Final Report

Decision support models for Australian dried tree fruit

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DT23001

Project:

Decision support models for Australian dried tree fruit (DT23001)

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Public Summary

A new decision support model enables dried apricot growers to develop their business case for investment in new and improved varieties. The model is known as Apricot Invest and was developed by the Australian Dried Tree Fruits Association in conjunction with Hort Innovation (Project DT23001) to enable growers to develop their business case for investment in the new dried apricot varieties.

To remain financially viable and competitive, dried tree fruit growers need to ensure their farm management is based on industry best practice and remains focused on improving the key drivers of productivity, quality, and profitability.

In 2018 the South Australian Research and Development Institute (SARDI) released 17 new apricot varieties to the Australian apricot industry. The Australian apricot industry needed new apricot varieties to improve the cost and profitability of production. The new varieties retain a traditional full colour cut half style and improve overall cropping reliability, fruit quality and yield as well as improved dry ratios. They are also compatible with mechanised labour-saving production systems such as mechanised picking. Traditional dried apricot enterprises have up to 70% of their direct costs consumed by the labour-intensive activities of picking, cutting and scraping. The new varieties present significant opportunity to positively improve the cost structures and return on investment proposition for a dried apricot enterprise.

This project produced an Excel file with detailed cost breakdowns for a dried apricot enterprise. This information provides for Apricot Invest which is a highly adaptable and easy to use cash flow analysis tool accessible through most web browsers. The purpose of Apricot Invest is to enable rapid development of a business case for an Australian Dried Apricot enterprise that precedes a business plan.

Every grower will approach the investment case for dried apricots differently to reflect their unique circumstances. Apricot Invest allows that uniqueness to be explored and planned out in yearly increments over a 20-year period. It can test the sensitivity of variables such as yield, crop ripeness, fruit size, drying ratio, establishment costs, price paid, pruning, picking, cutting and scraping rates, overhead costs, land, machinery and equipment capital investments.

Apricot Invest has been used by experienced horticulturalists adding their data and insights to test production options and practices through virtual modelling, exploring returns on investment and different risk settings. One of the big benefits of Apricot Invest is the ability to continuously ask ‘what if’ questions and rapidly report on the findings through graphs and tables.

The main benefit of Apricot Invest is its ability to enable growers to assemble enterprise numbers in one place and quickly explore for themselves the best configuration of a dried apricot investment tailored to their individual circumstances using the new SARDI varieties.

Key words

Dried apricots; enterprise model: cash flow; sensitivity; gross margin; return on investment

Introduction

The Australian apricot industry emerged in the 1920's mostly producing fresh fruit. Dried apricot production expanded in the 1930's and peaked in the 1960's at a production level that was globally significant. Since then, overall production of apricots for drying has decreased. Competition from imported dried apricots, particularly from Turkey and South Africa has been a major driver in the decline of the domestic dried apricot market.

The Australian industry has responded through innovations and improvements to drying activities such as cutting and handling machines to reduce labour costs and increase efficiency. More recently the South Australian Research and Development Institute (SARDI), developed seventeen new apricot varieties that reflect higher sugar levels and better yields (Graetz 2018). The new apricot varieties improve overall cropping reliability, fruit quality and yield both on tree and during the drying process. They show improved dry ratios and are robust enough to allow new mechanised labour-saving production systems such as pruning, harvesting and drying.

To achieve a strong domestic and export focused future, the Australian dried apricot industry will depend on careful and considered investment to create dried apricot enterprises models that are fit for the future and meet profit goals. To assess the opportunity, potential investors will need to assess feasibility and return on investment criteria.

The purpose of Apricot Invest is to enable rapid development of a business case for an Australian Dried Apricot enterprise. A business case sets up a first appraisal of an investment project to help management decide if they should go ahead to a business plan (Legge & Hindle). Apricot Invest is a discounted cash flow model that enables users to explore different enterprise models and the sensitivity of variables that drive annual profit margins and longer-term return on investment. The cloud-based software is easy to access and use and difficult to corrupt. It saves search time, brings much information into one place, supports discussions particularly in groups and supports learning and decision making. It is especially useful at testing 'what if' questions.

A decision to invest in dried apricot production is difficult with many uncertainties, technical complexities and requires well developed plans and goals. Discounted cash flow analysis using Net Present Value (NPV) and Internal Rate of Return (IRR) calculations is still the main way to assess return on investment (Ross et al 2003). However, assembling the information and constructing a business case that explores the feasibility of various scenarios and sensitivities takes time and expertise. In addition, the risk of forecasting error is high if the model does not provide an interactive learning environment where questions are raised and assumptions made clear, leading to further and more informed questioning. Interactive learning environments enable decision makers to speed up learning and review their mental models following a double loop learning process[1]. The shortcomings of traditional valuation methods suggest decision makers benefit less from a discounted cashflow built recommendation report than from the learning process allowed by an interactive learning environment (discussion group) aiming at a more complete consideration of a new or modified business model (Matos 2020). This is the key strength of Apricot Invest.

The individual enterprise model can strongly influence returns on investment. Apricot Invest is used to help decide if a dried apricot enterprise (model) meets specific investment criteria at a business case stage, with the caveat 'all models are wrong, but some are useful[2]'.

[1] Single-Loop Learning: This involves detecting and correcting errors by making adjustments to actions or strategies without questioning the underlying assumptions. Double-loop learning goes a step further by questioning the underlying assumptions and norms. https://en.wikipedia.org/wiki/Double-loop_learning Double-loop learning - Wikipedia

[2] https://en.wikipedia.org/wiki/All_models_are_wrong

Methodology

A reference group was formed to guide the project with a cross section of industry representing growers, processors, research and the industry association. This group interacted virtually through Teams®.

An initial project was completed in 2011 to provide a discounted cash flow model for the Australian dried apricot industry using Microsoft Excel® and iThink® software as the modelling tools (Chaffey 2011). Since that time both software products have improved in functionality and, with cloud based 'software as a service' (SaaS), are easier to access and use.

Software

Excel® was used a repository for enterprise data. It was reorganised and updated to present detailed enterprise data in a form that was more readily updateable. A summary sheet of all the main enterprise variables was formatted to be imported to the iThink® model as baseline, default data (Appendix 1: List of model variables and initial settings). Labour costs were split out for analysis in Excel but minimised in iThink® to allow modelling to be kept simple, fast and informative as to the financial performance criteria and resultant discussions and learning. The account structure is setup to report profit after tax and project cash flows (Appendix 2: Account structure).

iThink® software from isee systems[3] is Apricot Invest frontline product. It was used to model the enterprise in yearly increments over a 20-year period. The iThink® user interface was branded 'Apricot Invest', which succinctly reflects the products purpose and provides the industry with a simple, memorable name that resonates with the target audience (Appendix 3: User Interface home page).

The interface was split into ten pages covering the following enterprise themes.

1. Establishment
2. Sales
3. Costs
    a. Tree health (weed, pest, disease control, fertiliser, IPM)
    b. Irrigation
    c. Thinning and pruning
    d. Picking
    e. Drying
    f. Overhead costs
4. Investment.

Each theme breaks down the physical and financial calculations sufficiently to provide performance and result reports (Parmenter 2007). Performance indicators (PIs) and key performance indicators (KPIs) are activities that can be measured annually and impact longer term Key result indicators (KRIs) (Appendix 4: Performance and result indicators).

Enterprise models

Apricot Invest is designed to enable the user to run the numbers on their specific enterprise model i.e. the way their dried apricot enterprise will be set up and run. The user must consider what assets, knowledge and skills they bring to the investment, how they intend to run the enterprise, their management aims, and their desired return on investment. There is a large range of potential enterprise models (Appendix 5: Example of enterprise model options). In most cases the model will be a cross section of the options or merge from one option toward another to achieve a goal of the grower e.g. move from manual to mechanical option.

[3] https://www.iseesystems.com/

Access and use

The common way to access Apricot Invest is to create an account on the isee exchange[4] which hosts Apricot Invest. The industry association can decide how many accounts they want to host and who hosts them i.e. facilitates each site. Apricot Invest can be used by one person as part of their planning and estimation or in conjunction with their advisory professionals. It can also be used in group situations for example, a group of growers facilitated by industry service provider(s). A facilitator provides access to users, facilitates a group or individual and can check use and data related to specific variables in the model.

