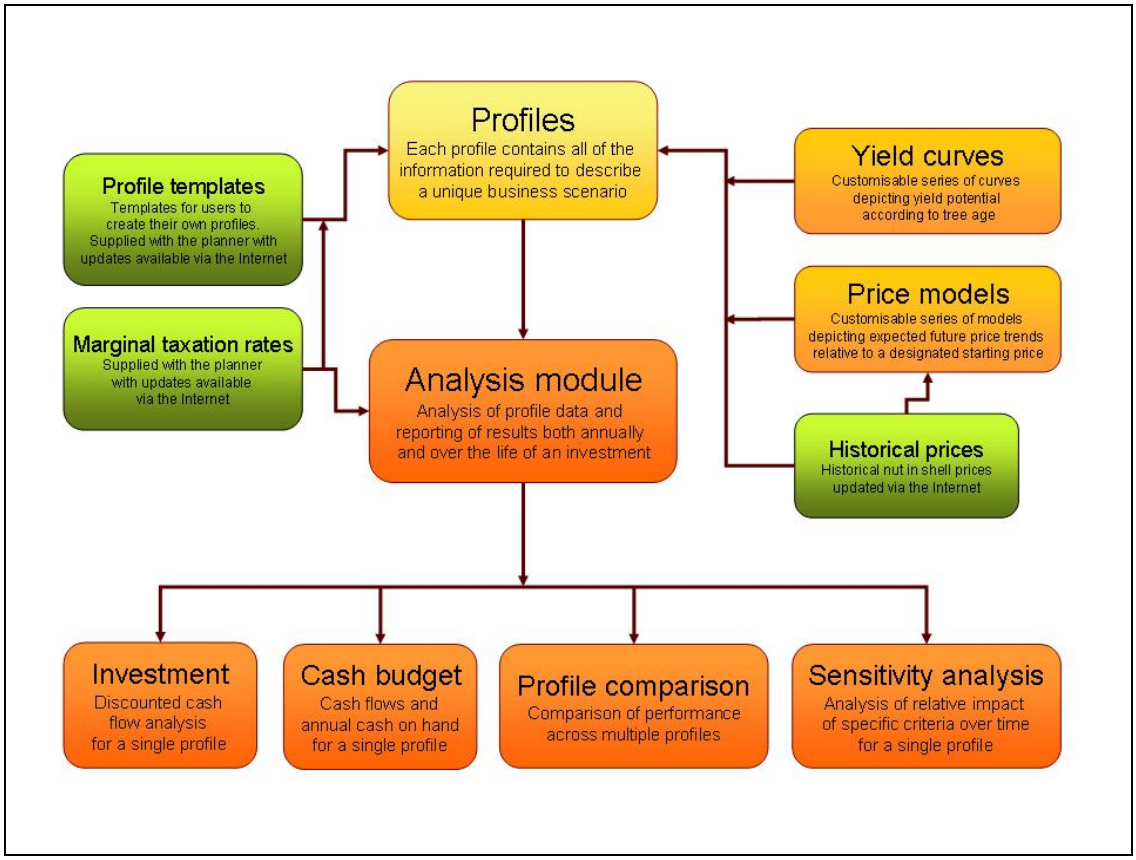


Figure 4.1 Components of the financial planner

A process of continual refinement has been ongoing in conjunction with the project steering group to ensure that the financial planner meets the needs of industry. Prototypes have been released to key users and formal testing and feedback sessions have guided the development and refinement of this tool.

4.4 Commercial delivery plan

A commercial delivery plan for the financial planner was developed by the project team in consultation with the Australian Macadamia Society and Horticulture Australia Limited. The plan provides guidelines for both domestic and international distribution and support of the planner. The plan also includes pricing structures for software licensing and provision of training and technical support for payers of the Australian Macadamia Industry Levy and non levy payers.

Following final testing and approval from the project steering group, the Financial Planner will be made available for sale according to the conditions specified in the commercial delivery plan.

5.0 Results

5.1 Summary of revenue, expenses, profit and production

The following tables show the difference in average revenue, expenses, profit and tonnes of nut-in-shell (NIS) per hectare in relation to farm age and size.

Table 5.1 shows that for farms between 6 and 10 years of age, farms are more efficient at turning revenues into profit as size increases. This is due to a decrease in expenses per hectare as farm size increases. As farm size increases, costs of production are spread over a larger area and expenses per hectare are reduced due to economies of scale. It is important to note that amongst farms between 6 and 10 years of age, the smaller farms tend to be younger than the larger farms and thus are also producing less. The effect of this is less revenue, higher costs and less profit per hectare for the smaller farm sizes.

Table 5.1 Summary of average annual revenue, expenses, profit and production for farms between 6 and 10 years of age.

>=6 Years & <=10 Years	Revenue per ha	Expenses per ha	Profit per ha	Tonnes NIS per ha
<15 Hectares	$5,087	$5,341	-$254	1.58
% of Revenue	100%	105%	-5%	
>= 15 ha & <35 Ha	$5,654	$4,164	$1,490	1.66
% of Revenue	100%	74%	26%	
>= 35 Ha	$7,268	$3,759	$3,509	1.77
% of Revenue	100%	52%	48%	

Table 5.2 shows that for farms older than 10 years of age, expenses per hectare are higher than those of younger orchards in Table 5.1, but there is less variation across the three farm size categories. However, revenue per hectare is less for smaller farms than larger farms. This translates into higher profit for larger farms given similar per hectare expenses across the three size groups.

This indicates that regardless of farm age, larger farms tend to be more efficient at turning revenue into profit due to economies of scale effects.

Table 5.2 Summary of average annual expenses and profit and production for farms older than 10 years of age.

>10 Years	Revenue per ha	Expenses per ha	Profit per ha	Tonnes NIS per ha
<15 Hectares	$9,289	$5,574	$3,714	3.11
% of Revenue	100%	60%	40%	
>= 15 ha & <35 Ha	$10,647	$5,931	$4,716	3.64
% of Revenue	100%	56%	44%	
>= 35 Ha	$11,193	$5,948	$5,245	3.69
% of Revenue	100%	53%	47%	

Appendix 2 provides a further summary of annual revenue, expenses and profit for sub samples within the survey, including:

- Farm size and revenue, costs and profit per tonne of NIS.
- Region and revenue, costs and profit per hectare.

- Managed and owner managed farm revenue, costs and profit per hectare.

5.2 Cross tabulations

The following cross tabulation tables give a breakdown of the sample based on age and revenue, costs, profit and tonnes of nut-in-shell per hectare. Almost 75% of the farms surveyed have an average age greater than ten years.

Younger farms in the survey sample have lower revenues per hectare. Table 5.3 shows that 66.7% of farm years for younger farms have revenue per hectare below $6,500 in comparison to only 10.5% of farm years for farms greater than ten years. (A farm year is the financial and production records for an individual farm for a given year.) Over half (59.6%) of the farm years for farms greater than ten years of age have revenues between $6,500 and $11,750, whereas only 20.5% of farm years for farms younger than ten years fall into the same category.

Table 5.3: Farm age and revenue per hectare cross tabulation

Farm age and revenue per hectare		**<$6,500**	**>=$6,500 to <$11,750**	**> =$11,750**	**Total**
>= 6 & <=10 Years	Number	26	8	5	39
	% Within Age group	66.7%	20.5%	12.8%	100%
	% of Total	17.0%	5.2%	3.3%	25.5%
> 10 Years	Number	12	68	34	114
	% Within Age group	10.5%	59.6%	29.8%	100%
	% of Total	7.8%	44.4%	22.2%	74.5%
Total	Number	38	76	39	153
	% of Total	24.8%	49.7%	25.5%	100%

Table 5.4 shows that 48.7% of farm years for farms younger than ten years of age have expenses of less than $6,250 per hectare compared to 15.8% of farm years for farms older than ten years. In comparison, 51.8% of farm years for farms older than 10 years have expenses between $4,250 and $6,250 per hectare. This demonstrates that the per hectare operational costs of younger farms tends to be less than for older farms.

Table 5.4: Farm age and expenses per hectare cross tabulation

Farm age and expenses per hectare		**<$4,250**	**>=$4,250 to <$6,250**	**>=6,250**	**Total**
>= 6 & <=10 Years	Number	19	17	3	39
	% Within Age group	48.7%	43.6%	7.7%	100%
	% of Total	12.4%	11.1%	2.0%	25.5%
> 10 Years	Number	18	59	37	114
	% Within Age group	15.8%	51.8%	32.5%	100%
	% of Total	11.8%	38.6%	24.2%	74.5%
Total	Number	37	76	40	153
	% of Total	24.2%	49.7%	26.1%	100%

As a consequence of lower revenue per hectare, younger farms also have lower profit per hectare. This can be seen in Table 5.5 with 35.9 % of farm years for farms less than 10 years of age making a loss compared to only 6.1% of farm years for farms greater than ten years of age. Only 17.9% of farm years for farms between 6 and 10 years made a profit of $6,000 per hectare or greater, compared to 30.7% of farm years for farms older than 10 years.

Table 5.5: Farm age and profit per hectare cross tabulation

Farm age and profit per hectare		<$0	>=$0 to < $6,000	>=$6,000	Total
>= 6 & <=10 Years	Count	14	18	7	39
	% Within Age group	35.9%	46.2%	17.9%	100%
	% of Total	9.2%	11.8%	4.6%	25.5%
> 10 Years	Count	7	72	35	114
	% Within Age group	6.1%	63.2%	30.7%	100%
	% of Total	4.6%	47.1%	22.9%	74.5%
Total	Count	21	90	42	153
	% of Total	13.7%	58.8%	27.5%	100%

The production data in table 5.6 also shows that 66.7% of farm years for farms less than 10 years old produced less than 2 tonnes of nut-in-shell per hectare. In comparison 60.5% of farm years for farms older than 10 years of age produced between 2 and 4 tonnes per hectare. The higher production in the older farms is a major factor in their higher profitability compared to the younger farms.

Table 5.6: Farm age and tonnes nut-in-shell cross tabulation

Farm age and tonnes per hectare		< 2 Tonnes	2-4 Tonnes	>=4 Tonnes	Total
>= 6 Years & <=10 Years	Count	26	12	1	39
	% Within Age group	66.7%	30.8%	2.6%	100%
	% of Total	17.0%	7.8%	0.7%	25.5%
> 10 Years	Count	7	69	38	114
	% Within Age group	6.1%	60.5%	33.3%	100%
	% of Total	4.6%	45.1%	24.8%	74.5%
Total	Count	33	81	39	153
	% of Total	21.6%	52.9%	25.5%	100%

5.3 Cost breakdowns

Figure 5.1 shows the cost breakdowns for farms between 6 and 10 years of age and less than 15 hectares. The major cost categories are:

- Repairs and maintenance of plant (38.6%)
- Administration (13.4%)
- Crop nutrition (10%)
- Repairs and maintenance of improvements (7.9%)
- Fuel (6.6%)
- Contractors (5.7%)

Employment costs make up only 0.6% and management costs only 0.4% of total costs indicating that the majority of work is undertaken by owners and is unpaid and therefore not reflected in operating costs. Most of the farms less than 15 hectares are managed by owner operators.

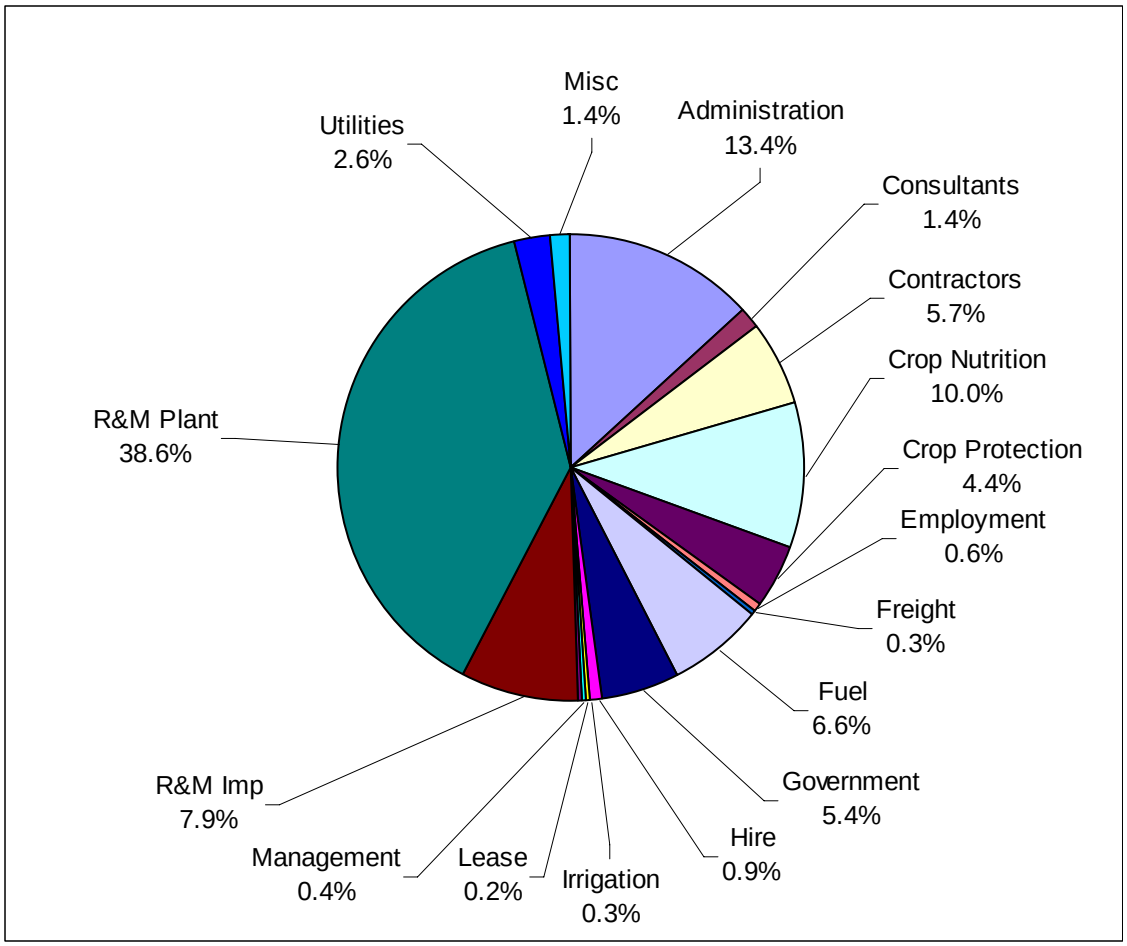


Figure 5.1: Breakdown of total costs for farms between 6 and 10 years of age and less than 15 hectares

Figure 5.2 shows the cost breakdowns for farms between 6 and 10 years of age and between 15 and 35 hectares. The major cost categories are:

- Employment (26.3%)
- Crop nutrition (16%)
- Administration (9.8%)
- Repairs and maintenance of plant (9.4%)
- Management costs (5.8%)
- Lease costs (5.8%)

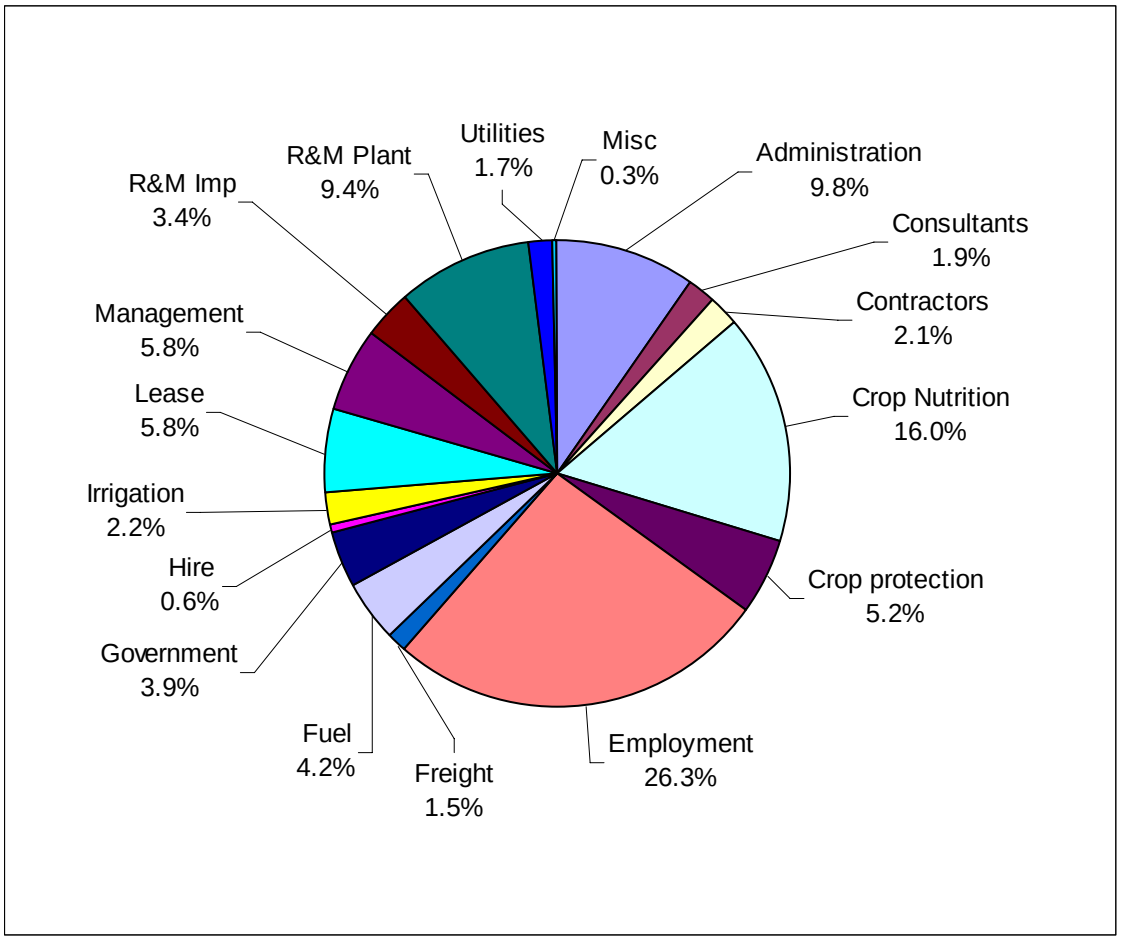


Figure 5.2: Breakdown of total costs for farms between 6 and 10 years of age and between 15 and 35 hectares

Figure 5.3 shows the cost breakdowns for farms between 6 and 10 years of age and larger than 35 hectares. The major cost categories are:

- Employment (32.3%)
- Management (12.4%)
- Crop nutrition (10.8%)
- Lease costs (9.1%)
- Administration (6.9%)
- Repairs and maintenance of plant (6.3%)

When comparing the cost breakdowns for the different size farms, employment and management costs increase and administration and repairs and maintenance of plant costs decrease as a percentage of total costs as farm size increases. The larger farms are also less likely to be managed by owner operators.

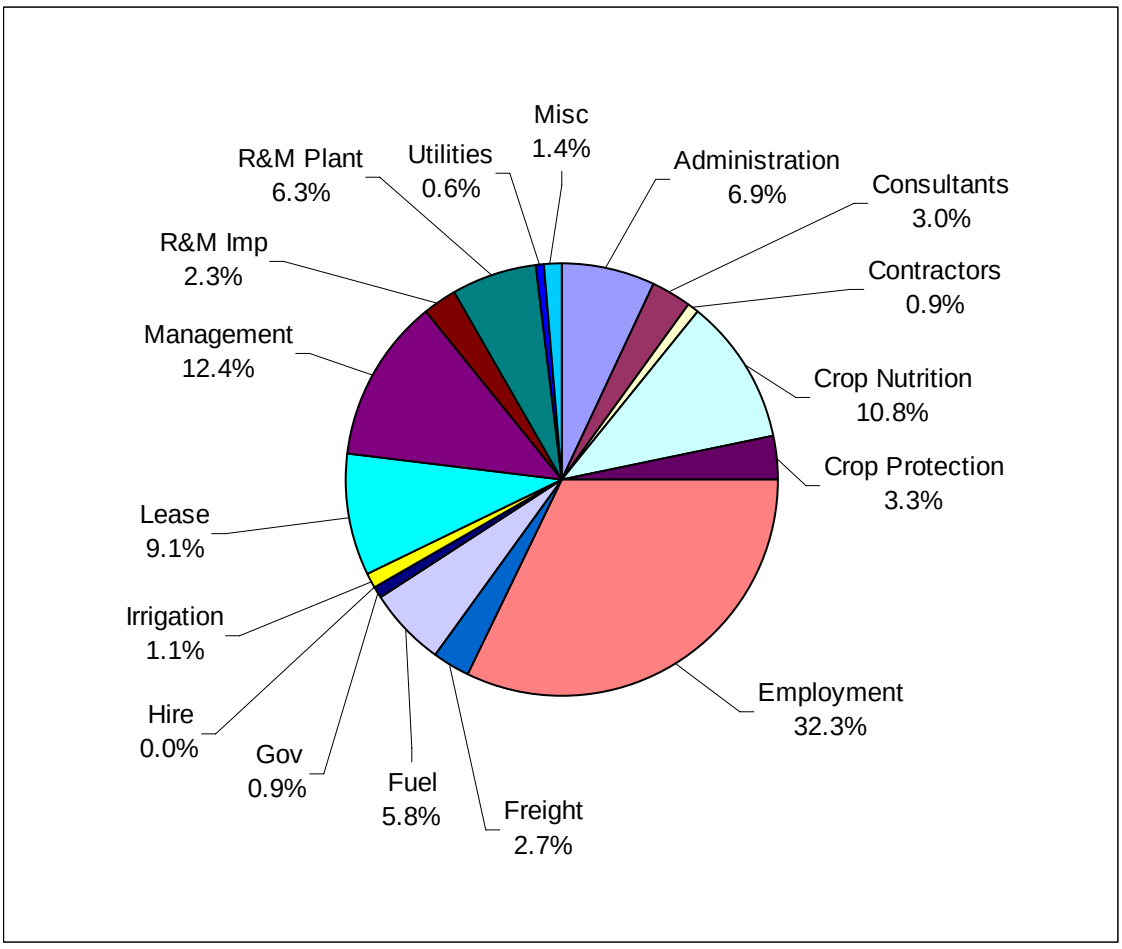


Figure 5.3: Breakdown of total costs for farms between 6 and 10 years of age and larger than 35 hectares

Figure 5.4 shows the cost breakdowns for farms older than 10 years of age and less than 15 hectares. The major cost categories are:

- Crop nutrition (14.3%)
- Administration (14.3%)
- Repairs and maintenance of plant (13.4%)
- Contractors (11.7%)
- Employment costs (10.0%)

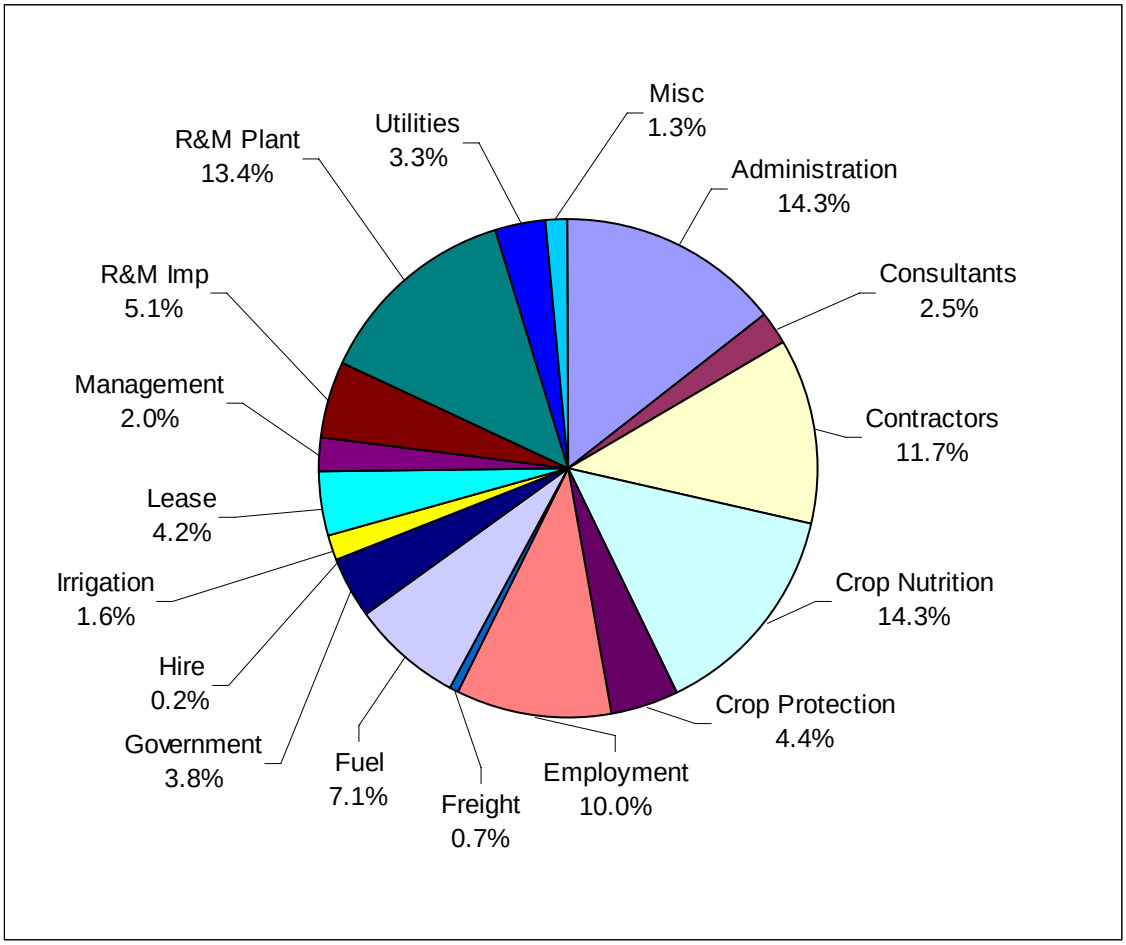


Figure 5.4: Breakdown of total costs for farms older than 10 years and less than 15 hectares

Figure 5.5 shows the cost breakdowns for farms older than 10 years of age and between 15 and 35 hectares. The major cost categories are:

- Employment costs (34.5%)
- Crop nutrition (10.3%)
- Repairs and maintenance of plant (9.6%)
- Management costs (7.3%)
- Administration (6.8%)
- Contractors (5.8%)

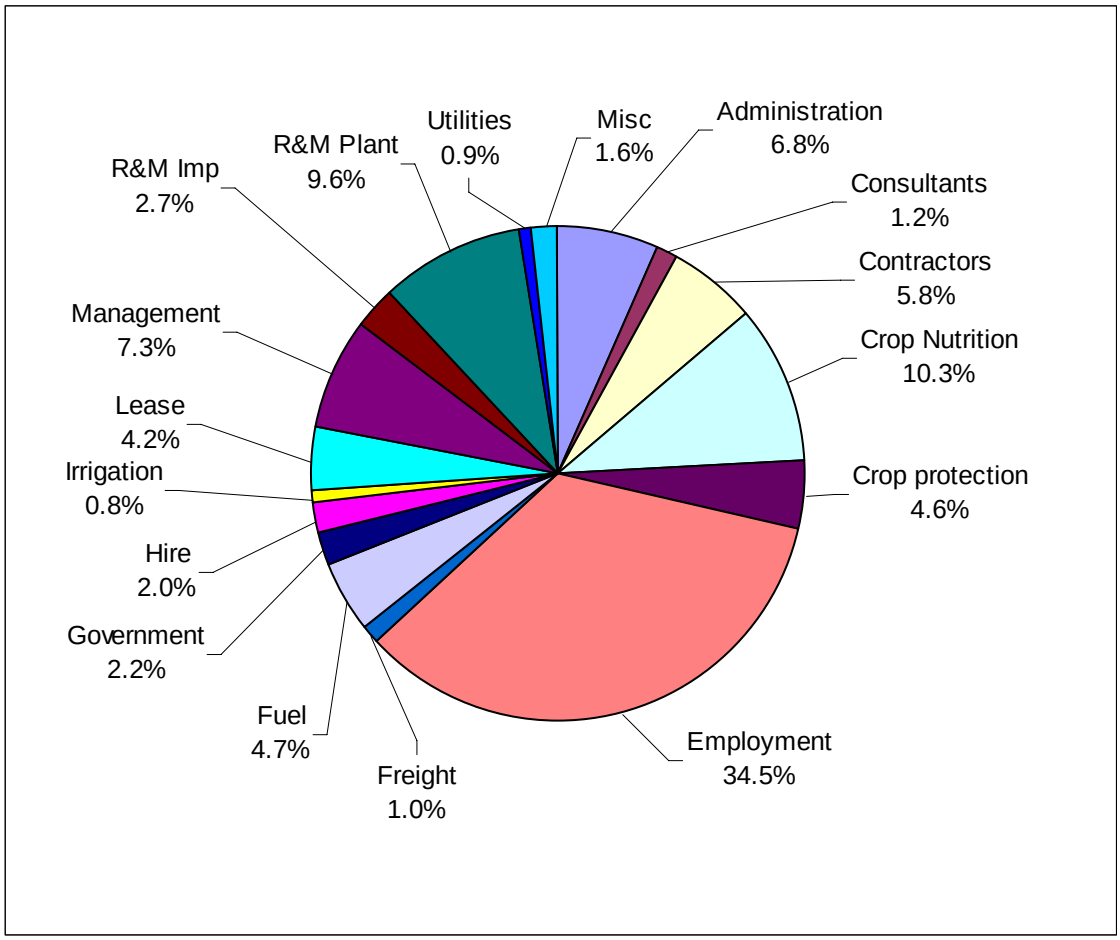


Figure 5.5: Breakdown of total costs for farms older than 10 years of age and between 15 and 35 hectares

Figure 5.6 shows the cost breakdowns for farms older than 10 years of age and larger than 35 hectares. The major cost categories are:

- Employment costs (32.4%)
- Crop nutrition (12.3%)
- Contractors (9.9%)
- Management costs (8.7%)
- Repairs and maintenance of plant (8.0%)

As with the younger farms, employment and management costs are higher and administration and repairs and maintenance of plant are lower as a percentage of total costs for larger farms compared with the farms less than 15 hectares.

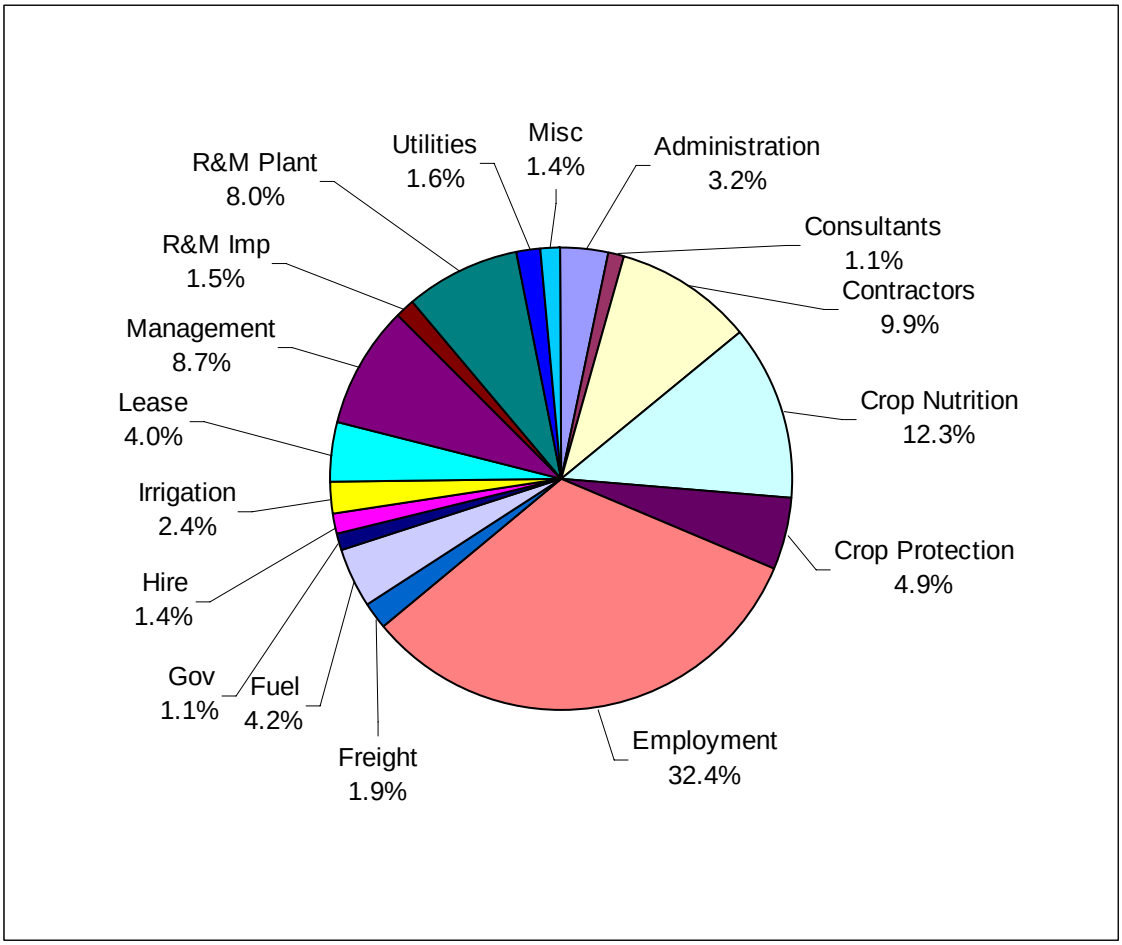


Figure 5.6: Breakdown of total costs for farms older than 10 years of age and larger than 35 hectares

5.4 Trend data

The following charts show the trends for farm age and region from 2003 to 2006 of weighted averages per hectare for revenue, costs, profit and production (tonnes nut-in-shell).

Figure 5.7 shows the trends for farms in the survey older than 10 years. Production peaked at an average of over 4.0 tonnes/ha in 2004 and 2006. Costs gradually increased from $5,022 in 2003 to $6,321 in 2005 and $6,198 per hectare in 2006. Revenue is a result of yield and price. Revenue and profit peaked in 2004 at $12,733 and $7,216 per hectare respectively. The profitability trend closely followed the revenue trend.

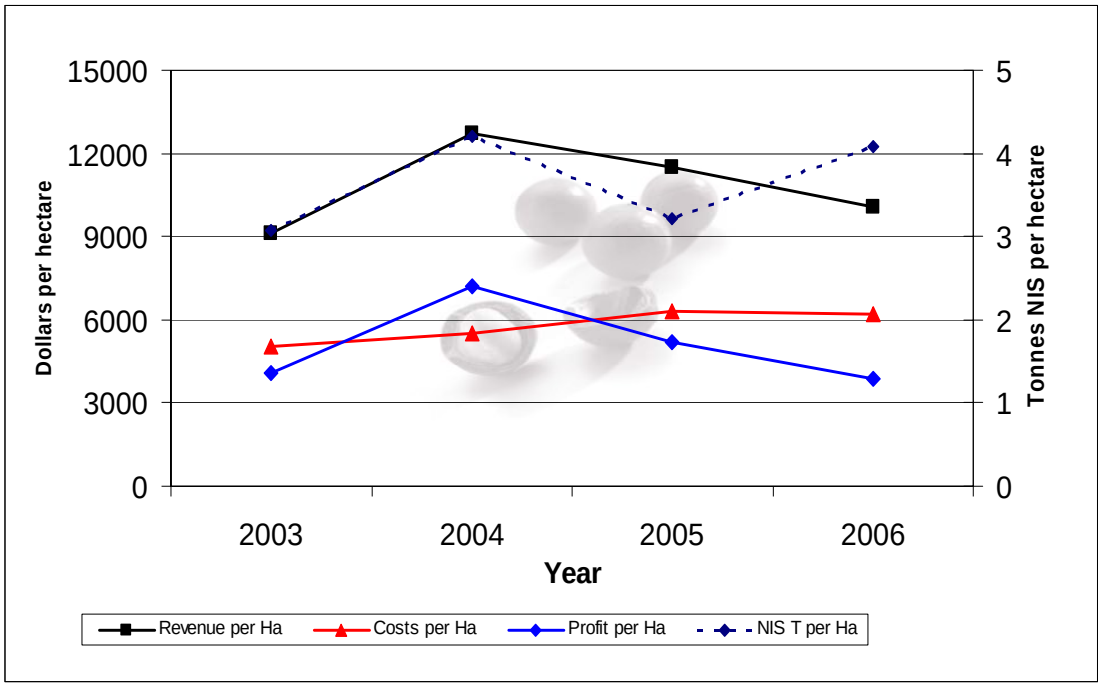


Figure 5.7: Average production and economic trends for orchards older than 10 years of age.

Figure 5.8 shows the trends for farms in the survey between 6 and 10 years of age. Average production per hectare increased steadily as the farms in the sample increased in age. Costs gradually increased from $3,608 in 2003 to $5,042 per hectare in 2006. Revenue and profit per hectare trends closely followed the increasing production.

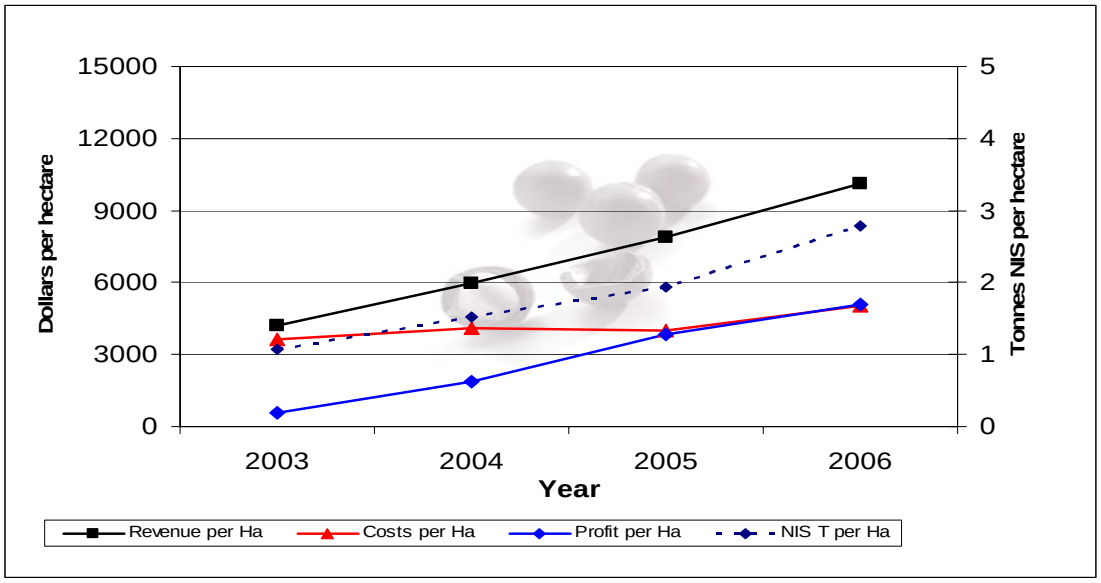


Figure 5.8: Average production and economic trends for orchards between 6 and 10 years of age.

Figure 5.9 shows the trends for farms in the survey from northern New South Wales (Lismore and Nambucca districts) older than 10 years of age. Average production peaked strongly in 2004 and 2006 at 4.54 and 4.23 tonnes nut-in-shell per hectare respectively. Costs per hectare gradually increased from 2003 to 2006. Revenue and profit peaked in 2004 at $14,448 and $8,180 per hectare respectively.

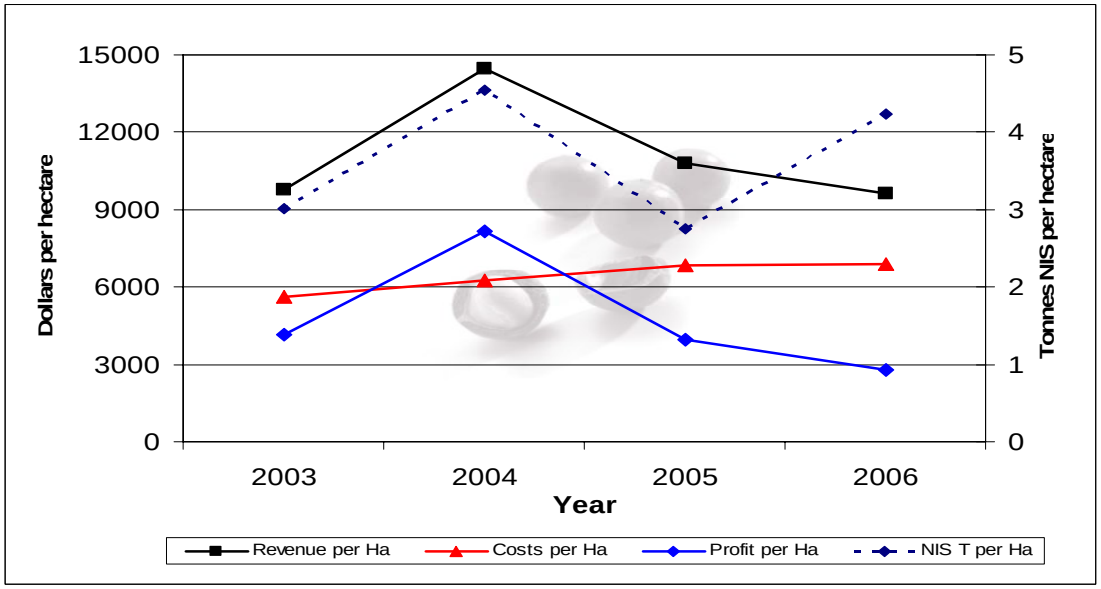


Figure 5.9: Average production and economic trends for northern NSW farms older than 10 years of age.

Figure 5.10 shows the trends for farms in the survey from the Bundaberg region older than 10 years of age. Average production was more consistent over the data collection period at approximately 4 t/ha. Costs increased from $5,023 to $5,811 per hectare from 2003 to 2006. Revenue and profit peaked in at $13,392 and $8,731 per hectare in 2004 and $13,726 and $8,638 per hectare in 2005.

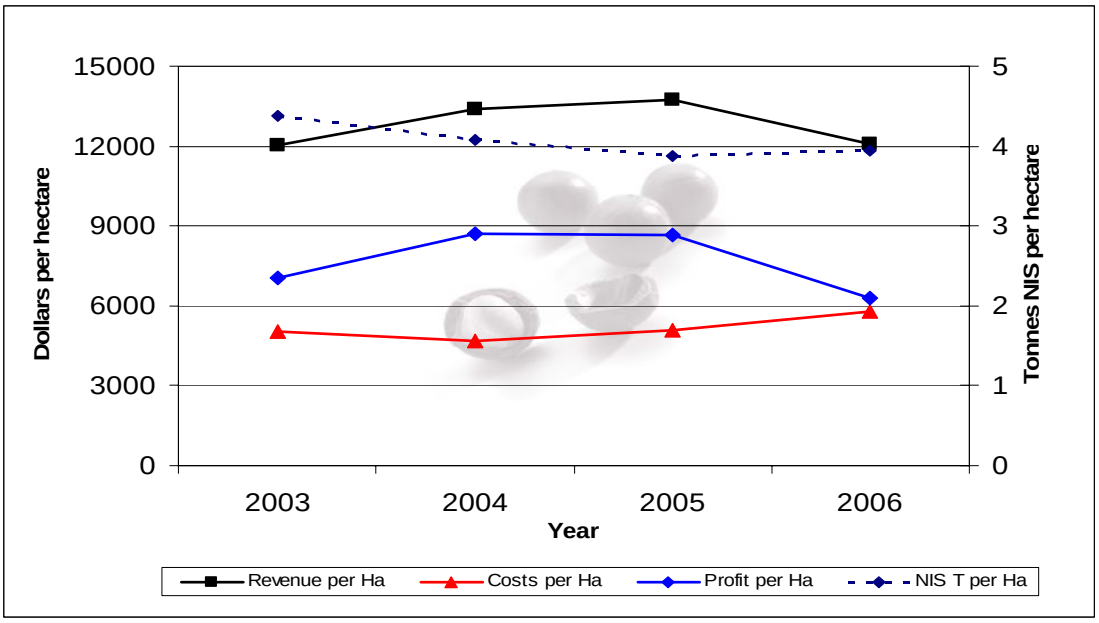


Figure 5.10: Average production and economic trends for Bundaberg farms older than 10 years of age.

Figure 5.11 shows the trends for farms in the survey from south-east Queensland (Glasshouse Mountains and Gympie districts) older than 10 years of age. Average production was well down in 2003 at 2.64 t/ha. Production from many of the farms in the survey from this region was reduced by very dry conditions from mid-2000 to 2002. Average production was more consistent after 2003 at just under 4 t/ha. Costs increased from $4,362 in 2003 to $5,897 and $5,216 per hectare in 2005 and 2006. Revenue and profit peaked in 2005 at $11,704 and $5,718 per hectare.