Data generated can be aggregated for analysis and reporting, or individual data can be provided to users for their own analysis. Alternatively, users can simulate their virtual enterprise and copy and paste data to Excel for further analysis. People can access Apricot Invest with a standard computer through commonly used web browsers.

Market testing

A beta version was tested with a sample of small and large experienced growers. Feedback led to improvements and a final product was made available to a wider audience. Given the nature of the product, improvements can be incremental and ongoing based on feedback.

[4] https://exchange.iseesystems.com/

Results and discussion

Apricot Invest was tested with a small sample of experienced horticulturalists, all of whom were considering investment in dried apricots. Each grower described and tested a different enterprise model. Double loop learning was a feature of all discussions where 'what if' questions led to new simulations, new insights and further questions, a process of refinement to each horticulturists mental model. All were able to reach or exceed their required return on investment. They were able to also test the conditions that challenged their required rate of return.

Enterprise models and return on investment

There was a range of dried apricot enterprise models expressed by the sample group with the following features and questions.

1. Small scale (5ha) mostly manual operations assuming new varieties.
    a. What happens if picking was mechanised?
    b. My overhead costs are much lower than the default, how does that affect results?
    c. What happens if I aim for a crop ripeness of 60% instead of 80%? What does that do to average drying ratio, gross margins etc.?
    d. What happens if I aim for 65% of the crop being large size?
    e. What happens to results if there is a 1 in 6 crop failure?
2. Small scale (4ha) with mostly mechanical operations up to harvest but with uncertainties surrounding drying options presenting the following questions.
    a. What happens when a high-volume tree shaker is used?
    b. What happens to results when the cutting rate (trays per hour) increases from 70 to 100?
    c. My overhead costs will be lower than default how does that affect results?
    d. What happens to results if a $100 000 investment is made in machinery?
    e. What happens to results if there is a 1 in 3 crop failure?
    f. Could drying be centralised?
    g. Could excess cool room storage in the region be used to hold fruit before presenting to a centrally located drying facility?
3. Large scale (20ha) with industry leading mechanisation for pruning, picking and drying.
    a. What happens to the drying cost ($/tray) if the cutting and scraping rate was 180 trays per hour, with 14 people, the tray size was 18 kilograms, and the cutting machine repair and maintenance was equating to $2 000 per year?
    b. What happens if only 10 people were needed on the cutting machine for the same output?
    c. What will drying trays cost to buy, who supplies them?
    d. What are the drying tray material options e.g. timber, plastic?
    e. What is the ideal size of a drying tray?

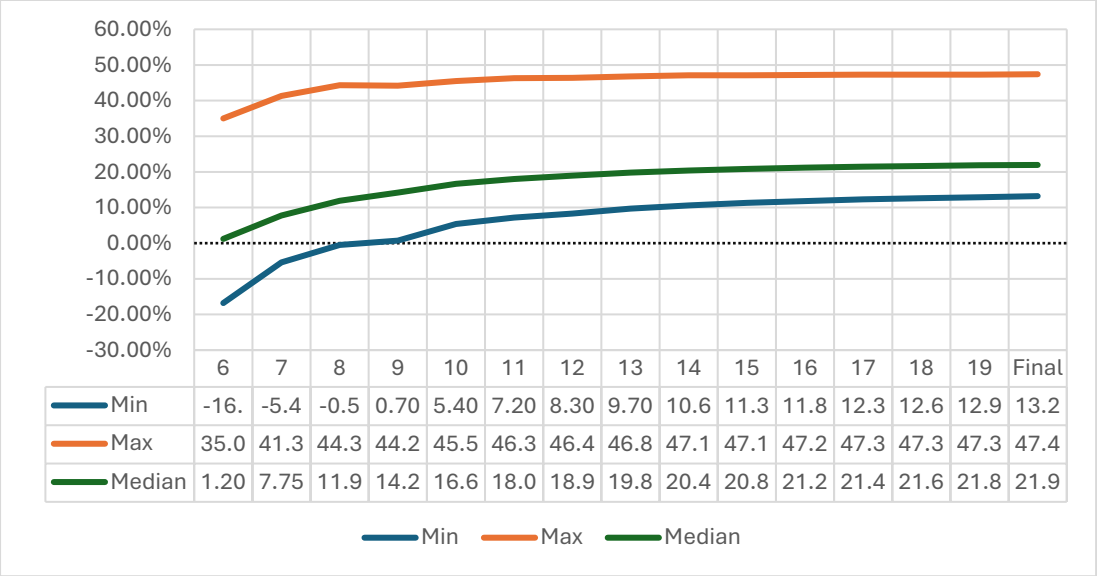
The median internal rate of return from 16 simulation runs from three experienced horticulturalists approximated 20%. The minimum peaked at 13% (Figure 1). Further enquiry and testing would refine these figures and build more confidence in them.

What became apparent in the workshops was the level of challenging enquiry and the repeated testing of variables at revenue, direct and indirect cost and capital investment levels. This included questioning the assumptions being made by each individual leading to refinement of original assumptions.

The process also led to innovative concepts such as.

- Centralised drying facilities
- Use of idle cool stores for fruit waiting to be dried
- The merits of larger tray sizes, their procurement, cost and the various materials they could be made from
- The justification for continuing as a small scale mostly manual operation

- The possible profit and return on investment impacts of highly mechanised picking machinery
- The merits of reducing labour in a highly mechanised drying process
- The value of short season production in water savings and the associated resource allocation advantages.



	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Final
Min	-16.	-5.4	-0.5	0.70	5.40	7.20	8.30	9.70	10.6	11.3	11.8	12.3	12.6	12.9	13.2
Max	35.0	41.3	44.3	44.2	45.5	46.3	46.4	46.8	47.1	47.1	47.2	47.3	47.3	47.3	47.4
Median	1.20	7.75	11.9	14.2	16.6	18.0	18.9	19.8	20.4	20.8	21.2	21.4	21.6	21.8	21.9

Figure 1: Internal rates of return (IRR) from 16 simulation runs from three different enterprise models as described by three experienced horticulturalists.

The workshops' also suggested return on investment was acceptable to each party despite the large variation in enterprise models (Appendix 5: Example of enterprise model). The differences were driven largely by individual circumstances such as the assets already in place and the choices made between picking, drying, overheads, extent of capital investment and market orientation. This suggests the dried apricot enterprise could deliver an acceptable return on investment to a wide range of people running different enterprise models.

Effect of changes in scale

Apricot Invest was used to test exponential scale changes (hectares) and holding all other variables the same. The simulation runs equate to the following scale changes.

- Run 1 = 5 ha
- Run 2 = 10 ha
- Run 3 = 20 ha
- Run 4 = 40 ha
- Run 5 = 80 ha

The result of these simulation runs showed the following (Appendix 6: Characteristics of Scale).

1. Cumulative production of fresh fruit increases with scale with yield (fresh tonnes per hectare) staying the same.
2. The level of debt driven by establishment costs increases with scale.
3. Gross margins and internal rates of return remain the same.

Enterprise differences can then be played out by adjusting revenue generators, direct and indirect costs and capital costs to suit individual enterprise models and situations.

Example of a hypothetical simulation

A hypothetical simulation using Apricot Invest was used based on an enterprise model where an existing dried apricot grower explored a business case adding 20 hectares of apricots for drying using one of SARDI's new varieties (Appendix 6: Example of a hypothetical simulation). This example had the following aims and assumptions.

1. Experienced tree fruit grower with 20 hectares of vacant land already owned (sunk cost)
2. Established infrastructure and equipment in proximity
3. Open vase orchard with a tree density of 760 trees per hectare
4. Aiming for a high degree of mechanisation in pruning, picking and drying activities with low operating cost base
5. Overhead costs diluted across the broader business so less than $5 000 per hectare
6. Significant infrastructure, machinery and equipment already owned however need to test capital investment in machinery and equipment to find the limits.