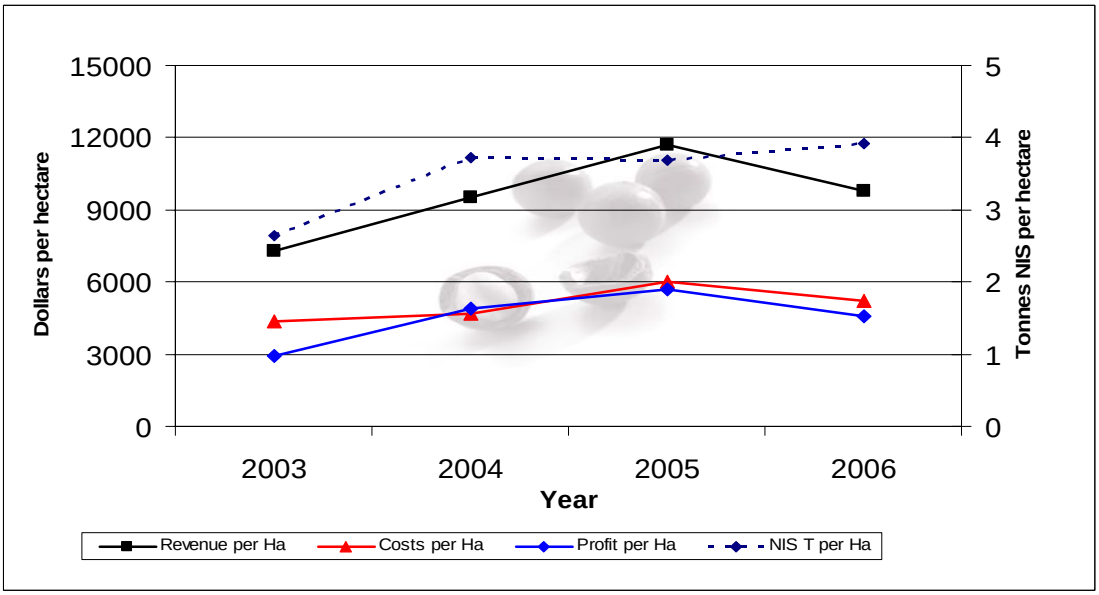


Figure 5.11: Average production and economic trends for SEQ farms older than 10 years of age.

Appendix 3 shows the charts with average per hectare trends for farms older than 10 years of age and:

- Less than 15 hectares;
- Between 15 and 35 hectares;
- Larger than 35 hectares;
- Managed by owner operators;
- Not managed by owner operators.

5.5 Statistical analyses

5.5.1 Correlations

Correlation is a measure of the interdependence of two random variables. The coefficient of correlation ranges in value from −1 indicating perfect negative correlation and +1 indicating perfect positive correlation, with 0 representing no correlation. Correlation is a directional measure of the interdependence between two variables. The strength of the correlation is measured by the significance level as well as the value of the correlation coefficient. A significance level of less than 10% (0.10 or less) indicates that there is a significant correlation between two variables. A positive or negative correlation coefficient then indicates the direction of that relationship.

For example, in the following correlation matrix in table 5.7, tree age and hectares have a positive correlation coefficient of 0.24 and the significance level is less than 1%. This means that they are significantly positively correlated indicating that in the survey sample, as farm size increases, tree age also increases. Conversely, we can see that sound kernel recovery (SKR) is significantly negatively correlated (1% level) with tree age. This indicates that as farm age increases, SKR decreases. Selection of varieties with higher kernel recoveries in the younger farms may be a contributing factor in this correlation.

NIS tonnes per hectare are significantly positively correlated with farm size and tree age. This indicates that while SKR decreases with age, production per hectare increases with age and farm size.

Unsound kernel recovery (UKR) is significantly positively correlated with farm size indicating that larger farms tend to have higher UKR than smaller orchards. SKR is also significantly negatively correlated with NIS production per hectare which indicates that as production per hectare increases, SKR decreases. UKR is significantly negatively correlated with SKR indicating that as UKR goes up, SKR goes down.

Revenue and profit per hectare are significantly correlated with orchard size, tree age and NIS production per hectare. As farm size, tree age and production per hectare increase, revenue and profit per hectare also increase. Costs per hectare are significantly correlated with tree age and NIS production per hectare. As tree age and NIS production per hectare increase, costs per hectare also increase.

Table 5.7: Correlation of farm characteristics

Correlations all farms		Hectares	Tree age	Tonnes /ha	SKR	UKR	Rev /ha	Costs /ha	Profit /ha
Hectares	Pearson Correlation Sig. (2-tailed) N	1 154							
Tree age	Pearson Correlation Sig. (2-tailed) N	0.24 0.00*** 154	1 154						
Tonnes /ha	Pearson Correlation Sig. (2-tailed) N	0.15 0.06* 154	0.55 0.00*** 154	1 154					
SKR	Pearson Correlation Sig. (2-tailed) N	0.06 0.50 154	-0.35 0.00*** 154	-0.27 0.00*** 154	1 154				
UKR	Pearson Correlation Sig. (2-tailed) N	0.16 0.04** 154	0.12 0.13 154	-0.03 0.75 154	-0.13 0.10* 154	1 154			
Revenue /ha	Pearson Correlation Sig. (2-tailed) N	0.18 0.02** 154	0.47 0.00*** 154	0.82 0.00*** 154	-0.11 0.18 154	-0.09 0.27 154	1 154		
Costs /ha	Pearson Correlation Sig. (2-tailed) N	-0.07 0.36 154	0.25 0.00*** 154	0.30 0.00*** 154	-0.05 0.52 154	-0.09 0.28 154	0.33 0.00*** 154	1 154	
Profit /ha	Pearson Correlation Sig. (2-tailed) N	0.23 0.00*** 154	0.32 0.00*** 154	0.65 0.00*** 154	-0.08 0.34 154	-0.04 0.66 154	0.81 0.00*** 154	-0.29 0.00*** 154	1 154

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

5.5.2 Comparison of farm ages

When comparing young farms with farms older than 10 years using t-tests for differences at the 10% level in table 5.8 please note the following.

If the mean difference for sample 1 minus sample 2 for a particular variable is negative and the difference is significant, then variable 1 is significantly less than variable 2. For example from table 5.8, we can see a mean difference of negative 61 for tonnes for farms between 6 and 10 years minus farms older than 10 years. This is significant at the 0.00 level (less than 0.01). This means that the younger farms produce significantly less than the farms older than 10 years.

Table 5.8 shows that the younger farms (between 6 to 10 years) in this survey are significantly smaller in size than farms older than 10 years, and produce less tonnes, tonnes per hectare and kilograms per tree. Younger farms also have significantly lower revenues, costs and profits per hectare than older farms.

SKR is significantly higher on younger farms. This may be influenced by younger farms having a varietal mix with a higher potential kernel recovery. There is no significant difference in the level of unsound kernel recovery between young and old farms.

In terms of individual cost categories (see appendix 4, table 4.1), younger farms have significantly lower per hectare costs for contractors, crop nutrition, crop protection, employment and management and significantly higher per hectare costs than older farms for repairs and maintenance of plant.

Table 5.8: Comparison of farm ages

Group statistics	Age >=6 & <=10Yrs (1) or >10 yrs (2)	Number	Mean	Mean difference (1-2)	Significance
Hectares	>=6Yrs & <=10Yrs	39	30	-2	0.03**
	>10 yrs	114	31		
Tonnes	>=6Yrs & <=10Yrs	39	52	-61	0.00***
	>10 yrs	114	113		
Tonnes per ha	>=6Yrs & <=10Yrs	39	1.7	-1.8	0.00***
	>10 yrs	114	3.5		
Kg per tree	>=6Yrs & <=10Yrs	39	5.7	-7.1	0.00***
	>10 yrs	114	12.7		
SKR	>=6Yrs & <=10Yrs	39	35.3%	3.2%	0.00***
	>10 yrs	114	32.2%		
UKR	>=6Yrs & <=10Yrs	39	1.8%	-0.3%	0.32
	>10 yrs	114	2.1%		
Revenue per ha	>=6Yrs & <=10Yrs	39	$5,848	-$4,564	0.00***
	>10 yrs	114	$10,412		
Costs per ha	>=6Yrs & <=10Yrs	39	$4,593	-$1,234	0.01***
	>10 yrs	114	$5,827		
Profit per ha	>=6Yrs & <=10Yrs	39	$1,254	-$3,331	0.00***
	>10 yrs	114	$4,585		

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

5.5.3 Comparison of management structure

It is apparent that when we compare managed and owner managed farms in table 5.9 that there are a number of significant differences. However, these differences are not necessarily due to different management regimes, but rather other factors such as orchard size and age.

For example the sound kernel recovery (SKR) of managed orchards is significantly lower than that of orchards that are owner managed, but owner managed orchards are significantly younger than managed orchards. There is a significant negative correlation between orchard age and SKR, which means that as orchard age increases there is a tendency for lower SKR. (see also table 5.7)

The average size of managed farms in the survey is also significantly larger than owner managed farms. However the revenue and profit per hectare for managed farms is significantly lower than for owner managed farms. There is no significant difference in overall costs per hectare between managed and owner managed farms. It is important to note however, that many of the smaller owner managed farms (particularly the smaller farms) do not pay themselves a salary and their time will not appear as a cost.

In terms of individual cost categories (see appendix 4, table 4.2), managed farms have significantly higher costs per hectare than owner managed farms for management and employment, and have significantly lower costs per hectare for administration, consultancy, crop nutrition, fuel and repairs and maintenance of plant than owner managed farms.

Table 5.9: Comparison of managed and owner managed farms older than 10 years

Group statistics	Managed (1) or Owner managed (2)	Number	Mean	Mean difference (1-2)	Significance
Tree age	Managed	66	17.8	2.2	0.00***
	Owner manager	48	15.5		
Hectares	Managed	66	37.7	15.6	0.00***
	Owner manager	48	22.1		
Tonnes	Managed	66	132	45	0.01***
	Owner manager	48	87		
Tonnes per ha	Managed	66	3.5	0.0	0.85
	Owner manager	48	3.5		
Kg per Tree	Managed	66	12.9	0.5	0.56
	Owner manager	48	12.5		
SKR	Managed	66	31.7%	-1.1%	0.01***
	Owner manager	48	32.8%		
UKR	Managed	66	2.2%	0.3%	0.26
	Owner manager	48	1.9%		
Revenue per ha	Managed	66	$9,945	-$1,110	0.10*
	Owner manager	48	$11,055		
Costs per ha	Managed	66	$5,876	$116	0.74
	Owner manager	48	$5,760		
Profit per ha	Managed	66	$4,069	-$1,225	0.04**
	Owner manager	48	$5,294		

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

5.5.4 Comparison of regional differences

Table 5.10 shows a comparison of the regional differences in production, revenues, costs and profit for farms greater than 10 years of age.

The statistical technique used in this section is Least Significant Difference (LSD), a post hoc ANOVA test. Please note the following:

When examining the significance level of the comparisons, any value less than 0.10 ($p<0.1$) indicates a significant difference at the 10 percent level. The mean difference tells us the directional nature of the relationship between any two variables. If the mean difference for sample 1 minus sample 2 is negative for a particular variable and the difference is significant, then the variable from sample 1 is significantly less than the variable from sample 2. For example from table 5.10 we can see that for Bundaberg minus northern New South Wales (NNSW) for hectares there is a mean difference of 16 which is significant at 0.02 (Less than 0.10). This means that in this survey, orchards in the Bundaberg region are significantly larger than orchards in NNSW and South East Queensland (SEQ). However, NNSW orchards are not significantly different to SEQ orchards. The Bundaberg orchards are also significantly younger than the NNSW orchards.

Table 5.10 also shows that farms in the Bundaberg region have significantly higher production of tonnes of nut in shell (NIS) and tonnes of NIS per hectare than NNSW and SEQ farms. Tonnes and tonnes per hectare are not significantly different between SEQ and NNSW farms.

The NNSW farms have significantly higher SKR than the Bundaberg and SEQ farms which are not significantly different. The NNSW orchards also have a significantly lower UKR than the SEQ farms.

The Bundaberg and NNSW farms have significantly higher revenue per hectare than the SEQ farms and the Bundaberg and SEQ farms have significantly lower costs per hectare than the NNSW farms. The Bundaberg farms have significantly higher profits per hectare than both the NNSW and SEQ farms. The profits per hectare are not significantly different between the NNSW and the SEQ farms.

In terms of individual cost categories (see appendix 4, table 4.3), Bundaberg farms have significantly higher costs per hectare than SEQ farms for crop nutrition and irrigation and significantly lower costs per hectare for administration, fuel and repairs and maintenance of plant. The Bundaberg farms have significantly higher costs per hectare than the NNSW farms for crop nutrition and management and significantly lower costs per hectare for contractors, employment, fuel and repairs and maintenance of plant. The NNSW farms have significantly higher costs per hectare than the SEQ farms for contractors, crop nutrition, employment, leases and repairs and maintenance of plant and lower costs per hectare for irrigation.

Table 5.10: Comparison of regions for farms older than 10 years

> 10 Years	Least significant difference					
Dependent variable	Region (I)	Region (J)	Mean difference (I-J)	Sig.	Mean	
Tree age	Bundaberg	NNSW SEQ	-2.0 -1.6	0.09* 0.21	Bundaberg	15.1
	NNSW	Bundaberg SEQ	2.0 0.5	0.09* 0.56	NNSW	17.2
	SEQ	Bundaberg NNSW	1.6 -0.5	0.21 0.56	SEQ	16.7
Hectares	Bundaberg	NNSW SEQ	16 13	0.02** 0.07*	Bundaberg	44
	NNSW	Bundaberg SEQ	-16 -3	0.02** 0.52	NNSW	29
	SEQ	Bundaberg NNSW	-13 3	0.07* 0.52	SEQ	31
Tonnes	Bundaberg	NNSW SEQ	75 72	0.01*** 0.02**	Bundaberg	180
	NNSW	Bundaberg SEQ	-75 -3	0.01*** 0.86	NNSW	104
	SEQ	Bundaberg NNSW	-72 3	0.02** 0.86	SEQ	107
Tonnes per ha	Bundaberg	NNSW SEQ	0.6 0.6	0.10* 0.08*	Bundaberg	4.0
	NNSW	Bundaberg SEQ	-0.6 0.1	0.10* 0.82	NNSW	3.5
	SEQ	Bundaberg NNSW	-0.6 -0.1	0.08* 0.82	SEQ	3.4
SKR	Bundaberg	NNSW SEQ	-1.9% -0.2%	0.00*** 0.74	Bundaberg	31.0%
	NNSW	Bundaberg SEQ	1.9% 1.7%	0.00*** 0.00***	NNSW	32.9%
	SEQ	Bundaberg NNSW	0.2% -1.7%	0.74 0.00***	SEQ	31.2%
UKR	Bundaberg	NNSW SEQ	0.2% -0.6%	0.68 0.21	Bundaberg	1.9%
	NNSW	Bundaberg SEQ	-0.2% -0.8%	0.68 0.01***	NNSW	1.8%
	SEQ	Bundaberg NNSW	0.6% 0.8%	0.21 0.01***	SEQ	2.6%

Revenue per ha	Bundaberg	NNSW SEQ	$1,518 $2,981	0.16 0.01***	Bundaberg	$12,258
	NNSW	Bundaberg SEQ	-$1,518 $1,463	0.16 0.04**	NNSW	$10,740
	SEQ	Bundaberg NNSW	-$2,981 -$1,463	0.01*** 0.04**	SEQ	$9,277
Costs per ha	Bundaberg	NNSW SEQ	-$1,354 $155	0.01*** 0.78	Bundaberg	$5,118
	NNSW	Bundaberg SEQ	$1,354 $1,510	0.01*** 0.00***	NNSW	$6,473
	SEQ	Bundaberg NNSW	-$155 -$1,510	0.78 0.00***	SEQ	$4,963
Profit per ha	Bundaberg	NNSW SEQ	$2,873 $2,825	0.00*** 0.01***	Bundaberg	$7,140
	NNSW	Bundaberg SEQ	-$2,873 -$47	0.00*** 0.94	NNSW	$4,267
	SEQ	Bundaberg NNSW	-$2,825 $47	0.01*** 0.94	SEQ	$4,314

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

5.5.5 Comparison of farm sizes

Table 5.11 shows farms less than 15 hectares in this survey are significantly younger and produce less tonnes NIS and less tonnes NIS per hectare than older farms. Farms in this survey larger than 35 hectares are significantly older than farms between 15 and 35 hectares but the tonnes NIS per hectare is not significantly different.

There is no significant difference in SKR between the three size categories but the farms larger than 35 hectares have a significantly higher UKR than the farms between 15 and 35 hectares.

In terms of revenue, the farms less than 15 hectares have significantly less income than the larger farms. Costs per hectare are not significantly different across the three size groups. Farms less than 15 hectares have significantly lower profit per hectare than farms larger than 35 hectares. However, there is no significant difference between profit per hectare for farms less than 15 hectares and farms greater 15 hectares and less than 35 hectares. This means that the biggest difference in profit is between farms in the smallest and largest size groups.

In terms of individual cost categories (see appendix 4 table 4.4), farms less than 15 hectares in the survey have significantly higher costs per hectare than farms between 15 and 35 hectares for administration, consultancy, crop nutrition, fuel and repairs and maintenance of improvements and plant and lower costs per hectare for employment and management. Farms less than 15 hectares also have higher costs per hectare than farms larger than 35 hectares for administration, consultancy, fuel and repairs and maintenance of improvements and plant and lower costs per hectare for employment and management.

Farms between 15 and 35 hectares have higher costs per hectare than farms larger than 35 hectares for administration and lower costs per hectare for irrigation and management. The higher irrigation costs are due to a higher proportion of the farms larger than 35 hectares being irrigated.

Table 5.11: Comparison of sizes for farms older than 10 years

> 10 Years	**Least significant difference**					
Dependent variable	Size (I)	Size (J)	Mean difference (I - J)	Sig.	Mean	
Tree age	<15 ha	>=15ha & <35ha	-2.3	0.00***	<15 ha	14.3
		>=35ha	-5.1	0.00***		
	>=15ha & <35ha	<15 ha	2.3	0.00***	>=15ha & <35ha	16.6
		>=35ha	-2.8	0.00***		
	>=35ha	<15 ha	5.1	0.00***	>=35ha	19.4
		>=15ha & <35ha	2.8	0.00***		
Hectares	<15 ha	>=15ha & <35ha	-20	0.00***	<15 ha	10
		>=35ha	-42	0.00***		
	>=15ha & <35ha	<15 ha	20	0.00***	>=15ha & <35ha	30
		>=35ha	-22	0.00***		
	>=35ha	<15 ha	42	0.00***	>=35ha	52
		>=15ha & <35ha	22	0.00***		
Tonnes	<15 ha	>=15ha & <35ha	-75	0.00***	<15 ha	32
		>=35ha	-162	0.00***		
	>=15ha & <35ha	<15 ha	75	0.00***	>=15ha & <35ha	107
		>=35ha	-88	0.00***		
	>=35ha	<15 ha	162	0.00***	>=35ha	195
		>=15ha & <35ha	88	0.00***		
Tonnes per ha	<15 ha	>=15ha & <35ha	-0.5	0.03**	<15 ha	3.1
		>=35ha	-0.6	0.02**		
	>=15ha & <35ha	<15 ha	0.5	0.03**	>=15ha & <35ha	3.6
		>=35ha	0.0	0.84		
	>=35ha	<15 ha	0.6	0.02**	>=35ha	3.7
		>=15ha & <35ha	0.0	0.84		

SKR	<15 ha	>=15ha & <35ha >=35ha	0.7% 0.7%	0.14 0.15	<15 ha	32.7%
	>=15ha & <35ha	<15 ha >=35ha	-0.7% 0.0%	0.14 0.98	>=15ha & <35ha	31.9%
	>=35ha	<15 ha >=15ha & <35ha	-0.7% 0.0%	0.15 0.98	>=35ha	32.0%
UKR	<15 ha	>=15ha & <35ha >=35ha	0.2% -0.3%	0.51 0.34	<15 ha	2.1%
	>=15ha & <35ha	<15 ha >=35ha	-0.2% -0.5%	0.51 0.09*	>=15ha & <35ha	1.8%
	>=35ha	<15 ha >=15ha & <35ha	0.3% 0.5%	0.34 0.09*	>=35ha	2.4%
Revenue per ha	<15 ha	>=15ha & <35ha >=35ha	-$1,358 -$1,905	0.09* 0.02**	<15 ha	$9,288
	>=15ha & <35ha	<15 ha >=35ha	$1,358 -$546	0.09* 0.49	>=15ha & <35ha	$10,647
	>=35ha	<15 ha >=15ha & <35ha	$1,905 $546	0.02** 0.49	>=35ha	$11,193
Costs per ha	<15 ha	>=15ha & <35ha >=35ha	-$356 -$373	0.39 0.38	<15 ha	$5,574
	>=15ha & <35ha	<15 ha >=35ha	$356 -$17	0.39 0.97	>=15ha & <35ha	$5,931
	>=35ha	<15 ha >=15ha & <35ha	$373 $17	0.38 0.97	>=35ha	$5,948
Profit per ha	<15 ha	>=15ha & <35ha >=35ha	-$1,002 -$1,531	0.16 0.04**	<15 ha	$3,714
	>=15ha & <35ha	<15 ha >=35ha	$1,002 -$529	0.16 0.45	>=15ha & <35ha	$4,716
	>=35ha	<15 ha >=15ha & <35ha	$1,531 $529	0.04** 0.45	>=35ha	$5,245

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

5.6 Asset values

Asset values for the sample relate to equipment used in the on-farm production of macadamias. This excludes buildings and other assets that are not employed for production activities. As stated earlier, these asset values are based on insured values. As a consequence these figures need to be treated with caution as they are only a proxy for market value. These assets do not include houses and other improvements to the land that are unrelated to macadamia production.

Table 5.12 shows that the mean asset value for the 132 farm years of data collected is $159,428. There are significant variations within the survey sample.

Older farms tend to have greater investment in assets than younger farms. Table 5.13 shows that farms older than 10 years of age have significantly greater average asset values and but lower average assets per hectare values than farms between 6 and 10 years of age. This is influenced by the older farms in the sample being larger on average than the younger farms and thus reflects economies of scale.

Table 5.12: Average asset values all farms

	Number	Minimum	Maximum	Mean
Total assets	132	$8,961	$331,000	$159,428
Assets per hectare	132	$1,071	$38,333	$8,907

Table 5.13: Average asset values for farm age groups

	Age	Number	Mean	Mean Difference	Significance
Total assets	>=6Yrs & <=10Yrs	33	$126,056	-$45,274	0.00***
	>10 yrs	98	$171,330		
Assets per ha	>=6Yrs & <=10Yrs	33	$11,151	$2,943	0.06*
	>10 yrs	98	$8,208		

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

When looking at asset values in relation to farm size in table 5.14, farms less than 15 hectares have significantly less average asset values but greater average asset per hectare values than farms larger than 15 hectares. This is because the smaller farms have fewer hectares over which to spread their investment.

The average investment in asset values is not significantly different between the farms from 15 to 35 hectares and the farms greater than 35 hectares. The larger farms do have significantly lower average asset per hectare values than the smaller farms, which indicates their economy of scale.

Table 5.14: Average asset values for farm size groups

	Farm size	Farm size	Mean difference	Sig.	Farm size	Mean
Total assets	<15 ha	>=15 & <35ha >=35ha	-$78,895 -$63,152	0.00*** 0.00***	<15 ha	$116,623
	>=15 & <35ha	<15 ha >=35ha	$78,895 $15,744	0.00*** 0.27	>=15 & <35ha	$195,519
	>=35ha	<15 ha >=15 & <35ha	$63,152 -$15,744	0.00*** 0.27	>=35ha	$179,775
Assets per ha	<15 ha	>=15 & <35ha >=35ha	$7,862 $10,422	0.00*** 0.00***	<15 ha	$14,330
	>=15 & <35ha	<15 ha >=35ha	-$7,862 $2,561	0.00*** 0.07*	>=15 & <35ha	$6,468
	>=35ha	<15 ha >=15 & <35ha	-$10,422 -$2,561	0.00*** 0.07*	>=35ha	$3,907

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

Table 5.15 shows that the managed farms have a significantly greater average investment in assets than the owner managed farms but less average assets per hectare. This is influenced by the managed farms tending to be larger in area on average than the owner managed farms and thus reflecting economies of scale.

Table 5.15 Average asset values for management structure groups

	Management	Number	Mean	Mean difference	Significance
Total assets	Managed	55	$198,119	$66,328	0.00***
	Owner Manager	77	$131,791		
Assets per ha	Managed	55	$6,211	-$4,260	0.00***
	Owner Manager	77	$10,832		

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

Table 5.16 shows that the farms in the Bundaberg region have a significantly lower average investment in assets and lower average assets per hectare than farms in northern New South Wales (NNSW) and south-east Queensland (SEQ). This is influenced by some farms in the Bundaberg group owning minimal assets of their own due to their management structure. Farms in south-east Queensland have a greater investment in assets than northern New South Wales but not a significant difference in assets per hectare.

Table 5.16 Average asset values for regions

	Region	Region	Mean difference	Significance	Region	Mean
Total assets	Bundaberg	NNSW SEQ	-$12,162 -$40,467	0.59 0.09*	Bundaberg	$140,000
	NNSW	Bundaberg SEQ	$12,162 -$28,305	0.59 0.04**	NNSW	$152,162
	SEQ	Bundaberg NNSW	$40,467 $28,305	0.09* 0.04**	SEQ	$180,467
Assets per ha	Bundaberg	NNSW SEQ	-$6,076 -$7,384	0.01*** 0.00***	Bundaberg	$3,125
	NNSW	Bundaberg SEQ	$6,076 -$1,308	0.01*** 0.36	NNSW	$9,201
	SEQ	Bundaberg NNSW	$7,384 $1,308	0.00*** 0.36	SEQ	$10,509

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

5.7 Discounted cash flow analysis

The discounted cash flow analysis is designed to provide a complete picture of the economics of macadamia production over a specified period for a farm.

A discounted cash flow analysis is a method of evaluating an investment by estimating future cash flows and taking into consideration the time value of money. The time value of money refers to the idea that the value of one dollar today is worth more than the same dollar in a year's time. This is based on the core principle of finance that any amount of money is worth more now than it will be in the future. In economic terms this means that due to inflation, the buying power of a dollar is eroding as time goes by.

When undertaking a discounted cash flow analysis we are discounting the future value of the cash flows of a potential investment so we know what the returns are in today's dollars. That is the present value of the investment's cash flows, not the eroded future value of the cash flows. This allows us to evaluate whether the investment outlay in relation to the cash flows it will generate are profitable, given our individual requirements for return on investment. This is referred to as the discount rate and is calculated based on project risks and the potential returns of other alternative investments.

Internal rate of return (IRR) is the rate of return, or discount rate at which the net present value (NPV) will be equal to zero. In project evaluation this rate has to be equal to or greater than the required rate of return for the project to be acceptable. The net present value of a project is calculated by subtracting the present value of the capital outlays from the present value of the cash inflows.

The cash flow situation will differ for each farm depending on individual circumstances. The financial planning software will enable growers to examine the effect on profitability over the life of the orchard by varying yields, prices and costs. Further development of the software will enable the creation of example financial profiles based on data collected in this project to assist growers to examine these effects on profitability.

We have provided a comparison in this section between establishing a new 30 hectare macadamia farm and purchasing an existing bearing 30 hectare farm. Both farms are located in northern New South Wales or south-east Queensland. Both situations are analysed over 20 and 30 year time frames.

Both case studies are based on assumptions that can be varied for each situation. The costs used are based on figures from the economic analysis. These figures are used in the profiles in the financial planner. The price figures have been updated to reflect the 2009 NIS price figures and the 20 year average from 1987 to 2006. As the price in 2009 ($1.90/kg NIS) was less than the 20 year average ($2.80/kg NIS), this has resulted in internal rates of return slightly lower than when just the 20 year average was used.

5.7.1 Case study 1 – Establishing a new farm

The assumptions in this case study are:

- It is a 30 hectare farm in northern New South Wales or south-east Queensland.
- The orchard is not irrigated.
- The required rate of return for the case study is 4%.
- A total of 40 hectares @ $30,000/ha is purchased in 2009 at the start of the project, of which 75% (30 hectares) is planted with macadamias. The land appreciates in value at 3% per annum (this is considered a conservative increase as macadamia land in NNSW and SEQ has increased in value at a higher rate over the past 20 years).
- Trees are purchased @ $12 / tree and cost $2 each to plant. The trees are valued @ $100/tree at maturity.
- There are other initial investment costs of $30,000 for improvements (e.g. farm shed and roads) and $100,000 for machinery. A further $50,000 is spent on shed machinery in year 5. In this case study, most orchard machinery is leased.
- Initial purchase is by owner cash investment rather than borrowings. Further cash injections are provided by the owner during the first 7 years until net nut revenue exceeds cash outflows.
- The expected value of the farm (land, trees, machinery and improvements) at the end of 20 years is $4,000,000 and at the end of 30 years is $5,300,000.
- The 30 hectares of macadamias are planted at a spacing of 8 metres by 4 metres at the start of the project. This gives a total of 9360 trees. Expected yield at maturity is 4 tonnes NIS/ha with a saleable kernel recovery of 36%.
- The trees are 4 years of age at their first harvest.
- The NIS price at the start of the case study is $1.90/kg (based on the 2009 price) at a standard sound kernel recovery of 33%. After 4 years, the NIS price recovers to a standard price of $2.80/kg. This is based on the average NIS price from 1987 to 2006 (Andrew Heap, Australian Macadamia Society, personal communication). After recovering to $2.80/kg, the price increases at an average annual rate of 1.2%. Based on this rate of increase, the price will be $3.30/kg in year 20 and $3.64/kg in year 30.
- The industry levy is 25.21c/kg kernel.
- The annual inflation rate is 3%.
- There is no taxation in this case study.
- During the non-bearing stage, the average annual fixed costs are $26,500 and the average annual variable costs are $1,450/ha.
- During the bearing stage, the average annual fixed costs are $45,300 and the average annual variable costs are $4,570/ha. In the first year of bearing, 60% of mature bearing costs apply. Full costs are reached 8 years after the first year of bearing.
- No other farm cash inflows or cash outflows are included in the case study.

Figure 5.12 shows the net cash flow, nut revenue and cash outflows during the 20 year time frame following the start of the project in 2009. The project has an internal rate of return (IRR) of 4.88%. Minimum cumulative cash flow is -$2,011,678 in 2016. For the 30 year time frame, IRR is 3.8%. The lower IRR at 30 years is due to costs increasing with inflation at a higher rate than prices. Figure 5.13 shows the cumulative cash flow over the 20 year time frame. The final year with the final farm value is not included in the chart.

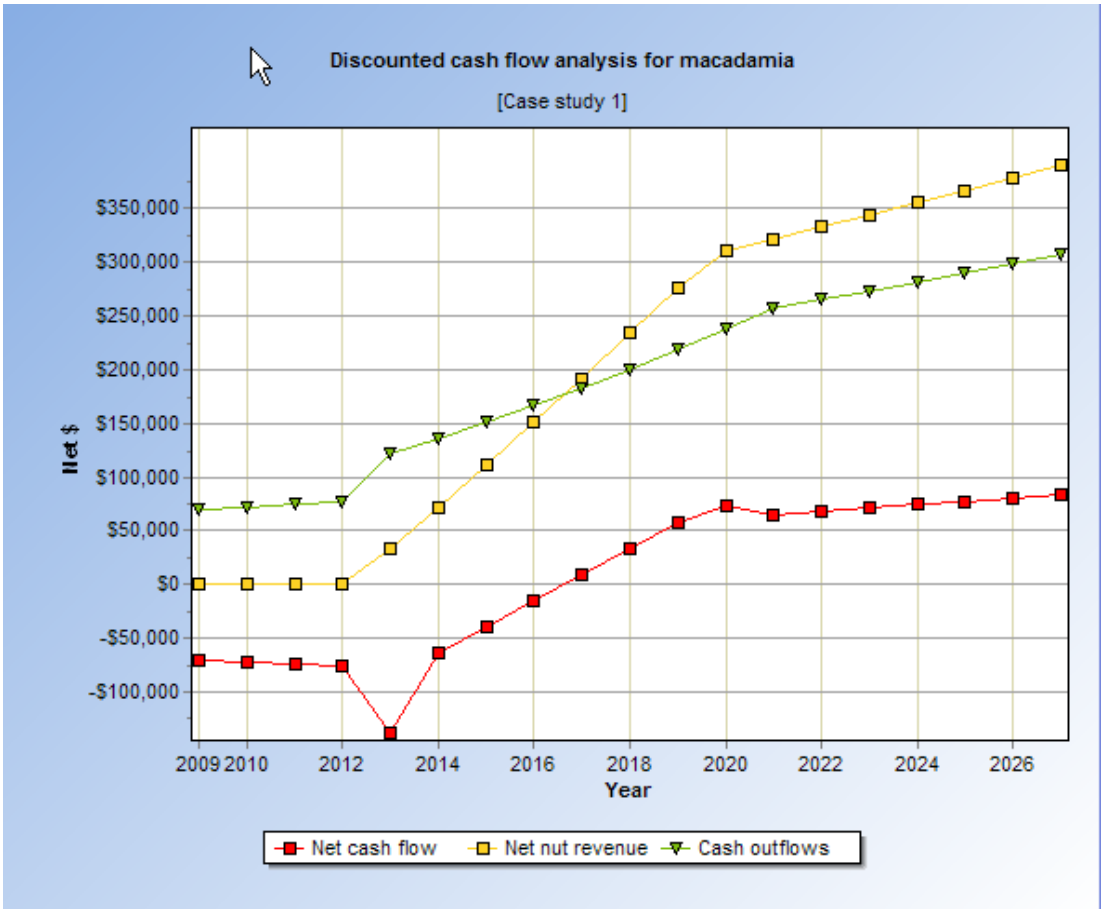


Figure 5.12: Net cash flow, nut revenue and cash outflows for a new 30 hectare farm

Figure 5.13: Cumulative cash flow for a new 30 hectare farm

5.7.2 Case study 2 – Buying an existing farm

The assumptions in this case study are:

- It is a 30 hectare farm in northern New South Wales or south-east Queensland.
- The orchard is not irrigated.
- The required rate of return for the case study is 4%.
- The farm comprises a total of 40 hectares, of which 75% (30 hectares) is planted with macadamias. The land is valued at $30,000/ha at purchase in 2009 at the start of the project. The land appreciates in value at 3% per annum.
- There are 30 hectares of macadamia trees planted at a spacing of 8 metres by 4 metres giving a total of 9360 trees. The trees are 15 years old at the start of the case study and are valued @ $100/tree.
- Expected yield at maturity is 4 tonnes NIS/ha with a saleable kernel recovery of 33%.
- There is a shed and equipment to the value of $80,000 and machinery to the value of $100,000 as part of the purchase. In this case study, most orchard machinery is leased.
- Initial purchase is by an owner contribution of $2,000,000 and borrowings of $400,000.
- The expected value of the farm (land, trees, machinery and improvements) at the end of 20 years is $4,000,000 and at the end of 30 years is $5,300,000.
- The NIS price at the start of the case study is $1.90/kg (based on the 2009 price) at a standard sound kernel recovery of 33%. After 4 years, the NIS price recovers to a standard price of $2.80/kg. This is based on the average NIS price from 1987 to 2006 (Andrew Heap, Australian Macadamia Society, personal communication). After recovering to $2.80/kg, the price increases at an average annual rate

of 1.2%. Based on this rate of increase, the price will be $3.30/kg in year 20 and $3.64/kg in year 30.

- The industry levy is 25.21c/kg kernel.
- The annual inflation rate is 3%.
- There is no taxation in this case study.
- The average annual fixed costs are $45,300 and the average annual variable costs are $4,570/ha.
- No other farm cash inflows or cash outflows are included in the case study.

Figure 5.14 shows the net nut revenue, cash outflows and net cash flow during the 20 year time frame following the start of the project in 2009. The project has an internal rate of return (IRR) of 5.91%. Minimum cumulative cash flow is $2,316,000 at the start of the project. For the 30 year time frame, IRR is 4.64%. The lower IRR at 30 years is due to costs increasing with inflation at a higher rate than prices. Figure 5.15 shows the cumulative cash flow over the 20 year time frame. The final year with the final farm value is not included in the chart.

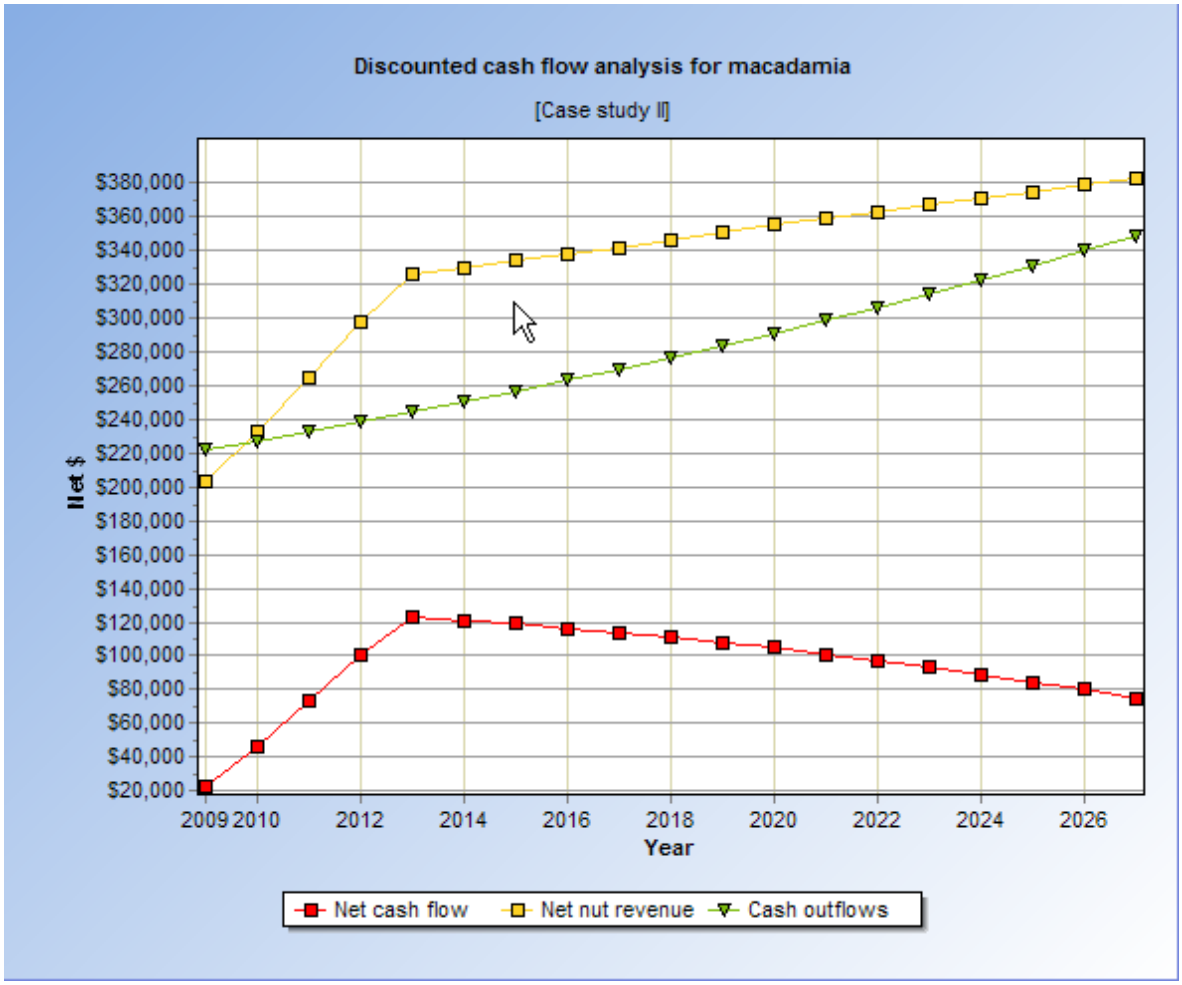


Figure 5.14: Net cash flow, nut revenue and cash outflows for an established 30 hectare farm

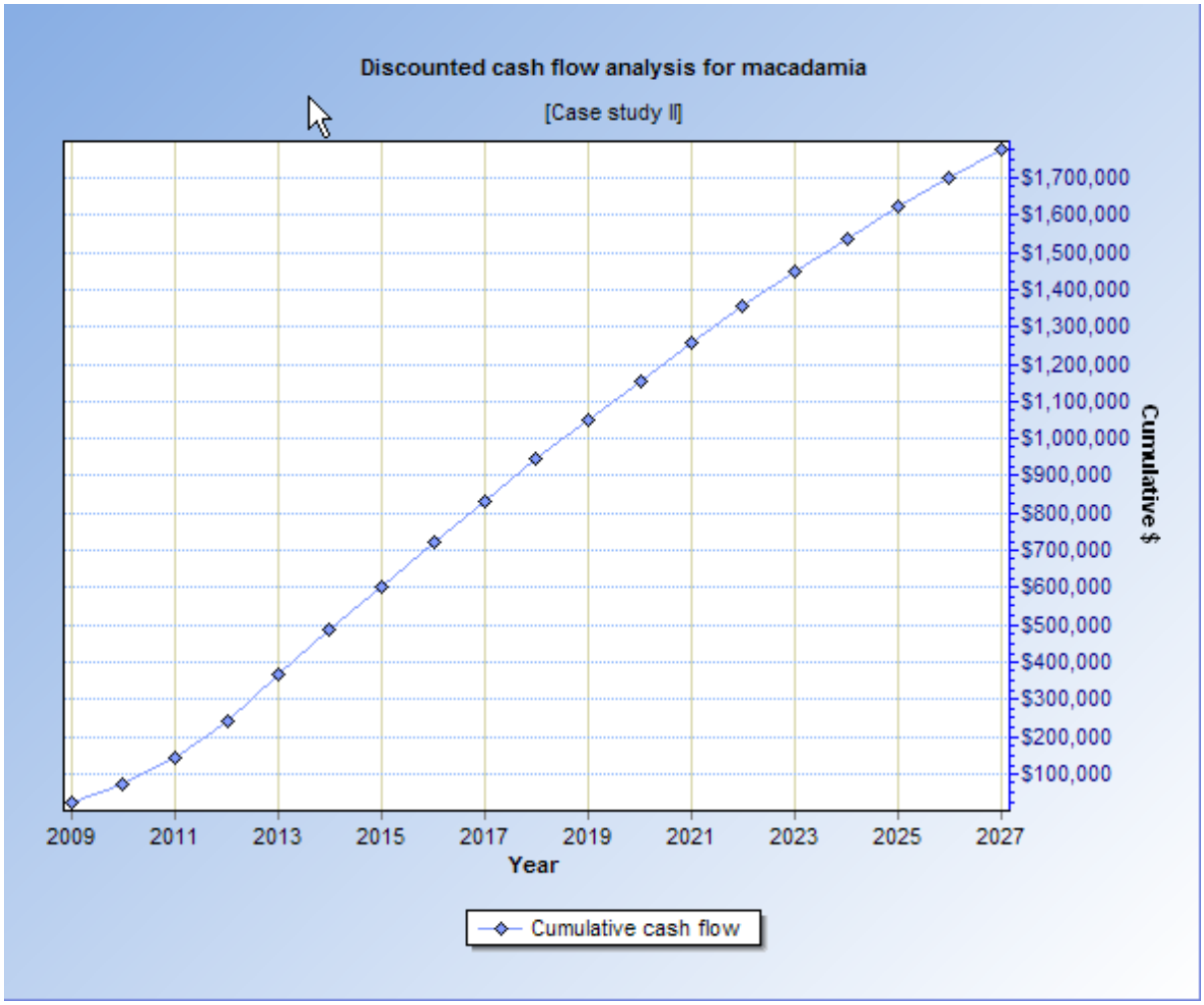


Figure 5.15: Cumulative cash flow for an established 30 hectare farm

Table 5.17 shows the summary data for the two case studies of establishing a new 30 hectare farm and purchasing an already established 15 year old 30 hectare farm in SEQ or NNSW based on the discounted cash flow analysis over a 20 year and 30 year period. The required rate of return has been set at 4%.

Table 5.17: Summary data for new and established 30 hectare farms

	Analysis period (years)	Required RR%	IRR%	NPV	Minimum cumulative cash flow ($)	Minimum cumulative cash flow (years)
New 30 ha farm	20	4.00%	4.88%	$316,764	-$2,011,678	7
	30	4.00%	3.8%	-$94,690	-$2,011,678	7
Established 30 ha farm	20	4.00%	5.91%	$752,274	-$2,316,000	Initial purchase
	30	4.00%	4.64%	$297,409	-$2,316,000	Initial purchase

Given the 4% required rate of return, both examples provide a positive net present value (NPV) over the 20 year analysis period. Both have a slightly lower internal rate of return (IRR) over the 30 year analysis period due to costs calculated to increase at a greater rate than nut prices. Purchasing the already established 30 hectare farm has a higher IRR and NPV over the 20 and 30 year analysis periods than establishing the new 30 hectare farm based on the data used in these examples.

The new 30 hectare farm has a minimum cumulative cash flow at 7 years after initial establishment of -$2,011,678 when the net nut revenue begins to exceed cash outflow. Purchasing the existing established 30 hectare farm produces a minimum cumulative cash flow of -$2,316,000 at the time of the initial investment.

These internal rates of return are slightly lower than those quoted in the original interim final report. This is mainly due to the lower price models used in these analyses. These lower price models more accurately reflect macadamia prices since the initial interim final report was published.

6.0 Discussion

6.1 Survey findings

Financial and production data was collected and analysed from 41 farms from major macadamia growing districts in Queensland and New South Wales for four calendar years from 2003 to 2006. The sample represents a cross-section of farms in the Australian macadamia industry for farm size, farm age, region, management structure, productivity and financial performance. The data was analysed to enable comparisons between subgroups within the survey sample.

6.1.1 Farm size

Larger farms tended to be more efficient at turning revenues into profits due to economies of scale. This was the case for both farms in their early bearing years between 6 and 10 years of age and for farms older than 10 years.

There were major differences in the cost breakdowns between the different farm sizes. Smaller farms spent a greater proportion of their total costs on repairs and maintenance of plant and improvements, administration, fuel and contractors compared to larger farms. Much of this greater proportion of costs is due to reduced economies of scale amongst the smaller farms.

Larger farms spent a greater proportion of their total costs on employment and management costs than the smaller farms. Most of the smaller farms in the survey are managed by owner operators who do not pay themselves a wage and who do not pay management costs. In this analysis, we have focused on cash revenues and costs and have not included the opportunity costs of unpaid labour. The opportunity costs of an owner operator's time need to be considered in the financial planning of a macadamia orchard.

The smaller farms in the survey sample yielded less tonnes of nut-in-shell (NIS) per hectare and had lower revenue and profit per hectare than the larger farms. Expenses per hectare were not significantly different between the farm sizes. The opportunity costs of smaller farms managed by owner operators who do not pay themselves a wage must also be considered when comparing expenses. The smaller farms had lower costs per hectare for employment and management. They also had higher costs per hectare for administration, consultancy, crop nutrition, fuel and R&M of plant and improvements than the larger farms due to the economies of scale of the larger farms.