Four decision criteria were chosen to measure and justify the investment. The investment would need to achieve a total cost (direct and overhead) of less than 50% of sales. A preferred machinery to income (sales) ratio of less than one. Interest costs on money borrowed less than 10% of sales revenue and an internal rate of return of greater than 15%.

The first simulation run (run 1) featured moderate heavy crop yield, picking 75% of the crop with a trailer catcher (800kg/hr) and 25% with hand picking off a work platform, overheads at $5 000 per hectare and no capital investments other than establishment costs.

Simulation run 2 reduced overhead costs from $5 000 to $3 500 per hectare because overheads were shared across the larger business.

Simulation run 3 increased capital investment in machinery from $0 to $500 000 in year 1.

Simulation run 4 changed yields to 'Your estimate' which equates to the moderate heavy crop yield but with three of 17 production years treated as 'failures' yielding approximately 10 fresh tonnes per hectare.

The results of the hypothetical simulation included.

1. Cumulative yield reduced by ~1000 fresh tonnes because of yield reductions in run 4 (Figure 5).
2. All simulation runs had total costs meeting the <50% of sales revenue criteria except for run 4 with three break out years (Figure 6).
3. Peak debt reached ~$1.5m and break-even years shifted out for runs 3 and 4 (Figure 7).
4. Interest paid as a percent of sales revenue exceeded the 10% of sales revenue in the early years and broke out in the three low yield years but largely met the criteria (Figure 8).
5. Machinery and equipment cost as a ratio of sales revenue (Figure 9) achieved the criteria of being less than 1 except in the years of poor yield (run 4).
6. Internal rate of return (IRR) exceeded the criteria of >15% on all simulations (Figure 10).

Apricot Invest is a planning tool assembling significant information in one place and simulates a wide range of dried apricot enterprise models. A user can quicky build their business case for investment in dried apricots that will fast track them to a detailed business plan.

Outputs

The following outputs were created from this project.

1. An Excel file providing bottom-up calculations to assemble sufficient enterprise data to present and cash flow report, a breakdown of labour hours and costs and a summary sheet of variables to set up base settings in the iThink® model and interface.
2. The brand name Apricot Invest.
3. An iThink® file presenting Apricot Invest – business support model
4. A six-month account on the isee exchange from 17 September 2024 to 2 June 2025.
5. Three face-to-face meetings using Apricot Invest with experienced horticulturalists exploring an investment in dried apricots.

Outcomes

Project DT230001 aligns with two of the four industry outcomes as described in Hort Innovation's dried tree fruit strategic investment plan (Hort Innovation 2021).

1. Business insights: the strategic intent of this outcome is to deliver data and insights which is foundational to achieving success in the other three outcome areas.
2. Industry supply, productivity and sustainability: the strategic intent of this outcome is to accelerate the application of production practices that optimise returns and reduce risk to growers.

While this project has had some early-stage discussion groups it is too early to provide meaningful evidence of outcomes however the table below shows the direction of outcomes desired.

Table 1 Outcome summary

Outcome	Alignment with Strategy	Description	Evidence
Discussions and challenges to assumptions focusing on enterprise model options, sensitivity of variables, innovations, improvements and returns on investment. **People investing in new dried apricot enterprises successfully.**	Business insights	Providing data and insights to investment and operations at the enterprise level (behind the farm gate) to better understand the conditions that deliver desired returns on investment.	Figure 1 and Appendices 5, 6, & 7
	Supply, productivity, sustainability	Accelerated application testing of production options and practices through virtual modelling, return optimisation and risk testing through double learning.	

Monitoring and evaluation

The evaluation framework was designed at the commencement of the project. The observations (Table 2) provide a basis for further objective evaluation during and after the extension phase from a larger sample size.

Table 2 Subjective evaluation summary

Project Evaluation Stages	Observations
Resources to do the project	Excel, iThink® software, past documentations, industry experts
Activities undertaken	Secondary research for data, design and construct software products. Advisory group meetings Test workshops with experienced horticulturalists
Participation in the project	High degree of participation in workshops with questions focused on the future e.g. what if? and driving enquiry of about enterprise model options, innovations and improvements to practice.
Reactions during and after the project	Enthusiastic, interest in personal aspirations and the opportunity to test in a 'virtual no risk world'.
Knowledge, Attitude, Skills, Aspirations of people associated with the project.	General realisation that a range of enterprise models can deliver acceptable returns on investment. It is not just about scale and mechanisation. A realisation the dried apricot enterprise is a serious option for future investment relative to other options.
Practices and Behaviour	Exploration of different methods, tools and techniques for pruning, picking, drying. Mechanisation opportunities, centralised versus dispersed drying facilities, cutting and scraping machine options, tray sizes, tray suppliers, tray materials and cost.
Social, Economic, Environmental Condition of the project and its context	Positive and rich discussions from use of Apricot Invest strongly promoting learning and insight, see appendices. Created conditions that led to ideas for innovation and improvement to the individual enterprises and industry
Ideals	To be completed from review of extension phase.

Recommendations

This project has created Apricot Invest and associated outputs as business support tools for the Australian Dried Tree Fruits Association (ADTFA) to aid investors with their investment decisions with a dried apricot enterprise. In the extension phase there will be several roles to fulfil to support the products and their users.

Custody of products

The ADTFA will need to take custody of the digital products on their preferred cloud-based storage system such as One Drive or equivalent.

Hosting the interface

The Apricot Invest interface is hosted on the isee exchange currently paid out to 2 June 2026. The ADTFA will need to appoint a facilitator of the account to provide access to users, check and review use and engage with isee systems customer service centre.

Using the Apricot Invest interface

There are three main ways ADTFA can provide access to the Apricot Invest interface.

1. Direct, for example. Users sign on to the isee exchange and use the product on their own or with the support and advice of their professional service providers.
2. Indirect, for example. The ADTFA provides access to professional service providers (accountants, consultants etc.) who then provide access to the Apricot Invest interface to their clients. This is like appointing third party facilitators who use Apricot Invest as a service product to their client base either individually or as small interest groups i.e. the service signs up to the exchange then shares their access with their client.
3. Independent, for example. An institution such as a consulting group, university or trade-based college may wish to use Apricot Invest as part of their curriculum or service offer. The ADTFA could provide a specific account on the isee exchange for this purpose so that the institution hosts and manages their own account on the isee exchange and provide access to their clients with permissions.

Ongoing improvements

The Apricot Invest products have been designed to allow for incremental improvements to be made as time progresses and circumstances change. The Excel file holds a large amount of specific data formatted in tables. This is readily updateable. An intermediate knowledge of Excel would be sufficient to be able to add improvements and update information.

The iThink® software from isee systems updates it default data from the Excel file. This link is not necessary but helps to keep the details and justifications for figures transparent and validated. The iThink® model is simple enough for anyone with intermediate iThink® skills to be able to update or change the current configuration and language. It is likely that small improvements will be needed because,

1. More people use the product and provide feedback for change
2. Default costs change and require a reset
3. Enterprise structures and behaviour over time change in ways not currently captured.

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Intellectual property

All intellectual property is owned by The Australian Dried Tree Fruits Inc.

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Appendices

Appendix 1: List of model variables and initial settings

The following tables summarise the base (starting) numbers for the variables in this report using Apricot Invest. The table data is extracted from details in Excel and exported as starting figures in iThink® (Apricot Invest) used to examine the enterprise investment opportunity. All variables can be challenged and changed to find effects on performance and results.