The effect of economies of scale was also seen in investment in assets. The smaller farms had lower average asset values but greater average assets per hectare as they have fewer hectares over which to spread their investment.

6.1.2 Farm age

The younger bearing farms were less productive than older farms and had lower revenues, costs and profit per hectare. This is expected as production increases steadily during this early bearing stage and then tends to plateau once the trees reach maturity. The younger farms had lower costs per hectare for contractors, crop nutrition, crop protection, employment and management compared to older farms. These costs would be expected to increase with the growing, harvesting and handling of the increasing production.

Younger farms had a significantly higher sound kernel recovery (SKR) than the older farms. This is largely due to the selection of varieties with potential for a higher SKR on the younger farms. These varieties were often not readily available when many of the older farms were planted. As kernel recovery is a key factor in determining unit (NIS) price, increasing kernel recovery is also an important factor in maintaining profitability in macadamia production. It is important to note that higher kernel recovery is just one important trait that needs to be considered in selecting varieties. Yield and susceptibility to pests and diseases are also important traits that need to be considered.

Costs per hectare increased from 2003 to 2006 with the older farms reflecting the gradual continued increase in unit input costs for labour and chemicals etc. Revenue per hectare moved more strongly depending on yield and unit NIS price. The profitability trend closely followed the revenue trend.

For the younger bearing farms, average production per hectare increased steadily as the farms increased in age. Costs per hectare increased more gradually than production. Revenue and profit per hectare trends closely followed increasing production. As with the older farms, this shows the importance of yield in maximising profitability.

The older farms being larger on average than the younger farms had a greater average investment in assets but fewer assets/ha than the younger farms.

6.1.3 Regional comparisons

For farms older than 10 years of age, average production peaked strongly at over 4 tonnes NIS/ha in 2004 and 2006 in northern New South Wales (NNSW). Average production was more consistent amongst the Bundaberg farms at approximately 4 tonnes per hectare over each of the four years. Average production in south-east Queensland (SEQ) was reduced in 2003 by very dry climatic conditions in preceding seasons and then was more consistent at just under 4 tonnes per hectare for the following 3 years. This resulted in the Bundaberg farms having a significantly higher average yield of 4.0 tonnes per hectare compared to an average of 3.5 tonnes per hectare for the NNSW farms and an average of 3.4 tonnes per hectare for the SEQ farms over the four years.

The yield results from the Bundaberg farms show the importance of being able to manage factors such as soil moisture in achieving consistent NIS yields. The Bundaberg farms are all irrigated. The NNSW farms are nearly all not irrigated. Some of the SEQ farms are irrigated but many of the irrigated farms had an insufficient water supply for the 2003 crop following very dry climatic conditions in 2001 and 2002. Increased rainfall in 2003 led to major increases in production in 2004 in NNSW and SEQ.

Bundaberg farms in the survey sample were younger than NNSW farms and larger and more productive (tonnes NIS/ha) than NNSW and SEQ farms. The Bundaberg and NNSW farms had higher revenue per hectare than the SEQ farms and the Bundaberg and SEQ farms had lower costs per hectare than NNSW farms. Most importantly, the Bundaberg farms also had a higher profit per hectare than the NNSW and SEQ farms.

The Bundaberg farms had higher costs per hectare for crop nutrition and irrigation than the SEQ and NNSW farms, reflecting the greater use of these inputs in growing the crop. The Bundaberg farms also had lower costs per hectare for fuel and R&M of plant than the SEQ and NNSW farms and employment (NNSW only). The flatter terrain and longer tree rows with the Bundaberg farms also contributed to the lower costs per hectare for cost categories such as fuel.

The Bundaberg district farms had a lower average investment per hectare in assets than the NNSW and SEQ farms. This was partly due to the Bundaberg farms being larger and achieving economies of scale. It was also influenced by some of the farms in the Bundaberg district owning minimal assets of their own due to their management structure. This enabled hiring and sharing machinery amongst farms.

6.1.4 Management structure

Managed farms in the survey sample were on average larger and older than owner operated farms. Revenue and profit per hectare were higher for owner operated farms but costs per hectare were similar between managed and owner operated farms. The opportunity costs of farms managed by owner operators who do not pay themselves a wage must also be considered when comparing expenses. The managed farms had higher costs per hectare for employment and management. Managed farms had lower costs per hectare for administration, consultancy, crop nutrition, fuel and R&M of plant. The larger size of the managed farms meant economies of scale in these cost categories.

The managed farms also had greater investment in assets but fewer average assets per hectare. This was mainly due to the managed farms being larger on average than the owner operated farms and able to achieve economies of scale.

6.1.5 Maintaining profitability

Maintaining profitability will be a key issue if costs continue to rise faster than prices. This can be achieved by increasing revenue or decreasing costs. In this project, revenue (driven by yield and unit price) was a larger driver of profitability than costs. The data showed how yield, revenue, and profitability per hectare were closely correlated. If the unit NIS price continues to increase at an average rate of 1.18% per annum (as occurred from 1987 to 2006) and costs continue to increase at least at an inflation rate of 3% per annum, improving yield per hectare and nut quality will become increasingly important in maintaining profitability.

Increasing the average yield of NIS per hectare and nut quality can be achieved. Individual farmers within the survey sample were able to consistently achieve higher yields, revenue and profitability per hectare than the average.

Individual farmers within the MacMan best practice groups have also been able to consistently achieve higher than average yields. The average yield for mature bearing orchards within the groups from 2001 to 2007 was 3.7 tonnes NIS per hectare (Summary of MacMan best practice group results 2001 to 2009). Several members of the best practice groups consistently yield higher than 4 tonnes NIS per hectare. The best practice groups have provided opportunity for macadamia growers to compare and analyse and improve their management practices and results. The “Evaluation of MacMan products and services” (2005) found that best practice group members had made major changes in the previous five years to their management practices to improve their efficiency and productivity.

Increased sound kernel recoveries are possible with selection of better performing varieties. This is seen in the higher average SKR amongst the younger bearing farms, which had access to better performing varieties that were not available at the time of planting of the older farms. It is important to note that

increased sound kernel recovery is just one of the key traits in selecting varieties, alongside yield, pest and disease susceptibility etc.

The level of reject nuts can also be reduced. Within the MacMan best practice groups, the average level of rejects due to sorting in the shed or at the factory was reduced from 16% of the harvest yield in 2002 to less than 10% in 2007.

Improvements in farm efficiency can also reduce costs of production. Dehusking and sorting and handling nuts and harvesting are the major labour categories in mature macadamia farms in the MacMan best practice groups. The average time spent machine harvesting in mature bearing farms in the groups was reduced from 4 to 2.5 hours per tonne from 2003 to 2006. The average time spent post-harvest handling was also reduced from 6 to 3.5 hours per tonne from 2003 to 2006. This did not lead to a reduction in quality. At the same time as improving efficiency, the average reject or unsound kernel recovery was reduced from a peak of 2.8% in 2002 to 1.8% in 2006.

Major changes amongst best practice group members included upgrading harvesting and post-harvest handling equipment. This resulted in improved productivity and efficiency and nut quality. Harvest intervals were reduced and nuts stored for less time on-farm before consignment. Quinlan et al (2006) also documented the quality gains and cost benefits from improved farm management practices such as reduced harvest intervals. Increasing the number of harvest rounds and decreasing the interval between harvest rounds did not increase labour and machinery running costs but led to a significant reduction in the level of shed rejects and a significant increase in average sound kernel recovery.

Hiring or sharing of equipment between farms, or contracting out services such as harvesting or dehusking can be a viable option in reducing capital outlays for some farms. This is particularly the case when farms have limited production due to farm size or age. Many farms contract out services until their level of production warrants capital expenditure on equipment. Financial benefits of sharing equipment or contracting out services must also be balanced with being able to readily access equipment and services during critical periods.

6.2 Discounted cash flow analyses

The data collected in this project has been used to develop example farm financial profiles to calculate discounted cash flow analyses. These analyses provide a complete picture of the economics of macadamia growing over a specified period for a farm.

The discounted cash flow analyses case studies (see section 5.7) compare the establishment or purchase of an existing 15 year-old 30 hectare macadamia farm. The farms are not irrigated and are typical of those found in NNSW or SEQ.

The financial profiles considered the following:

- Analysis period and required rate of return;
- Initial investment costs for land, trees, improvements and machinery and expected values at the end of the case study;
- Tree numbers, spacing and yield;
- Expected price trends;
- Inflation, taxation and depreciation;
- Annual fixed and variable costs for bearing and non-bearing plantings, and
- Periodic capital expenditure for improvements and machinery.

Given a required rate of return of 4% for both examples, the net present value (NPV) is positive over a 20 year analysis period, indicating that both case studies are viable investment options. However, the internal rate of return shows that when establishing a new 30 hectare farm using a 20 year analysis period, it only just covers the required rate of return with an IRR of 4.88%. In the 20 year analysis, the minimum cumulative cash flow of -$2,011,678 occurred seven years after the initial orchard establishment, after which net nut revenue began to exceed cash outflow.

The IRR was lower (3.8%) for establishing the new farm for the 30 year analysis period. The NPV is negative indicating that this is not a viable investment option if a rate of return of 4% is required. The drop in NPV and IRR over the longer 30 year analysis period is due to the assumption that production costs would increase with inflation, whereas nut prices would be more variable and based on historical data, increase at a lower rate than inflation.

The price increases in these profiles are based on historical nut price trends and reflect a conservative view of nut price increases over the life of the project. The profiles also assume that costs will continue to rise at the rate of inflation. No allowance in the profiles has been made for improved efficiencies that may reduce costs and improve profitability.

Given these assumptions, it is apparent from the examples in this report that the farm investments will become less viable over time due to prices increasing at a lower rate than costs, which are increasing at the rate of inflation. However, in reality the margin between revenues and costs will have to be adequate if the industry is to remain viable in the long term.

If there are extended periods where costs exceed revenues, it is implicit that there will be some industry rationalisation, but so long as a market exists, the industry will also continue to exist in some form. This is evidenced in the cyclic nature of prices for agricultural commodities such as beef and wool and horticultural crops where there are often periods where costs exceed prices but the industries continue to exist (Sarris and Hallum 2006; Kingwell 2000). As such, when making projections for a given scenario the relationship between nut prices and costs must be carefully considered.

Given the price and cost data used, the analysis of the two cases in this report indicates that it is a better investment to buy an existing established farm compared to buying land and establishing a new farm. This was expected given that full production and income begins in year one with the established farm. This compares to no income until the trees begin to bear when establishing a new farm. Cash outflows will also then continue to exceed revenue for a period until production increases as trees mature.

Moreover, it is important to note that a different set of data will yield different results and the reverse result may be true. For example, in this exercise the estimated NIS tonnes per hectare at tree maturity for the established farm were assumed to be the same as for the new farm. This does not take into account possible improvements in yield from newer varieties compared to older varieties in established orchards. The sound kernel recovery from the trees in the new farm in this exercise was assumed to be slightly higher than for the established farm. This reflects selection of newer varieties with higher kernel recoveries. This results in a higher price per kilogram NIS.

Land price at the start and end of the analysis period is a key consideration when calculating the financial viability of an investment in macadamia farming. We estimated an initial land value of $30,000 per hectare and for the land to increase at 3% per annum. Land values vary considerably between and within macadamia growing districts. Land prices in coastal NNSW and SEQ macadamia growing districts have also risen more sharply than the rate of inflation in recent decades. The land value at the start and end of the analysis will have a major bearing on the rate of return as it is commonly the major cost in establishing a macadamia farm.

It is very important that input data reflects reality as closely as possible in order to produce reliable output that gives potential investors sound information on which to base objective investment decisions.

As yield and nut in shell price are significant drivers of macadamia orchard profitability, it is especially important that these values are carefully considered when used within a discounted cash flow analysis.

6.3 Financial planner for macadamia

Several prototype versions of the financial planner have been tested by the industry steering group since the development of the first prototype in mid 2007. Much of the on-going development work since that time has been aimed at accommodating a wider range of macadamia investment and management scenarios, including:

- provision for future planting or removal of trees;
- variation in yield response curves and kernel recoveries for individual plantings;
- support for different taxation models;
- provision of lease and/or finance arrangements for periodic capital expenditure, and
- calculation of cash flow balances.

As with most forecasting or modelling tools, the accuracy of results is governed to a certain extent by underlying assumptions and in some cases is limited by unknown or uncontrollable variables. Future nut in shell or kernel price is an example of a variable that is challenging to predict yet has a significant impact on profitability and therefore financial forecasts. Techniques used to manage the various criteria that affect analysis outcomes are described below.

Production

Production or yield is one of the key drivers of profitability. Yield is governed by a range of factors including the number of trees planted, tree age and rate of growth, planting density, nutrition, canopy management and kernel recovery. To accurately estimate both current and future production, the financial planner manages information about existing as well as proposed tree plantings.

Tree information is recorded in the plantings section within financial planner profiles. In this context, a planting is defined as a group of trees of uniform age, spacing, yield potential and kernel recovery. Users can create as many plantings as they need to accurately describe all of the trees on their farm. Planting details include tree counts, spacing, age at first harvest, expected mature yield and saleable kernel recovery (see figure 6.1).

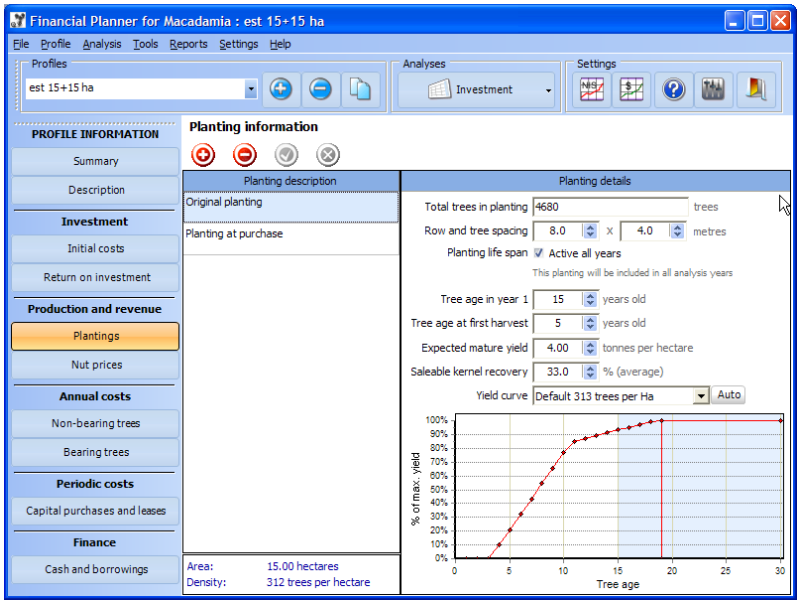


Figure 6.1: Profile showing planting details

Plantings can be active throughout an entire analysis term or have their life span limited to a specific range of years within that term. This enables users to create scenarios that include future tree plantings, tree removal or other orchard changes.

Each planting is linked to a yield curve that describes the proportion of expected mature yield that is available each year as trees age. Several yield curves based on typical yield potential for trees at different planting densities are included with the program. Users can either automatically assign one of these standard yield curves to their planting according to the closest matching planting density, or they can choose a specific yield curve themselves. Users also have the option of creating and customising their own yield curves (see figure 6.2). This can be useful for accommodating irregular yield patterns such as biennial bearing, steady yield decline in older or stressed trees, or high early yields in dense plantings.

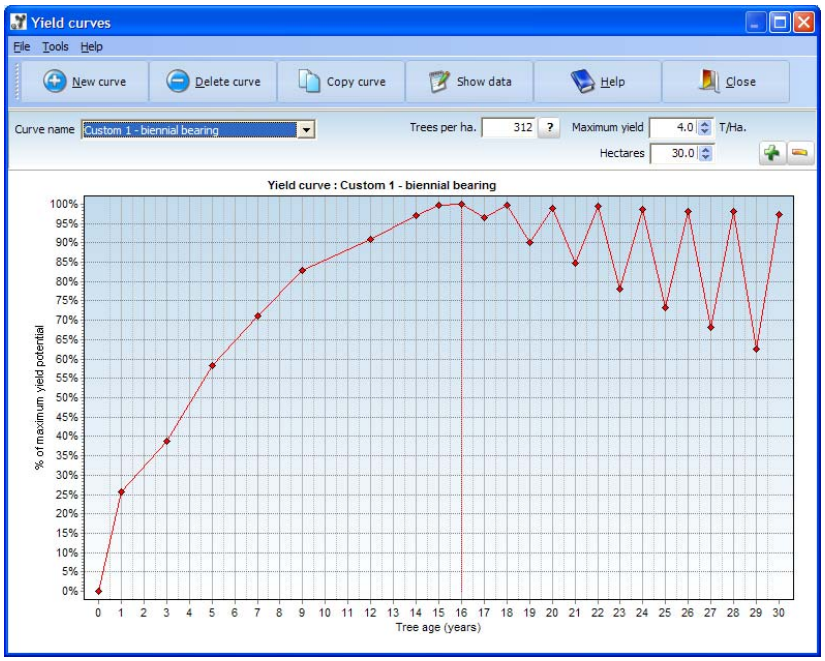


Figure 6.2: Creating or customising a yield curve

For each year of an analysis, the planner examines all plantings to determine the total trees for that year, their ages and their yield potential based on tree age in conjunction with yield curves. This information is then used to estimate combined production across all plantings for that year. Saleable kernel recovery data from the profile is used to convert nut in shell to kernel estimates.

Price

Future nut in shell price is perhaps the most challenging and variable factor to manage. The financial planner utilises a set of price models that reflect a range of future price scenarios including both linear and non-linear growth.

Users enter the current nut in shell price in the profile and also select an appropriate price model for estimating future prices. The current nut in shell price is used in the first year of the analysis to convert production to revenue. Price fluctuations relative to the current price are applied in all subsequent years of the analysis according to the shape of the selected price model (see figure 6.3). Historical nut in shell prices are available as a reference for guiding future price estimates.

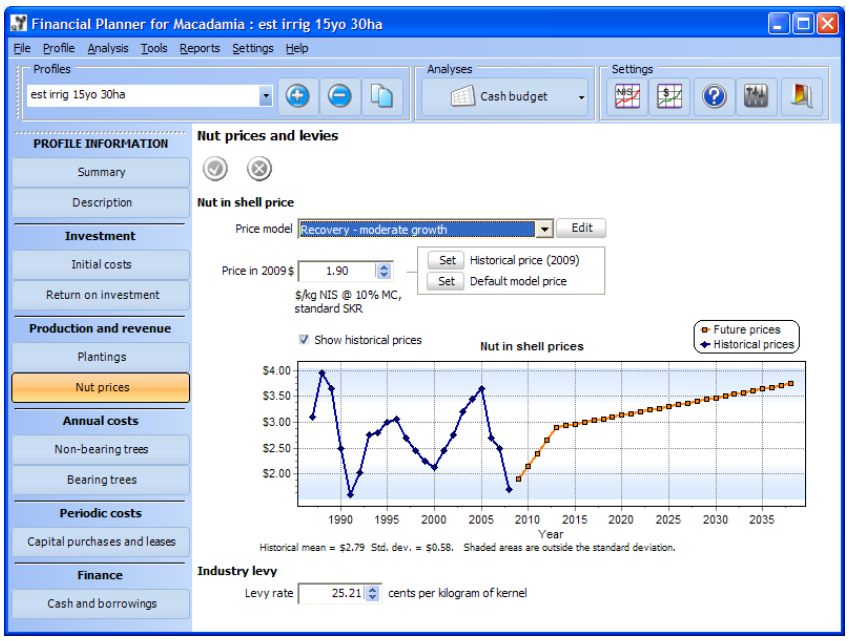


Figure 6.3: Profile showing price details

Users can choose one of the standard price models provided with the planner or can easily create and customise their own price models. Historical nut in shell prices are available within the program as a reference for estimating future prices. Historical price data is updated annually and is automatically made available within the financial planner via the Internet.

Annual costs

Annual costs can be recorded for both bearing and non-bearing trees. These include total fixed costs as well as variable costs. Variable costs can be expressed either as dollars per hectare or dollars per tonne of nut in shell (bearing trees only). A range of typical cost categories is included and there is also provision for entering up to two custom fixed costs and four custom variable costs (see figure 6.4).

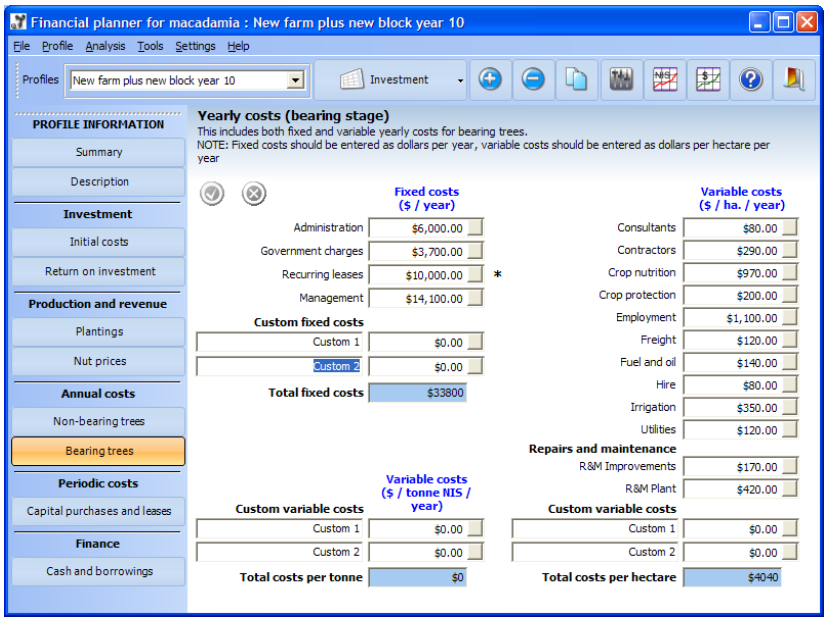


Figure 6.4: Profile showing annual costs

The financial planner uses planting information to distinguish between bearing and non-bearing trees on an annual basis within analyses. As non-bearing trees grow and begin to bear nuts, a gradual transition is required from non-bearing costs to bearing costs. The planner smoothly manages this transition based on tree age. Program parameters allow users to control the percentage of bearing costs to be applied when trees first begin to bear, as well as the number of years after first bearing at which full costs are applied.

Quality

Saleable or sound kernel recovery is specified for each planting created within a profile (see figure 6.2). Processors typically pay bonuses for kernel recoveries exceeding the industry average and users can set program preferences that specify the industry average sound recovery (SKR) and unsound kernel recovery (UKR) as well as the bonus paid for each 1% that SKR exceeds the industry average.

For each year in an analysis, conversion of total tonnes of nut in shell to kernel incorporates both actual SKR and industry average UKR. The revenue calculation for each year also includes estimation of bonuses paid for exceeding industry average sound kernel recovery.

Taxation

Taxation can be applied within the financial planner via four different business models including sole trader, company, partnership and custom. Users choose one of these models within a profile.

For sole traders, taxation is calculated according to marginal taxation rates. These rates are built into the program and are updateable via the Internet. Marginal tax rates are also used for partnerships, with each partner attracting a tax liability according to their proportion of ownership. This partnership information can be recorded within a profile.

For companies, a flat taxation rate applies and this can be customised via a program parameter. The custom option is also based on a flat taxation rate that is entered directly by users in the profile. Taxation can be eliminated from all analyses by selecting a custom taxation rate of zero. The planner also supports the optional deferral of tax assets in years where there is a net loss.

Depreciation

The financial planner supports depreciation of initial investment costs as well as periodic capital expenditure, including payout of residual values on termination of leases. It is important to note that depreciation is not a cash flow and as such is not represented as one in the financial planner, but it is required in the calculation of some cash flow variable. Primarily, depreciation is an expense which reduces taxation, a cash flow which is included in both the Investment Analysis and the Cash Budgeting Analysis.

Users can choose between straight line and reducing balance methods of depreciation. Where straight line depreciation is specified, assets are assigned a life span in years, during which time their value is written down annually by a fixed proportion of their initial value. The reducing balance method allocates a fixed percentage of an asset's written down value each year, based on a depreciation rate entered by the user. Both depreciation methods make the assumption that there is no residual value at the end of the asset's useful life. Any amount not depreciated at the end of the analysis term is assumed to be recovered upon sale of the business. These amounts are displayed as residual capital within the financial planner.

Users can choose which assets they wish to depreciate and can also set either the lifespan or the depreciation rate for each asset depending on the depreciation method selected.

Analyses

Four analyses are available within the financial planner. These include investment, cash budget, profile comparison and sensitivity analyses.

Investment analysis

The investment analysis is useful for investors and others who wish to examine the viability of macadamia industry investment. It is also useful for existing industry members who wish to measure the financial viability of proposed changes to their business such as expansion, capitalisation and other management changes.

The investment analysis measures the profitability of a specific investment scenario over time and provides standard financial indicators such as Net Present Value and Internal Rate of Return. As such, it allows investors to compare the viability of macadamia production with other forms of investment. It also provides a summary of cash flows, periodic capital expenditure and the present values of net cash flows on a yearly basis. Results are available in both tabular and graphical format (see figure 6.5).

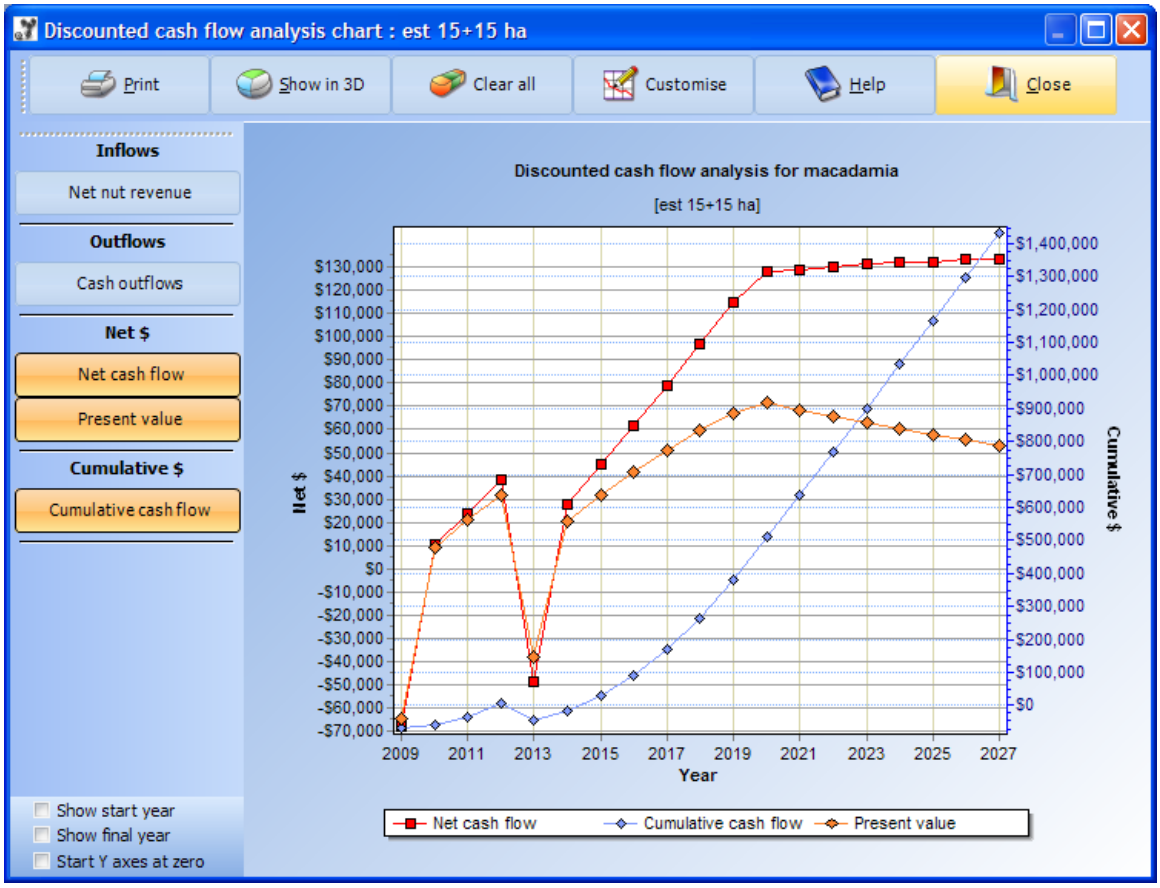
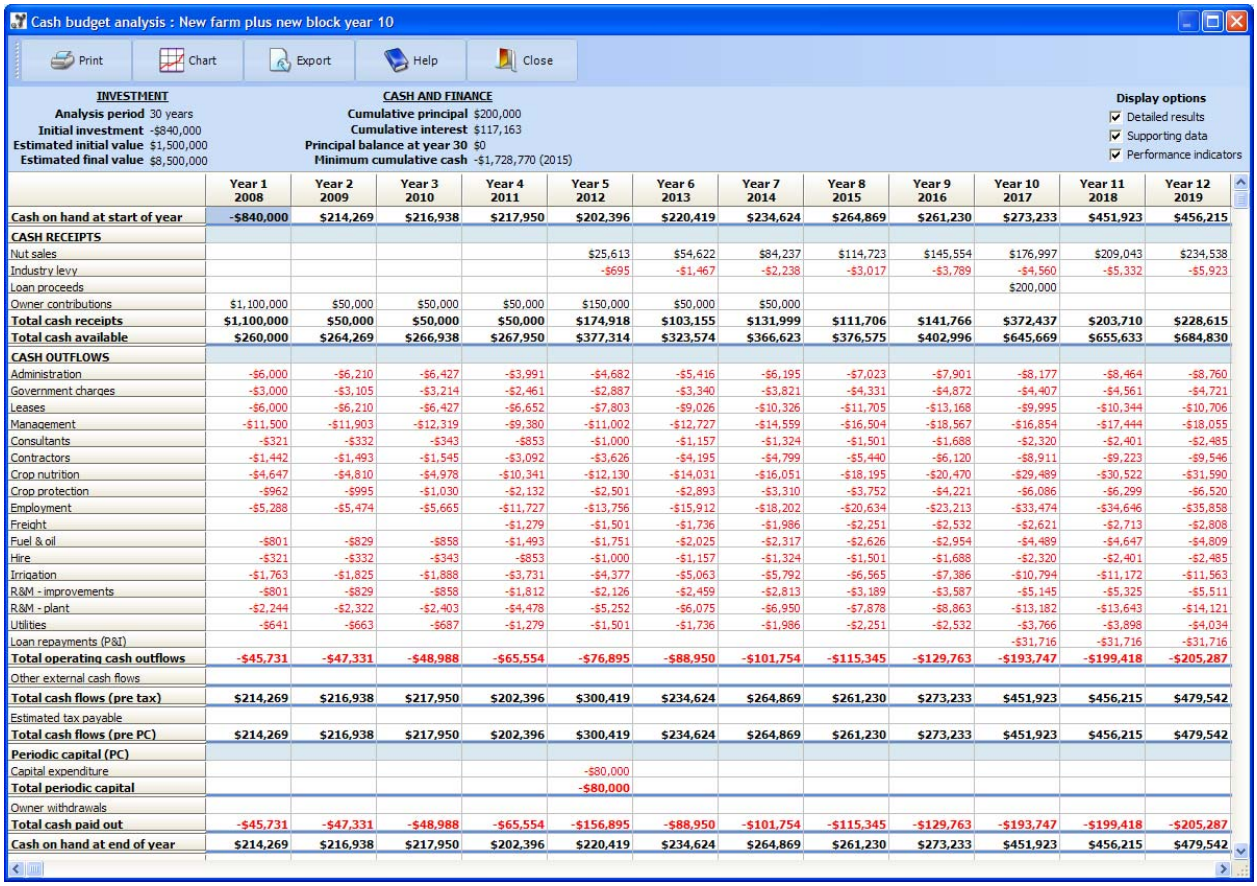


Figure 6.5: A discounted cash flow analysis

Cash budget analysis

The cash budget analysis allows existing growers to examine their annual cash balance. It is useful for measuring the impact of changes to existing farm operations and also for determining whether finance will be required and if so, in which years. Annual cash on hand is reported at both the start and end of each year of the analysis, with a breakdown of revenue, inflows, expenditure and withdrawals in between. This analysis also includes estimated tax payable, deferred tax assets and debt servicing costs, including principal and interest.

Performance indicators are presented for each year of the analysis, including operating expenses before and after tax, profit, interest coverage ratio, farm operating surplus and debt to income ratio. Results are available in both tabular (see figure 6.6) and graphical format.



Cash budget analysis : New farm plus new block year 10

Print | Chart | Export | Help | Close

INVESTMENT
Analysis period 30 years
Initial investment -$840,000
Estimated initial value $1,500,000
Estimated final value $8,500,000

CASH AND FINANCE
Cumulative principal $200,000
Cumulative interest $117,163
Principal balance at year 30 $0
Minimum cumulative cash -$1,728,770 (2015)

Display options
Detailed results
Supporting data
Performance indicators

	Year 1 2008	Year 2 2009	Year 3 2010	Year 4 2011	Year 5 2012	Year 6 2013	Year 7 2014	Year 8 2015	Year 9 2016	Year 10 2017	Year 11 2018	Year 12 2019
Cash on hand at start of year	**-$840,000**	**$214,269**	**$216,938**	**$217,950**	**$202,396**	**$220,419**	**$234,624**	**$264,869**	**$261,230**	**$273,233**	**$451,923**	**$456,215**
CASH RECEIPTS												
Nut sales					$25,613	$54,622	$84,237	$114,723	$145,554	$176,997	$209,043	$234,538
Industry levy					-$695	-$1,467	-$2,238	-$3,017	-$3,789	-$4,560	-$5,332	-$5,923
Loan proceeds										$200,000		
Owner contributions	$1,100,000	$50,000	$50,000	$50,000	$150,000	$50,000	$50,000					
Total cash receipts	**$1,100,000**	**$50,000**	**$50,000**	**$50,000**	**$174,918**	**$103,155**	**$131,999**	**$111,706**	**$141,766**	**$372,437**	**$203,710**	**$228,615**
Total cash available	**$260,000**	**$264,269**	**$266,938**	**$267,950**	**$377,314**	**$323,574**	**$366,623**	**$376,575**	**$402,996**	**$645,669**	**$655,633**	**$684,830**
CASH OUTFLOWS												
Administration	-$6,000	-$6,210	-$6,427	-$3,991	-$4,682	-$5,416	-$6,195	-$7,023	-$7,901	-$8,177	-$8,464	-$8,760
Government charges	-$3,000	-$3,105	-$3,214	-$2,461	-$2,887	-$3,340	-$3,821	-$4,331	-$4,872	-$4,407	-$4,561	-$4,721
Leases	-$6,000	-$6,210	-$6,427	-$6,652	-$7,803	-$9,026	-$10,326	-$11,705	-$13,168	-$9,995	-$10,344	-$10,706
Management	-$11,500	-$11,903	-$12,319	-$9,380	-$11,002	-$12,727	-$14,559	-$16,504	-$18,567	-$16,854	-$17,444	-$18,055
Consultants	-$321	-$332	-$343	-$853	-$1,000	-$1,157	-$1,324	-$1,501	-$1,688	-$2,320	-$2,401	-$2,485
Contractors	-$1,442	-$1,493	-$1,545	-$3,092	-$3,626	-$4,195	-$4,799	-$5,440	-$6,120	-$8,911	-$9,223	-$9,546
Crop nutrition	-$4,647	-$4,810	-$4,978	-$10,341	-$12,130	-$14,031	-$16,051	-$18,195	-$20,470	-$29,489	-$30,522	-$31,590
Crop protection	-$962	-$995	-$1,030	-$2,132	-$2,501	-$2,893	-$3,310	-$3,752	-$4,221	-$6,086	-$6,299	-$6,520
Employment	-$5,288	-$5,474	-$5,665	-$11,727	-$13,756	-$15,912	-$18,202	-$20,634	-$23,213	-$33,474	-$34,646	-$35,858
Freight				-$1,279	-$1,501	-$1,736	-$1,986	-$2,251	-$2,532	-$2,621	-$2,713	-$2,808
Fuel & oil	-$801	-$829	-$858	-$1,493	-$1,751	-$2,025	-$2,317	-$2,626	-$2,954	-$4,489	-$4,647	-$4,809
Hire	-$321	-$332	-$343	-$853	-$1,000	-$1,157	-$1,324	-$1,501	-$1,688	-$2,320	-$2,401	-$2,485
Irrigation	-$1,763	-$1,825	-$1,888	-$3,731	-$4,377	-$5,063	-$5,792	-$6,565	-$7,386	-$10,794	-$11,172	-$11,563
R&M - improvements	-$801	-$829	-$858	-$1,812	-$2,126	-$2,459	-$2,813	-$3,189	-$3,587	-$5,145	-$5,325	-$5,511
R&M - plant	-$2,244	-$2,322	-$2,403	-$4,478	-$5,252	-$6,075	-$6,950	-$7,878	-$8,863	-$13,182	-$13,643	-$14,121
Utilities	-$641	-$663	-$687	-$1,279	-$1,501	-$1,736	-$1,986	-$2,251	-$2,532	-$3,766	-$3,898	-$4,034
Loan repayments (P&I)										-$31,716	-$31,716	-$31,716
Total operating cash outflows	**-$45,731**	**-$47,331**	**-$48,988**	**-$65,554**	**-$76,895**	**-$88,950**	**-$101,754**	**-$115,345**	**-$129,763**	**-$193,747**	**-$199,418**	**-$205,287**
Other external cash flows												
Total cash flows (pre tax)	**$214,269**	**$216,938**	**$217,950**	**$202,396**	**$300,419**	**$234,624**	**$264,869**	**$261,230**	**$273,233**	**$451,923**	**$456,215**	**$479,542**
Estimated tax payable												
Total cash flows (pre PC)	**$214,269**	**$216,938**	**$217,950**	**$202,396**	**$300,419**	**$234,624**	**$264,869**	**$261,230**	**$273,233**	**$451,923**	**$456,215**	**$479,542**
Periodic capital (PC)												
Capital expenditure					-$80,000							
Total periodic capital					**-$80,000**							
Owner withdrawals												
Total cash paid out	**-$45,731**	**-$47,331**	**-$48,988**	**-$65,554**	**-$156,895**	**-$88,950**	**-$101,754**	**-$115,345**	**-$129,763**	**-$193,747**	**-$199,418**	**-$205,287**
Cash on hand at end of year	**$214,269**	**$216,938**	**$217,950**	**$202,396**	**$220,419**	**$234,624**	**$264,869**	**$261,230**	**$273,233**	**$451,923**	**$456,215**	**$479,542**

Figure 6.6: A cash budget analysis

Profile comparison analysis

The profile comparison analysis compares and ranks the key financial indicators of multiple profiles. To use this feature, users must first create two or more profiles, each of which can reflect a different business scenario. By creating individual profiles, users can model complex scenarios involving many dependent criteria. Once created, profiles can easily be cloned and modified to accommodate very specific management changes as required.

Up to 10 profiles can be simultaneously compared and ranked according to their net present value or internal rate of return. Charts are also available comparing annual summaries for each of the profiles for a range of criteria including cumulative cash flow, net nut revenue, nut in shell price, operating expenses, present value, profit, production and tax payable (see figure 6.7).

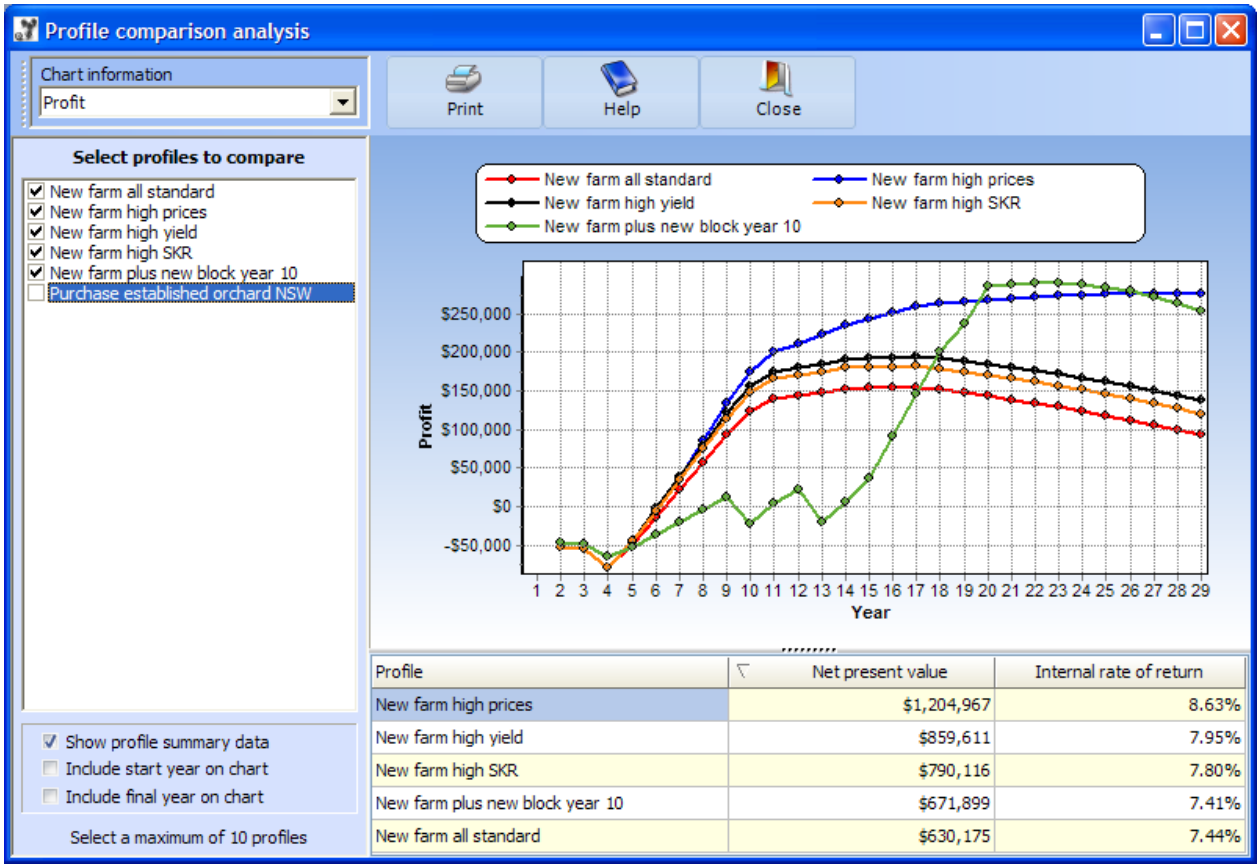


Figure 6.7: A profile comparison analysis

Sensitivity analysis

The sensitivity analysis provides a "what if" style tool allowing users to adjust key criteria within a single profile and measuring the impact on profitability over the life of an investment.

Up to two custom scenarios can be derived from a single profile, allowing users to model best and worst case outcomes. Each scenario is customised by adjusting threshold levels for criteria such as yield, kernel recovery, annual costs, and nut in shell price. The level of threshold adjustment available is dependent on the selected criterion. A separate analysis is conducted of the two custom scenarios as well as the original profile, which in this instance becomes the control scenario. The investment viability of each scenario is presented in the form of net present value and internal rate of return.

A range of annual analysis criteria are also presented graphically for each scenario, including cumulative cash flow, net nut revenue, nut in shell price, operating expenses, present value, profit, production and tax payable (see figure 6.8).

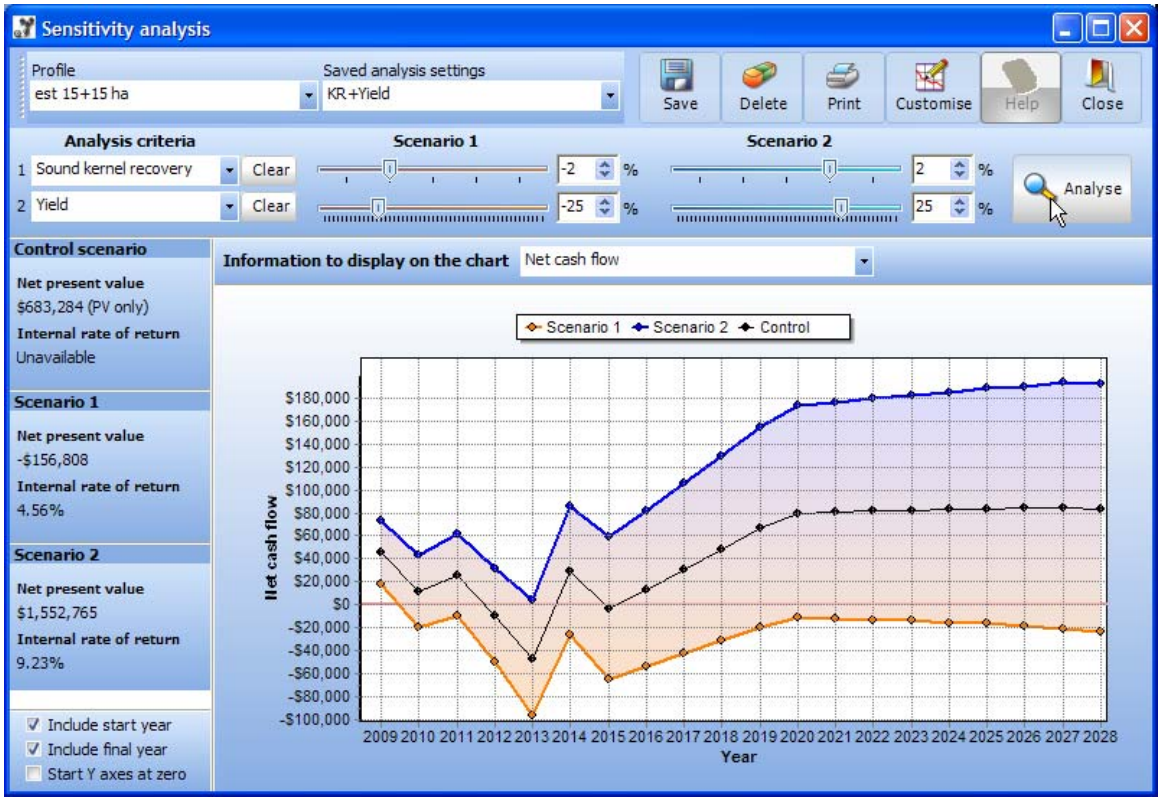


Figure 6.8: A sensitivity analysis

6.4 Commercial delivery plan

The commercial delivery plan provides guidelines for both domestic and international distribution and support of the financial planner. Following final testing and approval from the project steering group, the Financial Planner will be made available for sale according to the conditions specified in the commercial delivery plan.