Default settings on the Establishment page

Establishment			Notes
Hectares planted			
Open vase	hectares	20	
Free Standing V	hectares	0	
Tree density			
Open vase	trees/ha	420	
Free Standing V	trees/ha	990	
Yield - fresh tonnes		switch	
Moderate crop	ft/ha	0	Default setting uses moderate heavy crop which delivers ~6 484 tonnes of fresh fruit over 18 years of production period (~20 t/ha /yr) and 20-year investment time frame.
Moderately heavy crop	ft/ha	1	
Heavy crop	ft/ha	0	
Your estimate	ft/ha	0	
Establishment Costs			
Cost of trees	$/tree	$ 17.60	Approximate commercial cost
Land preparation	$/ha	$ 3,000	Estimate
Soil preparation	$/ha	$ 500	Estimate
Soil fumigation	$/ha	$ 6,000	Estimate
Other costs	$/ha	$ -	
Annual write off rate	%/year	13%	Reference tax office
Maximum write off period	Years	9	Reference tax office
Irrigation system	$/ha	$ 10,000	Variable depending on situation
Effective life of irrigation system	years	15	Indicative

Default settings for the Sales page

Sales			Notes
Fresh Fruit Ripeness at Harvest			
Ripe	%/ft	80%	Achieving a particular ripeness balance year on year is a management goal. Current settings assumed to be commercially desirable.
Under Ripe	%/ft	10%	
Immature	%/ft	5%	
Over Ripe	%/ft	3%	
Dropped	%/ft	2%	
		100%	
Dried Fruit Size Grade			
XL	% /ft	15%	Achieving a particular fruit size grade year on year is a management goal. Current settings assumed to be commercially desirable.
Large	% /ft	78%	
Medium	% /ft	5%	
Standard	% /ft	1%	
Manufacturing	% /ft	1%	
		100%	
Drying ratios			
Ripe	ft:dt	4.2	While dry ratio can vary, current settings are guided by SARDI research with new varieties.
Under Ripe	ft:dt	4.9	
Immature	ft:dt	5.9	
Prices Paid for Dried Fruit			
XL	$/dt	$ 10,800	Prices assumed to be indicative of market prices for dried apricots.
Large	$/dt	$ 10,400	
Medium	$/dt	$ 7,400	
Standard	$/dt	$ 5,700	
Manufacture	$/dt	$ 2,300	

Default settings for the Irrigation page

Irrigation			Notes
Irrigation			
Irrigation rate	ML/ha	7.0	Irrigation costs try to reflect commercial practise, although individual circumstances can vary considerably.
Water and delivery cost	$/ML	$ 275	
R&M cost	$/ha	$ 75.00	
Power cost	$/ML	$ 12.50	
Irrigation labour	hrs/ha	2.0	
Irrigation labour cost	$/ha	$ 34.19	

Default settings for the tree health page

Production costs	Unit		Notes
Weed control			
Cover crop			
Cover crop establishment cost	$/ha	$ 94	While interrow weed management can vary considerably depending on management goals, current settings are estimates of commercial practise.
Year of establishment	years	1	
Herbicide			
Year 1	$/ha	$ 268	
Year 2	$/ha	$ 253	
Year 3	$/ha	$ 289	
Year 4+	$/ha	$ 289	
Mowing			
Year 1	$/ha	$ 241	
Year 2	$/ha	$ 2411	
Year 3	$/ha	$ 241	
Year 4+	$/ha	$ 241	
Disease Control			
Year 1	$/ha	$ 125	Disease control cost estimates reflect commercial practice.
Year 2	$/ha	$ 230	
Year 3	$/ha	$ 526	
Year 4+	$/ha	$ 526	
Pest Control			
Year 1	$/ha	$ -	Pest control settings assume minimum pest issues early and minor costs year on year.
Year 2	$/ha	$ -	
Year 3	$/ha	$ -	
Year 4+	$/ha	$ 119	
Fertiliser			
Year 1	$/ha	$ 980	Fertiliser goals and cost estimates reflect commercial industry practise however they can vary considerably.
Year 2	$/ha	$ 538	
Year 3	$/ha	$ 1860	
Year 4+	$/ha	$ 2,315	
IPM			
Year 1	$/ha	$ -	It is assumed no integrated pest management costs are required but that may change if fruit fly emerges in the future.
Year 2	$/ha	$ -	
Year 3	$/ha	$ -	
Year 4+	$/ha	$ -	
Other direct costs			
Year 1	$/ha	$ -	It is assumed no other direct costs of production are incurred but this can used to add costs not covered elsewhere.
Year 2	$/ha	$ -	
Year 3	$/ha	$ -	
Year 4+	$/ha	$ -	

Default settings for Thinning and Pruning

Thinning and Pruning			Notes
Thinning			
Thinning rate	trees/hr		It is assumed there is no thinning needed because of pruning practises.
Thinning wage	$/hr	$ 34.19	
Thinning mechanisation	$/hr	$ 2.00	
Thinning labour units	people/hr	1.0	
Pruning			
Manual pruning			
Pruning rate	trees/hr	40	
Pruning wage	$/hr	$ 34.19	
Pruning labour units	people/hr	1.0	
Pruning mechanisation cost	$/hr	$ 0.94	
Manual Pruning option switch	switch	0	Switch off for manual pruning
Mechanical pruning			
Mechanical pruning option switch	switch	1	Switch on for mechanical pruning
Pruning rate	trees/hr	600	Estimate only
Pruning wage	$/hr	$ 34.19	
Pruning labour units	people/hr	1.0	
Pruning machine cost	$/hr	$ 80.00	Estimate only, this could vary considerably
Cleanup pruning			Cleanup supports mechanical pruning and maybe be biannual
Pruning rate	trees/hr	80	

Default settings for Picking

Picking			**Notes**
Picking rates			
Picking labour rate	$/hr	$34.19	Standard rate
Hand Picking	kg/hr	70	Picking rates are indicative, they can vary significantly
Work platform	kg/hr	100	
Manual branch shaker	kg/hr	600	
Trailer catcher (manual shake)	kg/hr	800	
Tree shaker and catcher*	kg/hr	4,800	
Picking labour requirements by method			
Hand Picking	people/method	1.1	People per method are indicative, they can vary considerably.
Work platform	people/method	1.1	
Manual branch shaker	people/method	3.2	
Trailer catcher (manual shake)	people/method	3.2	
Tree shaker and catcher*	people/method	3.2	
Picking machine costs			
Hand Picking	$/hr	$ 0.00	Machine naming is broadly representative of method, what is more important is the running costs $/hr which can vary considerably.
Work platform	$/hr	$ 1.69	
Manual branch shaker	$/hr	$ 7.50	
Trailer catcher (manual shake)	$/hr	$ 37.50	
Tree shaker and catcher	$/hr	$ 72.00	
Picking method allocation			
Hand Picking	% of crop	0%	A combination of methods might be used e.g. 80% branch shaker, 20% work platform.
Work platform	% of crop	20%	
Manual branch shaker	% of crop	0%	
Trailer catcher (manual shake)	% of crop	80%	
Tree shaker and catcher	% of crop	0%	

Default settings for Cutting, Scraping, Sulphur and layout

The drying activities can be done in a variety of ways that affect throughput and cost. Methods, tools and techniques can vary considerably. For example, cutting, scraping and layout methods, labour requirements and tray size all have a bearing on cost.

Drying			Notes
Cutting			
Manual cutting cost			
Manual cutting labour rate	$/tray	$ 3.25	Estimate
Manual cutting rate	trays/hr	20	
Mechanical cutting option	1 = yes, 0 = no	1	
Mechanical cutting cost			
Mechanical cutting rate	trays/hr	180	Estimate
Number of mechanical cutters	people/hr	14	Estimate
Labour rate	$/hr	$ 34.19	
Cutting equipment R&M	$/hr	$ 20.25	Estimate
Scraping and Sulphur costs			
Fresh fruit per drying tray	kg/tray	18.0	Variable
Sulphur cost	$/kg	$ 4.40	
Sulphur rate	g/kg	4.0	
Scrapping rate	trays/hr	180	Variable
Labour rate	$/hr	$ 34.19	
Freight cost	$/dt	$ 10.00	variable
Layout costs			
Layout rate	trays/person/hr	$ 100.00	Estimate
Layout labour rate	$/hr	$ 34.19	
Layout multiplier	in & out	2.0	Variable
Layout machine costs	$/hr	$15.00	Estimate

Default settings for Overhead costs

The default setting of $5 000 per hectare is an initial figure that each user will change to suit their own estimates and assumptions.