The plan includes pricing structures for software licensing and provision of training and technical support for payers of the Australian Macadamia Industry Levy and non levy payers. The plan also provides structures for software licensing and provision of training and technical support during and beyond the funded project term of "Improving farm productivity and competitiveness in the Australian Macadamia Industry" (from 01/02/2010 to 31/12/2014). Intellectual property generated by and associated with the project is also identified within the plan.

7.0 Technology transfer

Technology transfer has been integral to the project throughout its life to ensure participating growers and the industry were kept well informed of results and recommendations.

Technology transfer focussed on articles in industry media, presentations at industry meetings and conferences, reports to participating growers after each 6 monthly data collection period and individual contact. Technology transfer has also been conducted in association with related projects, particularly the "MacMan" and "Adoption of quality management systems in macadamia" projects.

7.1 Articles in industry media

O'Hare, P.J. et al, "Better management for better returns" AMS News Bulletin, March 2004, pages 46-47.
O'Hare, P.J. et al "How much does it cost to grow macadamias?" HAL Macadamia Industry Report 2004/05, page 5.
Slaughter, G. et al "How profitable is your macadamia farm?" AMS News Bulletin, September 2005, pages 56-58.
O'Hare, P.J. et al "On-farm economic analysis in the Australian macadamia industry" HAL Macadamia Industry Report 2005/06, page 5.
O'Hare, P.J. et al "How much fertiliser do you apply?" article in the MacMan News section in the AMS News Bulletin, July 2007, page 45.
O'Hare, P.J. et al "How profitable is macadamia growing?" article in the MacMan News section in the AMS News Bulletin, September 2007, pages 46-48.
O'Hare, P.J. et al "Financial planner being developed for the Australian macadamia industry" article in the MacMan News section in the AMS News Bulletin, November 2007, pages 44-45.
O'Hare, P.J. et al "Farm financial planning for macadamias", HAL Macadamia Industry Report 2006/07, page 12.
O'Hare, P.J. et al "Improving your yield and quality improves your profitability" AMS News Bulletin, January 2008, pages 36-39.
O'Hare, P.J. et al "Maintaining profitability in hard times" AMS News Bulletin, May 2008, pages 46-50.
Mulo, S.F. et al "Grower feedback shaping financial planner for macadamia" AMS News Bulletin, July 2008, pages 36-40.
O'Hare, P.J. et al "On-farm economic analysis helps planning, investment", HAL Macadamia Industry Report 2007/08, page 15.
Mulo, S.F. et al "How do changes in yield, kernel recovery, costs and price affect your bottom line" AMS News Bulletin, May 2009, pages 31-33.
Mulo, S.F. et al "Leasing vs. financing of equipment" AMS News Bulletin, September 2009, pages 40-41.
Mulo, S.F. et al "New tool for on-farm financial analysis", HAL Macadamia Industry Report 2008/09, page 10.

7.2 Conference/workshop presentations

O'Hare, P.J. et al "Farming for more profit – running a business not a lifestyle" AMS 2004 conference.
O'Hare, P.J. et al "On-farm economic analysis in the Australian macadamia industry" Macadamia Processing Company 2005 Conference.
O'Hare, P.J. et al "Summary of results of on-farm economic analysis" AMS 2007 conference.
O'Hare, P.J. et al "On-farm economic analysis results and financial planning software" AMS Science Seminar, 20/06/2007.
Mulo, S.F. et al "Financial planner for horticulture – a financial analysis tool for the macadamia industry" poster presentation, Australian Society for Horticultural Science 2008 conference.
O'Hare, P.J. et al "Economic analysis of macadamia growing in Australia" International Macadamia Symposium, South Africa, 2009.
Mulo, S.F. et al "Financial planner for macadamia" International Macadamia Symposium, South Africa, 2009.
Mulo, S.F. et al "Financial planner for macadamia" AMS 2009 conference.

7.3 Presentations at industry meetings

Presentation of project outline as part of a group of related projects at 8 AMS MacGroup meetings in Queensland and New South Wales, 2004.
Presentation of the project results and a presentation of the financial planning software prototype at 8 AMS MacGroup meetings in Queensland and New South Wales, October/November 2007.
Presentation of the project results and a presentation of the financial planning software prototype at 9 MacMan best practice group meetings in Queensland and New South Wales, November/December 2007.
"Maintaining profitability in hard times" presentation at AMS General meeting, Bundaberg, March 2008.

7.4 Steering group meetings

Project industry steering group meeting, Brisbane, 06/04/2004
Project industry steering group meeting, Brisbane, 13/10/2004
Project industry steering group meeting, Brisbane, 27/07/2005
Project industry steering group meeting, Brisbane, 11/08/2006
Project industry steering group meeting, Brisbane, 16/05/2007
Project industry steering group meeting, Brisbane, 22/02/2008
Project industry steering group meeting, Lismore, 20/03/2009

7.5 Other publications

O'Hare, P.J., Mulo, S.F et al "An evaluation of MacMan products and services" report to AMS and HAL as part of the MacMan project, 2005.

O'Hare, P.J., Mulo, S.F et al "A summary of MacMan best practice group results 2001 to 2009" report to AMS and HAL as part of the MacMan project, 2010.

8.0 Recommendations

Recommendations relate to the collection of the economic analysis data and use of the analysis results and to the development, distribution and adoption of the financial planner for macadamia.

8.1 Collection of economic analysis data and use of analysis results

Recommendations include:

- Ongoing collection and analysis of financial and production data using the system already established will enable the analysis results to remain current. Yields, costs and prices vary with time and ongoing data collection and analysis would show the effects of these changes.
- The analysis results should be used for benchmarking to provide industry comparisons. This will assist new growers and investors entering the industry and current growers contemplating changes to their business to make better decisions based on real data.
- Results from the economic analysis and ongoing collection and analysis of financial and production data should be included in industry publications, such as the "Macadamia Grower's Handbook". It should also be made available to financial advisers and accountants working with the Australian macadamia industry. This will increase the availability of the information to new and current growers.
- Further data collection and analysis is required, particularly in early establishment costs in new growing areas. The major focus in this analysis was on bearing orchards. Data was collected on early establishment costs but this may vary in new growing areas.
- Production variations need further investigation to better understand the major factors influencing nut yield and kernel recovery. This will assist growers in better decision making affecting profitability.
- The efficiencies of scale of operations need to be investigated. This includes investigating optimum asset investment, contracting out services compared with capital investment and potential for sharing resources between farms.

8.2 Financial planner for macadamia

Recommendations include:

- The financial planner needs to be thoroughly tested and associated profile templates need to be validated prior to industry release. This should be undertaken in conjunction with industry focus groups.
- Profile templates and associated program support data should be reviewed and updated annually to ensure ongoing relevance to industry.
- A staged release of the financial planner to industry should be undertaken according to the guidelines within the commercial delivery plan.
- Training and support activities should be provided to help users learn to use the financial planner. The training and support service provided for the MacMan farm recording software would be a good model to follow for this product.
- Client feedback in relation to the financial planner should be collected and regularly reviewed in conjunction with the project steering group to guide any further development of the financial planner.

References

- Heiman, G.W., (2001), *Understanding Research Methods and Statistics*: An Integrated Introduction for Psychology 2nd Edition, Houghton Mifflin, Boston Massachusetts, USA.

- Kenkl, J.L., (1989), *Introductory Statistics for Management and Economics*, 3rd Edition, PWS –Kent, Boston, Massachusetts, USA.

- Kingwell, R., (2000), *Price Risk Management for Australian Broad acre Farmers: some observations*, Agribusiness Review - Vol. 8. June, University of Melbourne, Vic.

- O'Hare, P. *et al* (2004), *Macadamia grower's handbook – a grower's guide*, Department of Primary Industries and Fisheries, Queensland, publication.

- O'Hare, P. *et al* (2005), *An evaluation of MacMan products and services,* Department of Primary Industries and Fisheries, Queensland, publication.

- O'Hare, P. *et al* (2009), *Summary of MacMan best practice group results 2001 to 2009,* Department of Primary Industries and Fisheries, Queensland, publication.

- Patton, M., (1990), *Qualitative Evaluation and Research Methods*, 2nd Edition, Sage Publications, Newbury Park, California, USA.

- Quinlan, K. (2003), *Macadamia gross margins*, New South Wales Department of Primary Industries Agnote.

- Quinlan, K. *et al* (2006), *The gains from adopting better on-farm quality management,* Proceedings of the Australian Macadamia Society 2006 Conference.

- Reilly, T. and Bevan, P. (1995), *Profitability of macadamia growing*, Australian Macadamia Society News Bulletin November 1995.

- Sarris, A., and Hallum, D., eds. (2006), *Agricultural Commodity Markets And Trade: New Approaches to Analyzing Market Structure and Instability.* Edward Elgar ,UK.

Appendices

Appendix 1

Example questionnaire

Ref. No.

Survey of
On-Farm Economics of Macadamia Production

2006 Calendar Year

This is a follow up to the 2005 survey to bring the data up to date to the end of the 2006 calendar year. The data being gathered will be used to provide the Australian Macadamia Industry with up to date information about the on-farm economics of macadamia production. Individual data will remain confidential and only aggregated statistics will made be available to the industry. Thank you for ongoing participation in this research, your time and effort are greatly appreciated.

1. Which of the following arrangements best describes your relationship to this farm? Please tick one only.

- Own and Manage
- Manage for owner
- Own and employ Manager
- Own part and lease part
- Lease
- Other - Please state: _____?

2. a. What was the total area of trees planted on this farm as at the 1st July 2005 _____ ha.

b. What was the total number of trees planted on this farm as at the 1st July 2005 _____ (Trees)

c. Have you planted any additional macadamia trees since the 2004 survey? Yes No

If Yes: **Trees** _____; **Hectares**_____.

3. What was the average tree age in years on this farm as at the 1st of July 2005? _____ (Years)

4. What was the annual rainfall on this property for 2006? _____.

5. If you irrigate how many megalitres did you use in 2006? _____.

6. Factory Results

Production	2006
NIS @ 10% MC (Tonnes)	
SKR %	
Commercial %	
UKR %	

Unsound kernel reject analysis %	2006
Insect Damage	
Mould	
Discoloured	
Internal discolouration	
Immature	
Germinated	

7. Financial Data

7a Revenue and Expenses

Please Note: If you do not have quarterly data available, use financial year totals. All costs should be based on cash payments. Please exclude non cash items such as provisions for holidays and long service leave etc.

	2006 1st Qtr	2006 2nd Qtr	2005/2006 Financial Year	2006 3rd Qtr	2006 4th Qtr
Nut Revenue Net of Levies					
Nut Co-Op Shareholder Revenue					
Expenses					
Administration					
Accounting					
Admin salaries					
Administration - other					
Insurance					
Office equipment/stationery					
Telephone/fax/post					
Administration Total					
Consultants					
Consultants - other					
Insect monitoring					
Nutrition or irrigation monitoring					
Orchard consultant					
Consultants Total					
Contractors					
Contract dehusking and sorting					
Contract harvesting					
Contract pruning					
Contract spraying					
Contractors - other					
Contractors Total					
Crop Nutrition					
Crop nutrition - other					
Fertiliser					
Crop Nutrition Total					
Crop Protection					
Crop protection - other					

Fungicide					
Insecticide					
Rodenticide					
Weedicide					
Crop Protection Total					

	2006 1st Qtr	2006 2nd Qtr	2005/2006 Financial Year	2006 3rd Qtr	2006 4th Qtr
Employment Costs					
Casual wages					
Employment costs - other					
OH&S					
Permanent wages					
Staff training costs					
Superannuation					
Workers compensation					
Employment Costs Total					
Freight					
Freight - other					
Freight inwards					
Freight outwards					
Freight Total					
Fuel and Oil					
Diesel					
Fuel and oil - other					
Oil					
Petrol					
Fuel & Oil Total					
Government Charges					
Government charges - other					
Rates					
Vehicle registrations					
Government Charges Total					
Hire					
Hire equipment					
Hire Total					
Irrigation					
Irrigation - other					

R&M Irrigation system					
Water rates					
Water usage					
Irrigation Total					
Leases					
Leases - farm machinery					
Leases - other					
Leases - shed machinery					
Management					
Management - other					
Management fees					
Management salaries					
Management Total					

	2006 1st Qtr	2006 2nd Qtr	2005/2006 Financial Year	2006 3rd Qtr	2006 4th Qtr
Repairs and Maintenance – Improvements					
R&M improvements - other					
R&M dams					
R&M farm buildings					
R&M fences					
R&M roads					
Repairs and Maintenance – Improvements Total					
Repairs and Maintenance - plant					
R&M motor vehicles					
R&M orchard machinery					
R&M plant - other					
R&M shed machinery					
R&M tools					
Repairs and Maintenance – plant Total					
Utilities					
Electricity					
Gas					
Utilities - other					
Utilities Total					

7b Assets and Liabilities

Note: Please base assets (apart from land and Co-op Shares) on their current insured values

	30th June 2006
Assets	
Land (estimated per hectare market value)	
Buildings	
Machinery	
Silos	
Shares in Macadamia Co-Op	
Other	
Total Assets	
Liabilities	
Long-term debt *(more than one year)*	
Short-term debt (*less than one year)*	
Total Liabilities	

End of Questionnaire

Thank you for your continuing participation.

Appendix 2

Summary of revenue, costs and profit

The following tables provide a further summary of average annual revenue, costs and profit for sub-samples within the survey including:

- Farm size and revenue, costs and profit per tonne NIS.
- Region and revenue, costs and profit per hectare.
- Managed and owner managed farm revenue, costs and profit per hectare.

Appendix 2.1 Farm size and revenue, costs and profit per tonne NIS

Table 2.1: Summary of average annual revenue, costs and profit per tonne NIS for farms less than 15 hectares and older than 10 years

Farms <15 hectares and > 10 yrs	Number	Mean
Revenue per tonne	35	$3,205
Percentage of Revenue		100%
Costs per tonne	35	$2,139
Cost Percentage of Revenue		67%
Profit per tonne	35	$1,066
Profit Percentage of Revenue		33%

Table 2.2: Summary of average annual revenue, costs and profit per tonne NIS for farms 15 to 35 hectares and older than 10 years

Farms >=15 ha and =<35 ha and >10 yrs	Number	Mean
Revenue per tonne	41	$3,008
Percentage of Revenue		100%
Costs per tonne	41	$1,730
Cost Percentage of Revenue		58%
Profit per tonne	41	$1,278
Profit Percentage of Revenue		42%

Table 2.3: Summary of average annual revenue, costs and profit per tonne NIS for farms more than 35 hectares and older than 10 years

Farms >35 hectares > 10 yrs	Number	Mean
Revenue per tonne	38	$3,235
Percentage of Revenue		100%
Costs per tonne	38	$1,787
Cost Percentage of Revenue		55%
Profit per tonne	38	$1,449
Profit Percentage of Revenue		45%

Appendix 2.2 Region and revenue, costs and profit per hectare

Table 2.4: Summary of average annual revenue, costs and profit per hectare for farms in the Bundaberg region and older than 10 years

>10 yrs & Bundaberg	Number	Mean
Revenue per hectare	12	$12,257.94
Percentage of Revenue		100%
Costs per hectare	12	$5,118.4
Cost Percentage of Revenue		42%
Profit per hectare	12	$7,139.54
Profit Percentage of Revenue		58%

Table 2.5: Summary of average annual revenue, costs and profit per hectare for farms in the northern New South Wales region and older than 10 years

>10 yrs & NNSW	Number	Mean
Revenue per hectare	64	$10,739.7
Percentage of Revenue		100%
Costs per hectare	64	$6,472.73
Cost Percentage of Revenue		60%
Profit per hectare	64	$4,266.97
Profit Percentage of Revenue		40%

Table 2.6: Summary of average annual revenue, costs and profit per hectare for farms in the south-east Queensland region and older than 10 years

> 10 yrs and SEQ	Number	Mean
Revenue per hectare	38	$9,277.04
Percentage of Revenue		100%
Costs per hectare	38	$4,962.93
Cost Percentage of Revenue		53%
Profit per hectare	38	$4,314.11
Profit Percentage of Revenue		47%

Appendix 2.3 Management structure and revenue, costs and profit per hectare

Table 2.7: Summary of average annual revenue, costs and profit per hectare for managed farms and older than 10 years

Managed farms and >10 yrs	Number	Mean
Revenue per hectare	66	$9,945
Percentage of Revenue		100%
Costs per hectare	66	$5,876
Cost Percentage of Revenue		59%
Profit per hectare	66	$4,069
Profit Percentage of Revenue		41%

Table 2.8: Summary of average annual revenue, costs and profit per hectare for owner managed farms and older than 10 years

Owner managed farms and >10 yrs	Number	Mean
Revenue per hectare	48	$11,055
Percentage of Revenue		100%
Costs per hectare	48	$5,760
Cost Percentage of Revenue		52%
Profit per hectare	48	$5,294
Profit Percentage of Revenue		48%

Appendix 3

Trend data

The following charts show the trends from sub-samples of the data from 2003 to 2006 of weighted averages per hectare for revenue, costs, profit and production (tonnes nut-in-shell) for different farm sizes and management structures.

Appendix 3.1 Trend data for farm size

Figure 3.1 shows the trend for farms in the survey older than 10 years and less than 15 hectares. Average production was well down in 2003 at 2.15 t/ha. It was more consistent from 2004 to 2006. Costs increased from $4,690 to $5,887 and $5464 per hectare from 2003 to 2005 and 2006. Revenue and profit peaked at $10,610 and $4,723 per hectare in 2005.

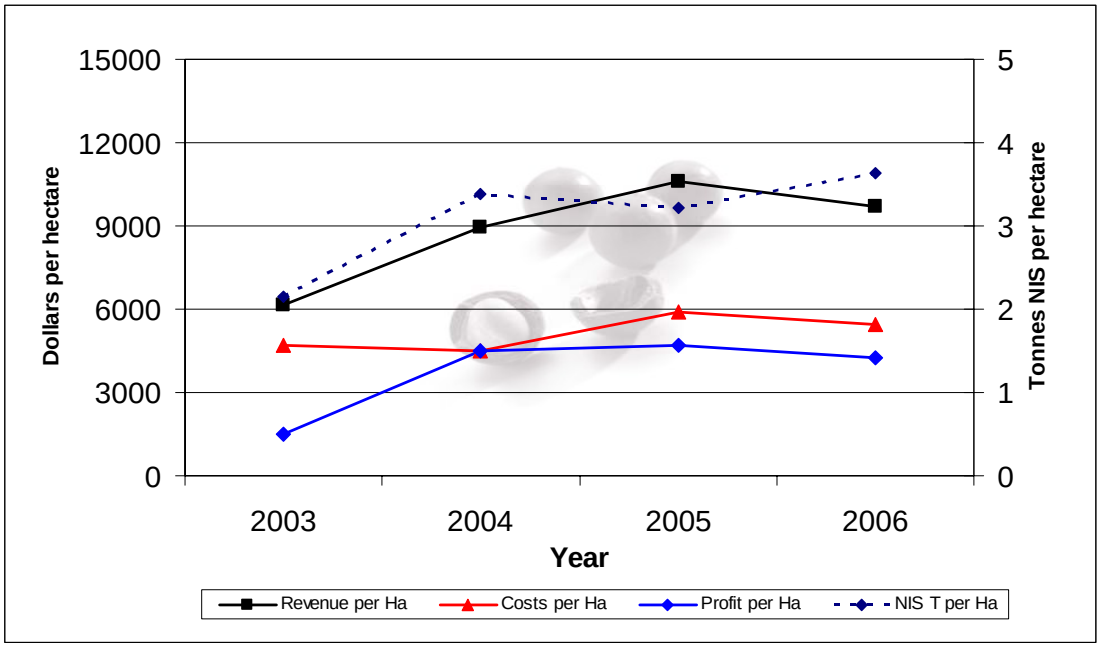


Figure 3.1: Average production and economic trends for orchards older than 10 years and less than 15 hectares.

Figure 3.2 shows the trends for farms in the survey older than 10 years and between 15 and 35 hectares. Average production peaked at over 4 t/ha in 2004 and 2006. Costs increased from $4,809 to $6,597 per hectare from 2003 to 2006. Revenue and profit peaked at $12,227 and $6,531 per hectare in 2004.

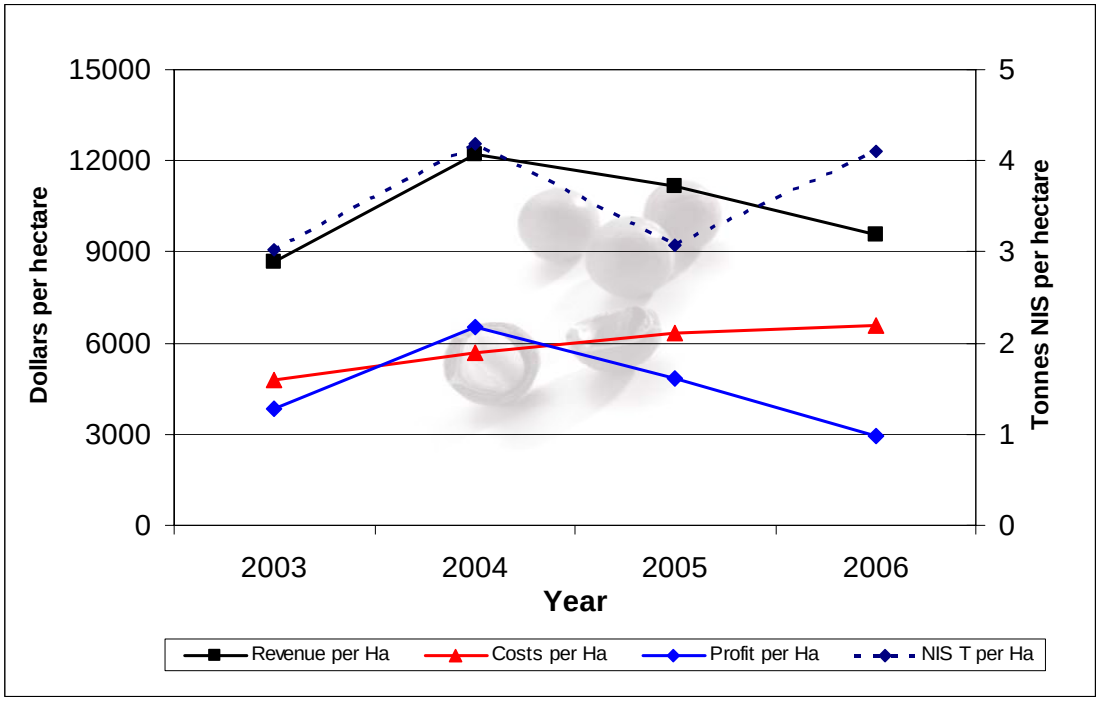


Figure 3.2: Average production and economic trends for orchards older than 10 years and between 15 and 35 hectares

Figure 3.3 shows the trends for farms in the survey older than 10 years and more than 35 hectares. Average production peaked at over 4 t/ha in 2004 and 2006. Costs increased from $5,170 to $6,409 and $6,131 per hectare from 2003 to 2005 and 2006. Revenue and profit peaked at $13,733 and $8,165 per hectare in 2004.

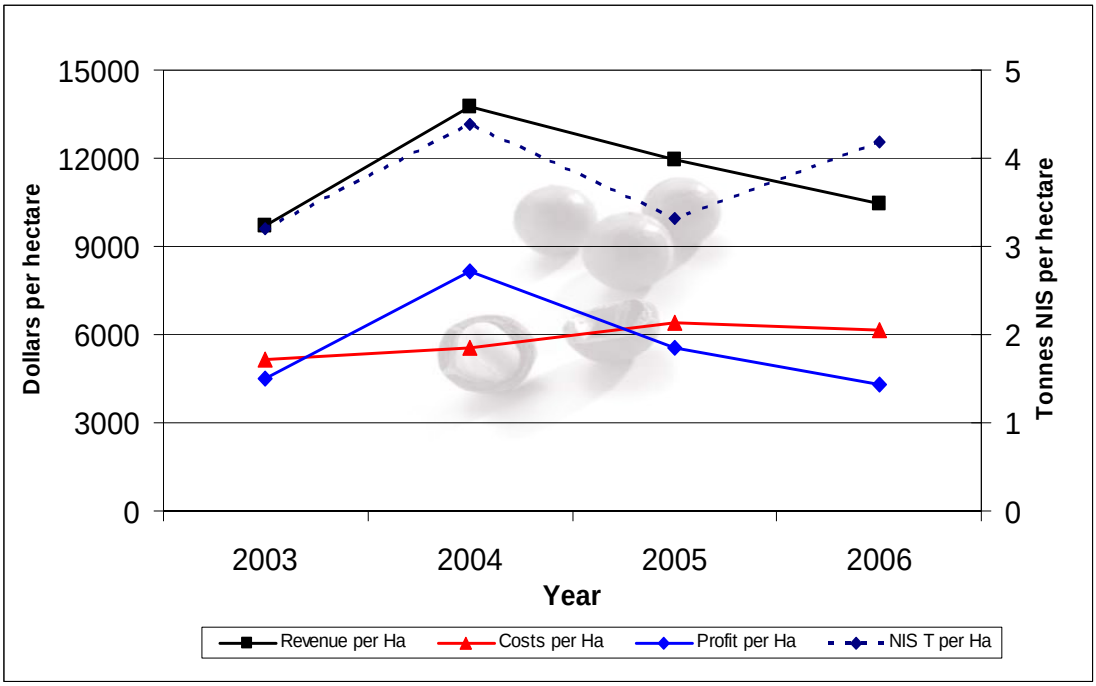


Figure 3.3: Average production and economic trends for orchards older than 10 years and more than 35 hectares

Appendix 3.2 Trend data for management structures

Figure 3.4 shows the trends for farms in the survey older than 10 years and managed by owner operators. Average production peaked at over 4 t/ha in 2004 and 2006. Costs increased from $4,622 to $6,395 per hectare from 2003 to 2006. Revenue and profit peaked at $14,397 and $8,182 per hectare in 2005.

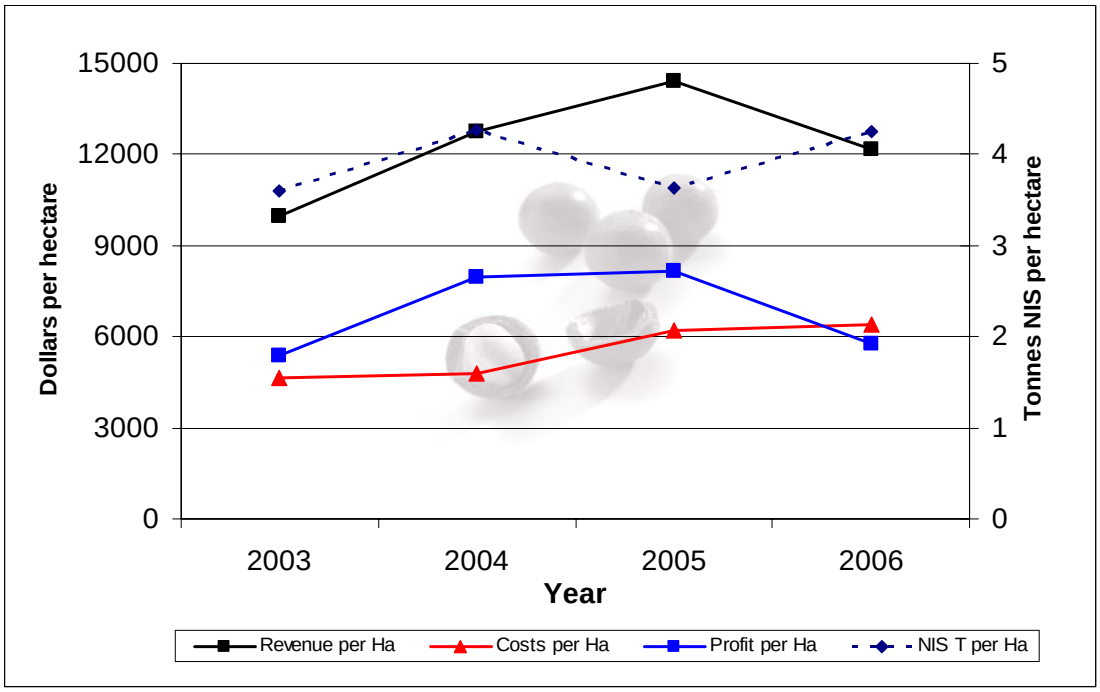


Figure 3.4: Average production and economic trends for orchards older than 10 years and managed by owner operators

Figure 3.5 shows the trends for farms in the survey older than 10 years and not managed by owner operators. Average production peaked at over 4 t/ha in 2004 and 2006. Costs increased from $5,165 to $6,368 and $6,106 per hectare from 2003 to 2005 and 2006. Revenue and profit peaked at $12,721 and $6,876 per hectare in 2004.

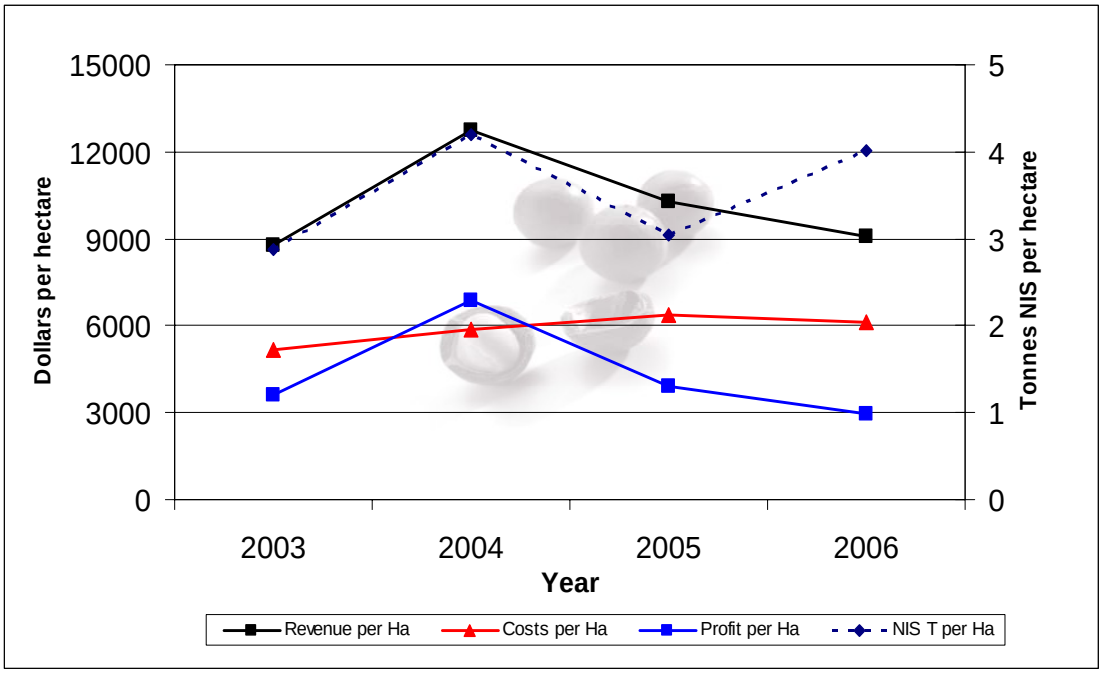


Figure 3.5: Average production and economic trends for orchards older than 10 years not managed by owner operators

Appendix 4

Statistical analyses

Appendix 4.1 Farm age cost category comparisons

Table 4.1 provides a comparison of the different cost categories between farms from 6 to 10 years of age and farms older than 10 years.

Table 4.1: Comparison of cost categories of farm ages

Group statistics	Farm age	Number	Mean	Mean difference (1-2)	Significance
Admin per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$509 $453	$56	0.53
Consultancy per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$86 $89	-$3	0.86
Contractors per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$174 $516	-$342	0.02**
Crop Nutr. per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$533 $706	-$173	0.02**
Crop Prot. per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$198 $270	-$72	0.04**
Employ. per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$639 $1,552	-$914	0.00***
Freight per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$52 $70	-$18	0.16
Fuel per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$268 $305	-$38	0.28
Hire per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$28 $72	-$44	0.28
Irrigation per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$43 $91	-$48	0.14
Lease per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$163 $245	-$82	0.31
Management per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$204 $363	-$159	0.00***
R&M Imp. per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$255 $175	$80	0.11
R&M Plant per ha	>=6Yrs & <=10Yrs >10 yrs	39 114	$1,118 $594	$524	0.10*

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

Appendix 4.2 Management structure cost category comparisons

Table 4.2 provides a comparison of the different cost categories between managed farms and owner managed farms older than 10 years.

Table 4.2: Comparison of cost categories of managed and owner managed orchards older than 10 years

Group statistics	Managed (1) or owner managed (2)	Number	Mean	Mean difference (1-2)	Significance
Admin. per ha	Managed Owner manager	66 48	$347 $598	-$251	0.00*
Consultancy per ha	Managed Owner manager	66 48	$69 $118	-$49	0.01*
Contractors per ha	Managed Owner manager	66 48	$499 $540	-$41	0.82
Crop Nutr. per ha	Managed Owner manager	66 48	$586 $872	-$287	0.00*
Crop Prot. per ha	Managed Owner manager	66 48	$292 $240	$52	0.17
Employ. per ha	Managed Owner manager	66 48	$1,918 $1,050	$868	0.00*
Freight per ha	Managed Owner manager	66 48	$74 $64	$10	0.37
Fuel per ha	Managed Owner manager	66 48	$239 $397	-$158	0.00*
Hire per ha	Managed Owner manager	66 48	$116 $12	$103	0.03*
Irrigation per ha	Managed Owner manager	66 48	$75 $113	-$39	0.29
Lease per ha	Managed Owner manager	66 48	$255 $230	$26	0.77
Management per ha	Managed Owner manager	66 48	$530 $134	$395	0.00*
R&M Imp. per ha	Managed Owner manager	66 48	$147 $213	-$66	0.18
R&M Plant per ha	Managed Owner manager	66 48	$517 $699	-$183	0.02*

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

Appendix 4.3 Regional cost category comparisons

Table 4.3 provides a comparison of the different cost categories between regions for farms older than 10 years.

Table 4.3: Comparison of cost categories for regions for farms older than 10 years

> 10 Years	**Least significant difference**					
Dependent variable	**Region (I)**	**Region (J)**	**Mean difference (I-J)**	**Sig.**	**Mean**	
Admin per ha	Bundaberg	NNSW SEQ	-$189 -$317	0.20 0.04**	Bundaberg	$241
	NNSW	Bundaberg SEQ	$189 -$128	0.20 0.19	NNSW	$430
	SEQ	Bundaberg NNSW	$317 $128	0.04** 0.19	SEQ	$558
Consultancy per ha	Bundaberg	NNSW SEQ	-$4 -$23	0.91 0.46	Bundaberg	$80
	NNSW	Bundaberg SEQ	$4 -$20	0.91 0.31	NNSW	$83
	SEQ	Bundaberg NNSW	$23 $20	0.46 0.31	SEQ	$103
Contractors per ha	Bundaberg	NNSW SEQ	-$458 $99	0.10* 0.73	Bundaberg	$293
	NNSW	Bundaberg SEQ	$458 $557	0.10* 0.00***	NNSW	$750
	SEQ	Bundaberg NNSW	-$99 -$557	0.73 0.00***	SEQ	$193
Crop Nutr. per ha	Bundaberg	NNSW SEQ	$213 $421	0.08* 0.00***	Bundaberg	$966
	NNSW	Bundaberg SEQ	-$213 $208	0.08* 0.01***	NNSW	$753
	SEQ	Bundaberg NNSW	-$421 -$208	0.00*** 0.01***	SEQ	$545
Crop Prot. per ha	Bundaberg	NNSW SEQ	-$82 -$76	0.20 0.25	Bundaberg	$199
	NNSW	Bundaberg SEQ	$82 $6	0.20 0.89	NNSW	$280
	SEQ	Bundaberg NNSW	$76 -$6	0.25 0.89	SEQ	$275

Dependent variable	Region (I)	Region (J)	Mean difference (I-J)	Sig.	Mean	
Employ. per ha	Bundaberg	NNSW SEQ	-$829 -$70	0.03** 0.86	Bundaberg	$1,063
	NNSW	Bundaberg SEQ	$829 $759	0.03** 0.00***	NNSW	$1,893
	SEQ	Bundaberg NNSW	$70 -$759	0.86 0.00***	SEQ	$1,134
	LSD					
Freight per ha	Bundaberg	NNSW SEQ	$59 $45	0.00*** 0.02**	Bundaberg	$118
	NNSW	Bundaberg SEQ	-$59 -$14	0.00*** 0.23	NNSW	$59
	SEQ	Bundaberg NNSW	-$45 $14	0.02** 0.23	SEQ	$73
Fuel per ha	Bundaberg	NNSW SEQ	-$209 -$145	0.00*** 0.02**	Bundaberg	$139
	NNSW	Bundaberg SEQ	$209 $64	0.00*** 0.11	NNSW	$349
	SEQ	Bundaberg NNSW	$145 -$64	0.02** 0.11	SEQ	$285
Hire per ha	Bundaberg	NNSW SEQ	$335 $352	0.00*** 0.00***	Bundaberg	$377
	NNSW	Bundaberg SEQ	-$335 $17	0.00*** 0.71	NNSW	$43
	SEQ	Bundaberg NNSW	-$352 -$17	0.00*** 0.71	SEQ	$25
Irrigation per ha	Bundaberg	NNSW SEQ	$333 $208	0.00*** 0.00***	Bundaberg	$347
	NNSW	Bundaberg SEQ	-$333 -$125	0.00*** 0.00***	NNSW	$14
	SEQ	Bundaberg NNSW	-$208 $125	0.00*** 0.00***	SEQ	$139
Lease per ha	Bundaberg	NNSW SEQ	-$156 $25	0.29 0.87	Bundaberg	$166
	NNSW	Bundaberg SEQ	$156 $181	0.29 0.06*	NNSW	$321
	SEQ	Bundaberg NNSW	-$25 -$181	0.87 0.06*	SEQ	$140

Dependent variable	Region (I)	Region (J)	Mean difference (I-J)	Sig.	Mean	
Management per ha	Bundaberg	NNSW SEQ	$259 $72	0.00*** 0.44	Bundaberg	$533
	NNSW	Bundaberg SEQ	-$259 -$187	0.00*** 0.00***	NNSW	$274
	SEQ	Bundaberg NNSW	-$72 $187	0.44 0.00***	SEQ	$461
R&M Imp. per ha	Bundaberg	NNSW SEQ	-$110 -$118	0.18 0.17	Bundaberg	$74
	NNSW	Bundaberg SEQ	$110 -$8	0.18 0.88	NNSW	$184
	SEQ	Bundaberg NNSW	$118 $8	0.17 0.88	SEQ	$192
R&M Plant per ha	Bundaberg	NNSW SEQ	-$475 -$311	0.00*** 0.02**	Bundaberg	$223
	NNSW	Bundaberg SEQ	$475 $164	0.00*** 0.04**	NNSW	$698
	SEQ	Bundaberg NNSW	$311 -$164	0.02** 0.04**	SEQ	$534

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level

Appendix 4.4 Farm size comparisons

Table 4.4 provides a comparison of the different cost categories between farm sizes for farms older than 10 years.

Table 4.4: Comparison of cost categories for farm sizes for farms older than 10 years

> 10 Years	**Least significant difference**					
Dependent variable	**Size (I)**	**Size (J)**	**Mean difference (I - J)**	**Sig.**	**Mean**	
Admin per ha	<15 ha	>=15ha & <35ha	$397	0.00***	<15 ha	$798
		>=35ha	$607	0.00***		
	>=15ha & <35ha	<15 ha	-$397	0.00***	>=15ha & <35ha	$401
		>=35ha	$209	0.03**		
	>=35ha	<15 ha	-$607	0.00***	>=35ha	$192
		>=15ha & <35ha	-$209	0.03**		
Consultancy per ha	<15 ha	>=15ha & <35ha	$64	0.00***	<15 ha	$137
		>=35ha	$73	0.00***		
	>=15ha & <35ha	<15 ha	-$64	0.00***	>=15ha & <35ha	$72
		>=35ha	$8	0.69		
	>=35ha	<15 ha	-$73	0.00***	>=35ha	$64
		>=15ha & <35ha	-$8	0.69		
Contractors per ha	<15 ha	>=15ha & <35ha	$311	0.14	<15 ha	$654
		>=35ha	$76	0.72		
	>=15ha & <35ha	<15 ha	-$311	0.14	>=15ha & <35ha	$343
		>=35ha	-$235	0.26		
	>=35ha	<15 ha	-$76	0.72	>=35ha	$577
		>=15ha & <35ha	$235	0.26		
Crop Nutrition per ha	<15 ha	>=15ha & <35ha	$187	0.04**	<15 ha	$797
		>=35ha	$71	0.45		
	>=15ha & <35ha	<15 ha	-$187	0.04**	>=15ha & <35ha	$610
		>=35ha	-$116	0.20		
	>=35ha	<15 ha	-$71	0.45	>=35ha	$726
		>=15ha & <35ha	$116	0.20		
Crop Protection per ha	<15 ha	>=15ha & <35ha	-$28	0.55	<15 ha	$244
		>=35ha	-$48	0.32		
	>=15ha & <35ha	<15 ha	$28	0.55	>=15ha & <35ha	$272
		>=35ha	-$20	0.66		
	>=35ha	<15 ha	$48	0.32	>=35ha	$292
		>=15ha & <35ha	$20	0.66		

Dependent variable	Size (I)	Size (J)	Mean difference (I - J)	Sig.	Mean	
Employment. per ha	<15 ha	>=15ha & <35ha >=35ha	-$1,489 -$1,383	0.00*** 0.00***	<15 ha	$556
	>=15ha & <35ha	<15 ha >=35ha	$1,489 $106	0.00*** 0.65	>=15ha & <35ha	$2,045
	>=35ha	<15 ha >=15ha & <35ha	$1,383 -$106	0.00*** 0.65	>=35ha	$1,939
Freight per ha	<15 ha	>=15ha & <35ha >=35ha	-$16 -$69	0.19 0.00***	<15 ha	$41
	>=15ha & <35ha	<15 ha >=35ha	$16 -$53	0.19 0.00***	>=15ha & <35ha	$57
	>=35ha	<15 ha >=15ha & <35ha	$69 $53	0.00*** 0.00***	>=35ha	$110
Fuel per hectare	<15 ha	>=15ha & <35ha >=35ha	$114 $147	0.01*** 0.00***	<15 ha	$395
	>=15ha & <35ha	<15 ha >=35ha	-$114 $33	0.01*** 0.45	>=15ha & <35ha	$281
	>=35ha	<15 ha >=15ha & <35ha	-$147 -$33	0.00*** 0.45	>=35ha	$248
Hire per ha	<15 ha	>=15ha & <35ha >=35ha	-$109 -$71	0.06* 0.22	<15 ha	$9
	>=15ha & <35ha	<15 ha >=35ha	$109 $38	0.06* 0.50	>=15ha & <35ha	$118
	>=35ha	<15 ha >=15ha & <35ha	$71 -$38	0.22 0.50	>=35ha	$80
Irrigation per ha	<15 ha	>=15ha & <35ha >=35ha	$40 -$47	0.36 0.30	<15 ha	$90
	>=15ha & <35ha	<15 ha >=35ha	-$40 -$87	0.36 0.05**	>=15ha & <35ha	$50
	>=35ha	<15 ha >=15ha & <35ha	$47 $87	0.30 0.05**	>=35ha	$136
Lease per ha	<15 ha	>=15ha & <35ha >=35ha	-$12 -$13	0.91 0.91	<15 ha	$236
	>=15ha & <35ha	<15 ha >=35ha	$12 -$1	0.91 0.99	>=15ha & <35ha	$248
	>=35ha	<15 ha >=15ha & <35ha	$13 $1	0.91 0.99	>=35ha	$249
Management per ha	<15 ha	>=15ha & <35ha >=35ha	-$318 -$410	0.00*** 0.00***	<15 ha	$112
	>=15ha & <35ha	<15 ha >=35ha	$318 -$92	0.00*** 0.10*	>=15ha & <35ha	$430
	>=35ha	<15 ha >=15ha & <35ha	$410 $92	0.00*** 0.10*	>=35ha	$522

Dependent variable	Size (I)	Size (J)	Mean difference (I - J)	Sig.	Mean	
R&M Imp per ha	<15 ha	>=15ha & <35ha >=35ha	$121 $196	0.04** 0.00***	<15 ha	$284
	>=15ha & <35ha	<15 ha >=35ha	-$121 $76	0.04** 0.18	>=15ha & <35ha	$163
	>=35ha	<15 ha >=15ha & <35ha	-$196 -$76	0.00*** 0.18	>=35ha	$87
R&M Plant per ha	<15 ha	>=15ha & <35ha >=35ha	$183 $270	0.05** 0.00***	<15 ha	$749
	>=15ha & <35ha	<15 ha >=35ha	-$183 $87	0.05** 0.33	>=15ha & <35ha	$566
	>=35ha	<15 ha >=15ha & <35ha	-$270 -$87	0.00*** 0.33	>=35ha	$480

* The mean difference is significant at the 10% level
** The mean difference is significant at the 5% level
*** The mean difference is significant at the 1% level