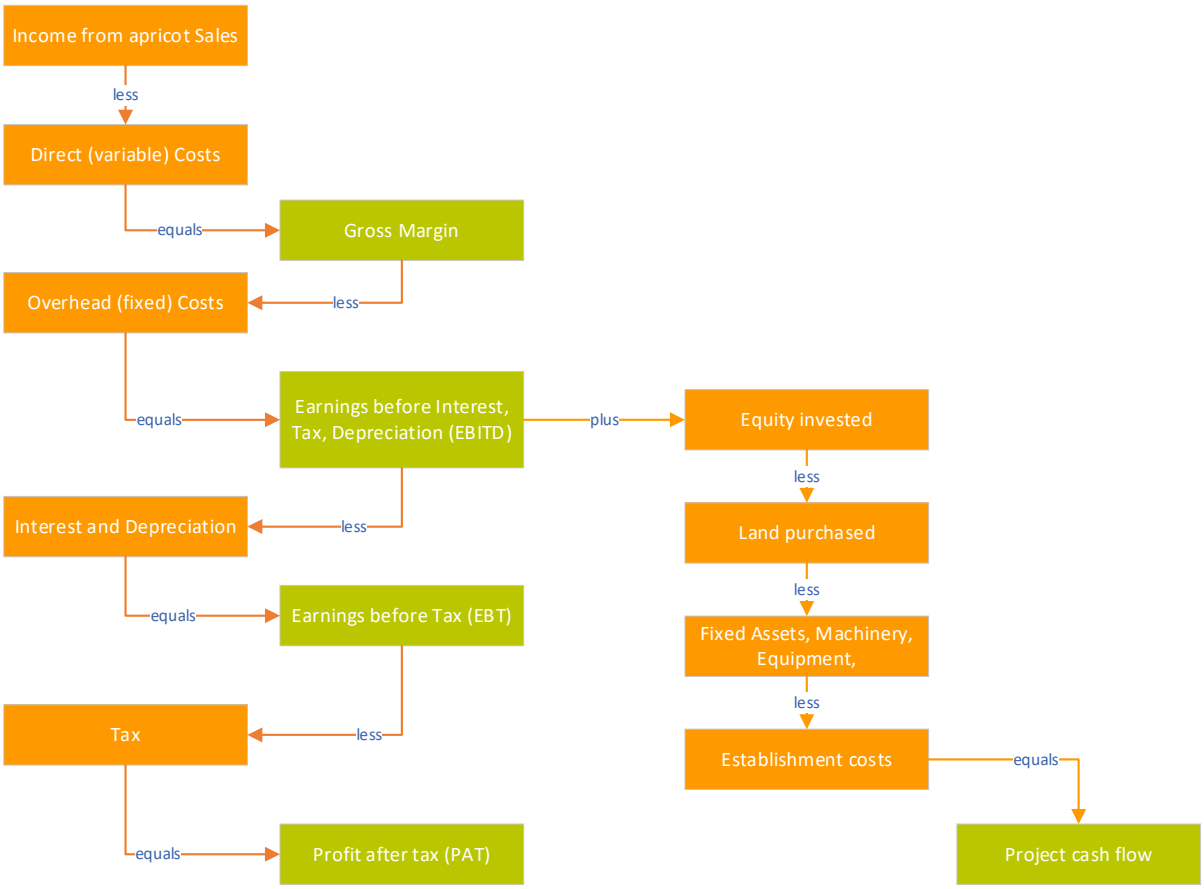
Overhead costs			**Notes**
Overhead cost allocation			
Target Overhead cost	$/ha	$ 5,000	
Energy	% target	8%	Allocations are indicative, what's more important is achieving the management goal for overhead costs relative to the scale of investment.
Equipment	% target	25%	
Insurance	% target	22%	
Office administration	% target	14%	
Professional services	% target	10%	
Education and training	% target	4%	
Management overhead	% target	17%	
Calculation for management input			
Management overhead	hrs/yr	21	
Management overhead	$/hr	$ 41.26	
Management overhead	$/ha	$ 850.00	

Default settings for Capital Investment

The default starting position for Apricot Invest is zero capital investment in land, water, machinery and equipment. Debt is an overdraft and initially driven by establishment costs only. This allows the user to decide their capital investment program relative to the assets they bring to the enterprise investment.

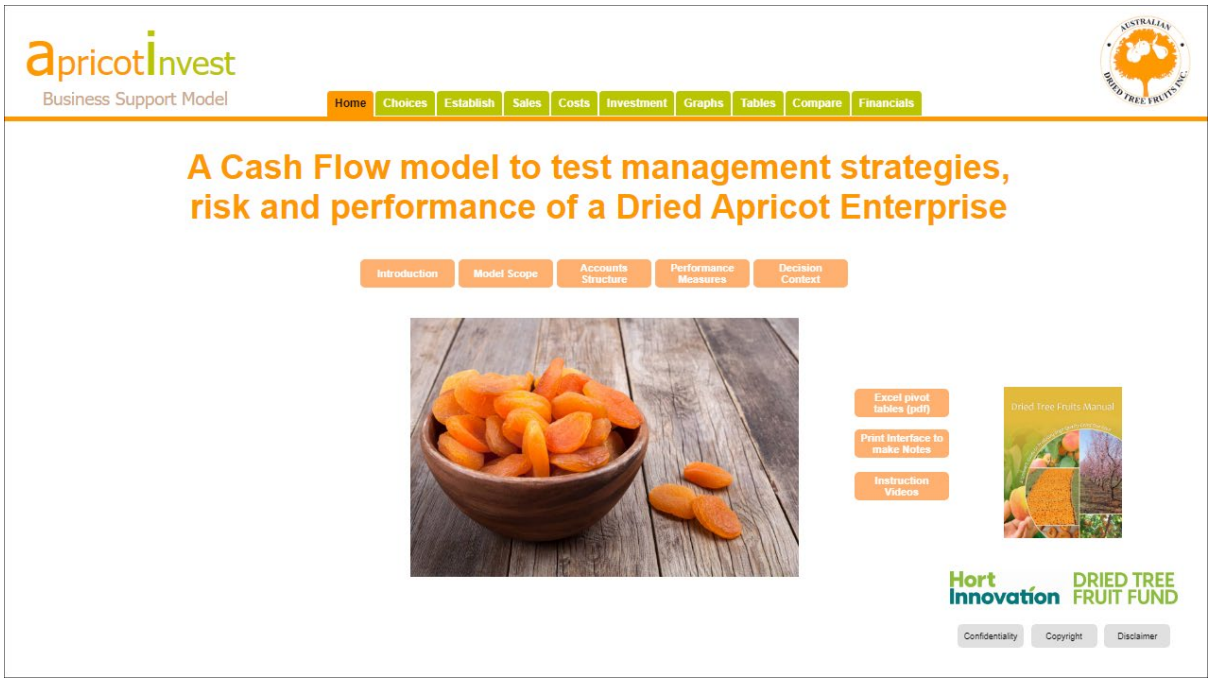
Investment					Notes
		Capital Investment			
		Cost of land	$	$ -	
		Cost of permanent water	$	$ -	
		Equity investment	$	$ -	
		Fixed Assets investment			
		Fixed asset costs A	$	$ -	
		Year to buy assets A	year	1	
		Fixed asset costs B	$	$ -	
		Year of purchase B	year	3	
		Machinery investment			
		Machines A costs	$	$ -	
		Year of purchase A	year	1	
		Effective life A	years	15	
		Machines B costs	$	$ -	
		Year of purchase B	year	2	
		Effective life B	years	15	
		Equipment investment			
		Equipment costs A	$	$ -	
		Year of purchase A	year	1	
		Effective life A	years	15	
		Equipment costs B	$	$ -	
		Year of purchase B	year	3	
		Effective life B	years	15	
		Finance Assumptions			
		Total equity invested	$	$ 0	
		Interest rate on cash	%/year	4.0%	Estimate
		Overdraft interest rate	%/year	9.0%	Estimate
		Tax rate	%	30%	Estimate
		Required return on investment	%	0%	Decided by user

Appendix 2: Account structure



Appendix 3: User Interface home page

Interface home page



Model level home page

Appendix 4: Performance and result indicators

The following three tables summarise the performance and result measures in Apricot Invest that are collected on the isee exchange. A performance indicator (PI) identifies the various metrics management can monitor that contribute to results. A key performance indicator (KPI) is a metric aligned to measure performance that can have a significant impact on results. A key result indicator (KRI) is a measure of how well the investment has done.

Table 3 Eight Performance Indicators

Indicators	**Unit**
Direct costs	$/ha
Water efficiency	ML/dt
Overhead costs	$/ha
Picking cost	$/ft
Pruning costs	$/ha
Machinery and equipment depreciation	$/ha
Average drying ratio	ratio
Average price paid for dried fruit	$/dt

Table 4 Seven Key Performance Indicators

Indicators	**Unit**
Direct costs	%/sales
Yield	dt/ML
Gross margin	$/ML
Gross margin	%/sales
Gross margin	$/ha
Gross margin	$/dt
Total Drying costs	$/tray

Table 5 Five Key Result Indicators

Indicators	**Unit**
Total costs	%/sales
Discounted cash flow	$
Internal rate of return	%
Machinery, equipment to income	ratio
Interest paid as % Sales	% sales

Appendix 5: Example of enterprise models

An enterprise model is most likely configured as a cross section of the options below.

Model element	Unit	Option A	Option B	Option C	Option D
Grower type		Current apricot grower	Current stone fruit grower adopting apricots	New to stone fruits	New to horticulture
Market Focus		Cottage: farmers markets, small	Niche: secondary supply chains, health food shops, processor	Mass: Major processor, supermarkets	Other
Degree of mechanisation		Fully manual	Mix of manual and mechanisation	Mostly mechanised	Other
Capital investment					
Land	$	Owned (sunk cost)	Partial purchase	Full purchase	Leased
Permanent water	$	Owned (sunk cost)	Permanent and temporary	Temporary	Other
Equity investment	$	Non	Some	All	Mix equity and debt
Fixed Assets investment	$	Non	Some	All	Other
Machinery investment	$	Non	Some	All	Other
Equipment investment	$	Non	Some	All	Other
Required return on investment	%/yr	<12%	12% to 20%	>20%	Other
Overhead costs	$/ha	<$3k	$3k to $5k	$5k to $8k	>$8k
Establishment					
Area	ha	<5	5 to 10	10 to 20	>20
Orchard configuration	choice	Open vase	Free standing V	Other	
Tree density	trees/ha	Low <500	Medium 500 to 750	High >750	Other
Establishment costs	$/ha	<$20k	$20k to $30k	>$30 to $40k	>$40k
Tree health					
Weed control	$/ha	Minimal (organic)	Modest	Full commercial	Other
Disease control	$/ha	Minimal (organic)	Modest	Full commercial	Other
Pest control	$/ha	Minimal (organic)	Modest	Full commercial	Other
Fertiliser	$/ha	Minimal (organic)	Modest	Full commercial	Other
Irrigation					
Irrigation rate	ML/ha	<5	5 to 7	7 to 10	>10
Irrigation cost	$/ha	Numerous	Numerous	Numerous	Numerous
Pruning and thinning					
Thinning	method	None	Biannual	Annual	Other
Pruning method	method	manual	Mechanical	Mix; manual, mechanical	Other
Pruning equipment	capital	Owned	Leased	Mix owned, leased	Contracted
Picking					
Method	method	Manual	Mechanical	Mix; manual, mechanical	Contracted
Drying					
Cutting	method	Manual	Mechanical	Mix; manual, mechanical	Contracted
Sulphuring	method	Manual	Mechanical	Mix; manual, mechanical	Contracted
Scraping	method	Manual	Mechanical	Mix; manual, mechanical	Contracted
Layout	method	Manual	Mechanical	Mix; manual, mechanical	Contracted

Appendix 6: Characteristics of Scale

Using Apricot Invest to test exponential scale changes (hectares) and holding all other variable the same. Simulation runs equate as follows.

Run 1 = 5 ha

Run 2 = 10 ha

Run 3 = 20 ha

Run 4 = 40 ha

Run 5 = 80 ha

The result of these simulation runs showed the following.

1. Cumulative production of fresh fruit increases with scale
2. The level of debt driven by establishment costs increases with scale
3. Gross margins and internal rates of return remained the same.

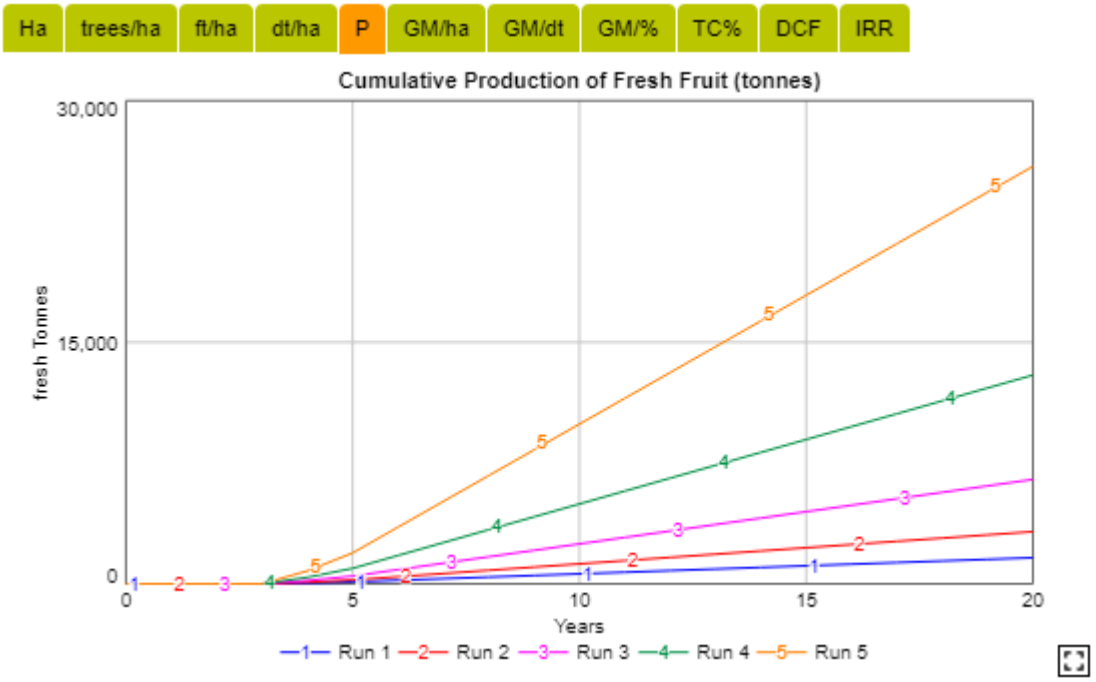


Figure 2: As scale increased cumulative production of fresh tonnes reflected the increase in area planted.

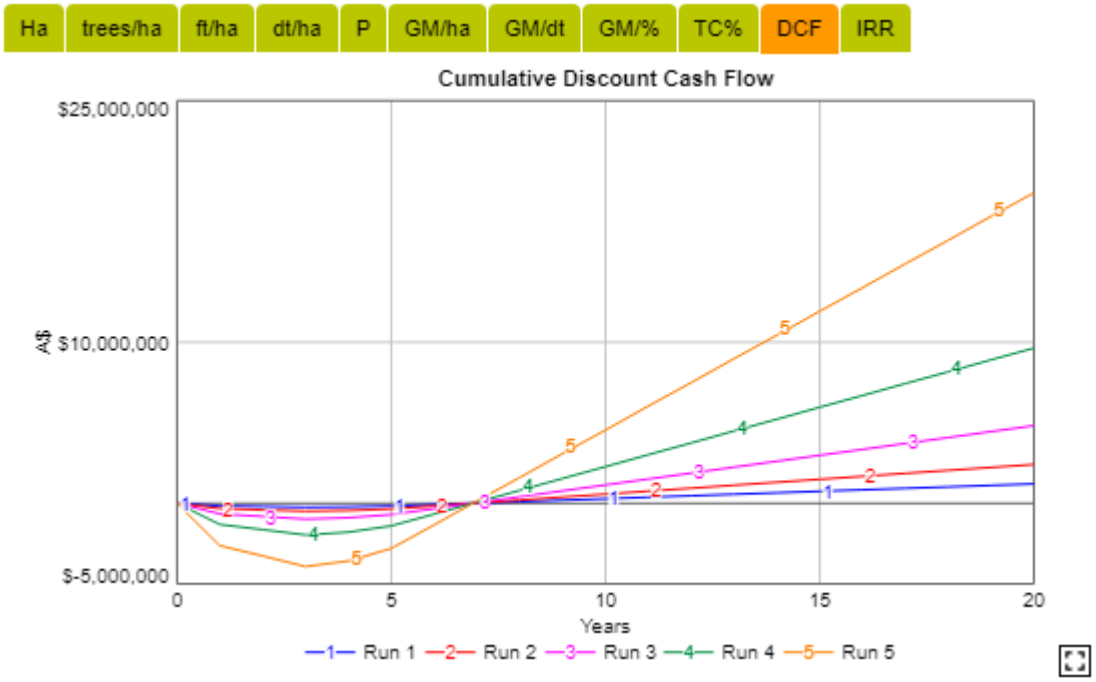


Figure 3: The level of debt driven by establishment costs increases with scale

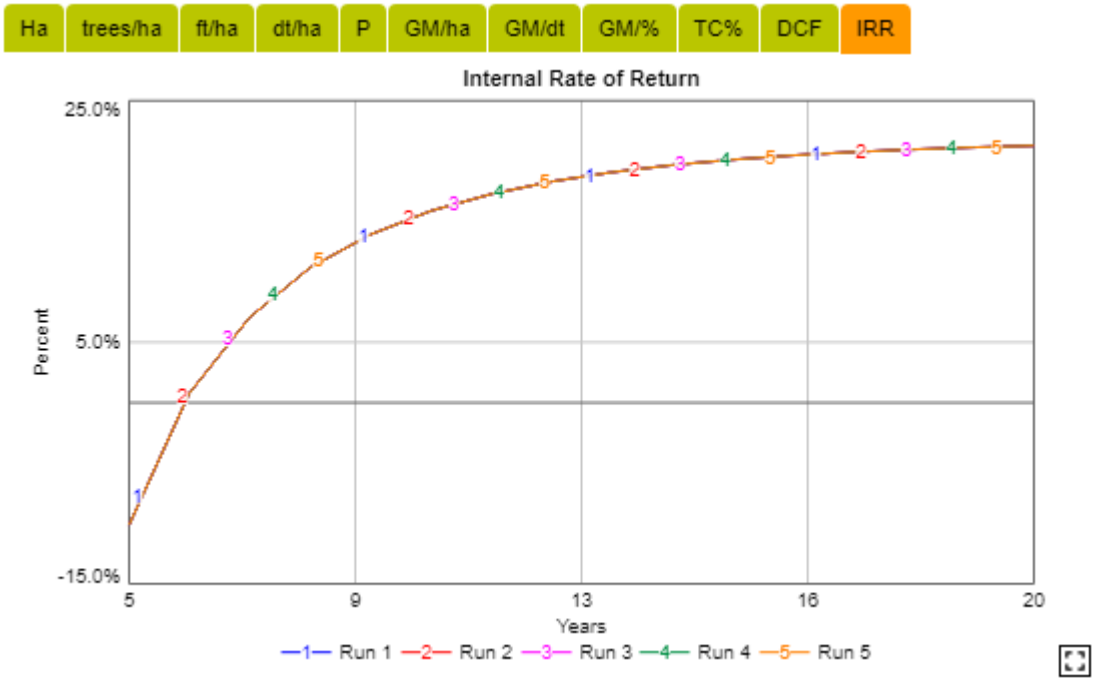


Figure 4: Internal rate of return (IRR) remained same regardless of scale.

Appendix 7: Example of a hypothetical simulation

A hypothetical simulation using Apricot Invest was used based on an enterprise model where an existing dried apricot grower explores a business case adding 20 hectares of apricots for drying using one of SARDI's new varieties. This example has the following aims and assumptions.

7. Experienced tree fruit grower with 20 hectares of vacant land already owned (sunk cost)
8. Established infrastructure and equipment in proximity
9. Open vase orchard with a tree density of 760 trees per hectare
10. Aiming for a high degree of mechanisation in pruning, picking and drying activities with low operating cost base
11. Overhead costs diluted across the broader business
12. Significant infrastructure, machinery and equipment already owned however need to test capital investment in machinery and equipment to find the upper limits.

Four decision criteria were chosen to measure and justify the investment (Table 1). The investment would need to achieve a total cost (direct and overhead) of less than 50% of sales. A preferred machinery to income (sales) ratio of less than one. Interest costs on money borrowed less than 10% of sales and an internal rate of return of greater than 15%.

Table 6: Example investment decision criteria used in this report.

Criteria	Total costs % Sales	Machinery to Income ratio	Interest costs % Sales	Internal rate of return
Benchmark	=<50%	=<1	=<10%	>15%

Initial simulation run (run 1) featured moderate heavy crop yield, picking 75% of the crop with a trailer catcher (800kg/hr) and 25% with hand picking off a work platform, overheads at $5 000 per hectare and no capital investments other than establishment costs.

Simulation run 2 reduced overhead costs from $5 000 to $3 500 per hectare because overheads were shared across the larger business.

Simulation run 3 increased capital investment in machinery from $0 to $500 000 in year 1.

Simulation run 4 changed yield to 'Your estimate' which equates to the moderate heavy crop yield but with three years across 17 production years yielding approximately 10 fresh tonnes per hectare.

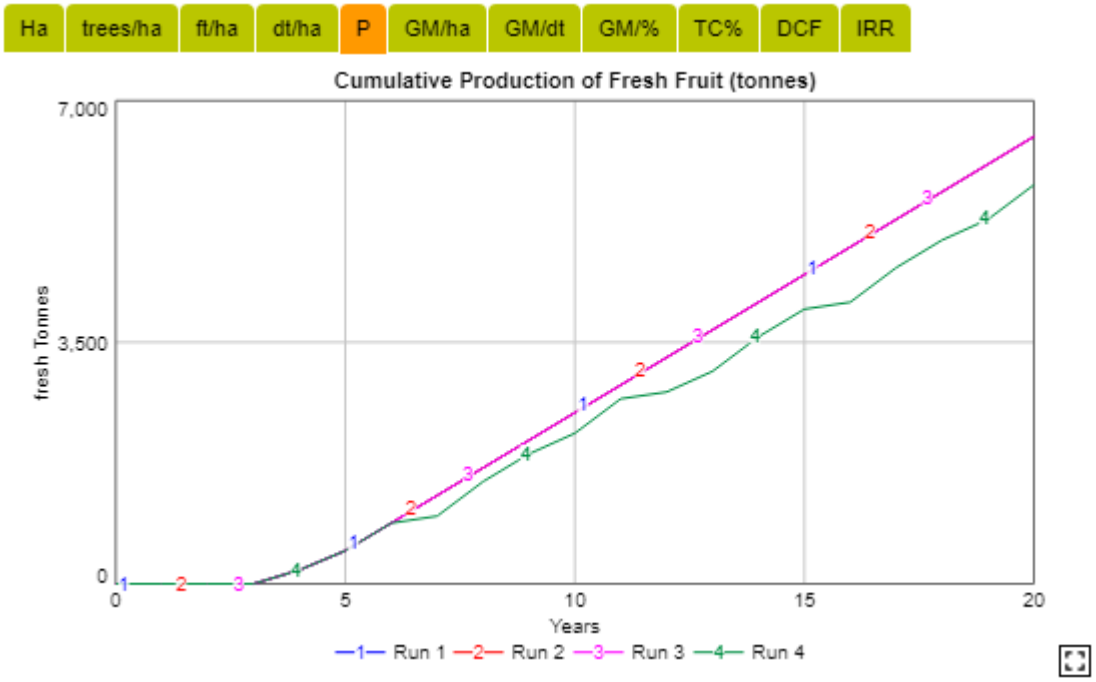


Figure 5: Cumulative yield reduce by ~1000 fresh tonnes because of yield reductions in run 4.

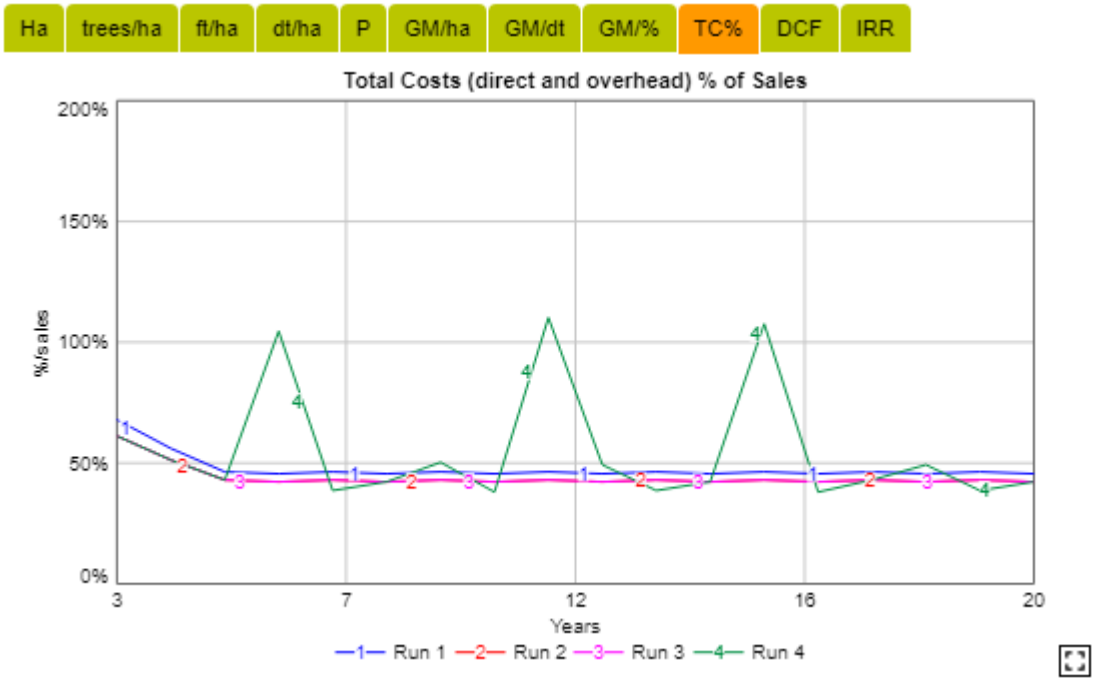


Figure 6: All simulation runs had total costs meeting the <50% of sales revenue criteria except for run 4 with three break out years.

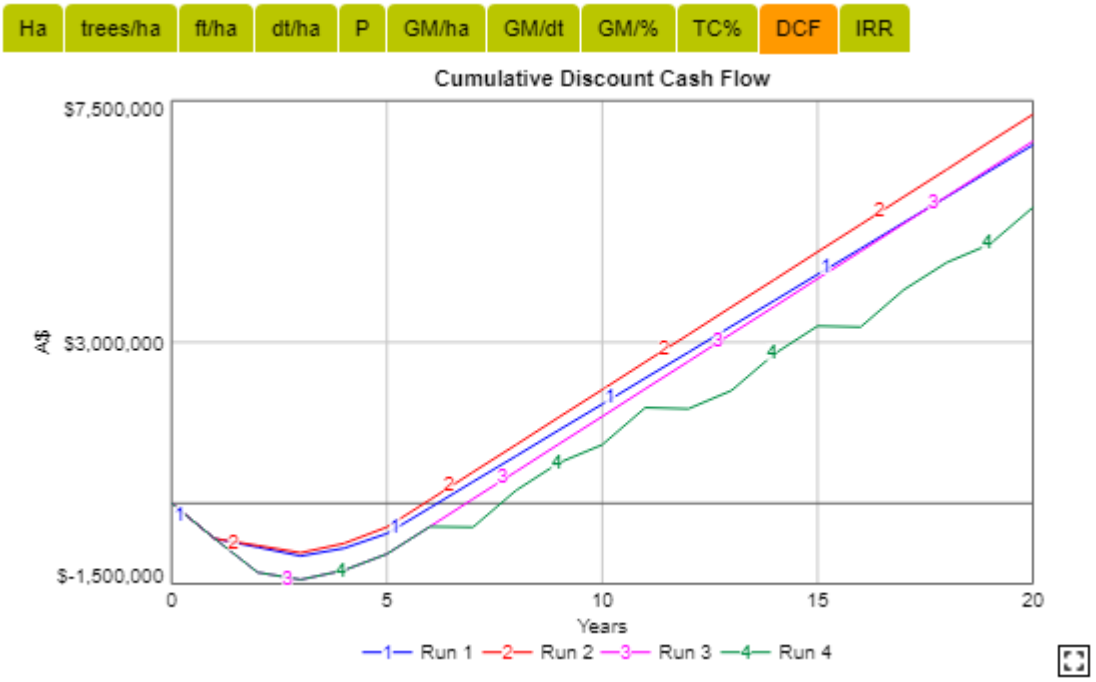


Figure 7: Peak debt reached ~$1.5m and break-even years shifted out for runs 3 and 4.

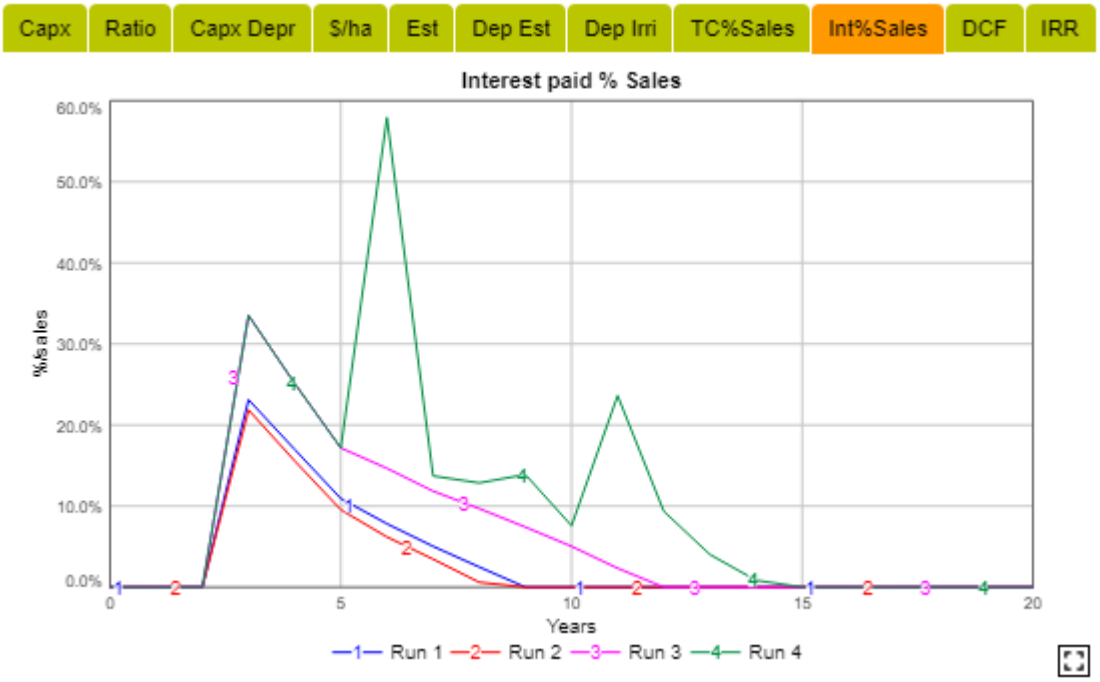


Figure 8: Interest paid as a percent of sales revenue exceeded the 10% of sales revenue in the early years and broke out in the three low yield years but largely met the criteria.

Figure 9: Machinery and equipment cost as a ratio of sales revenue achieved the criteria of being less than 1 except in the years of poor yield (run 4).

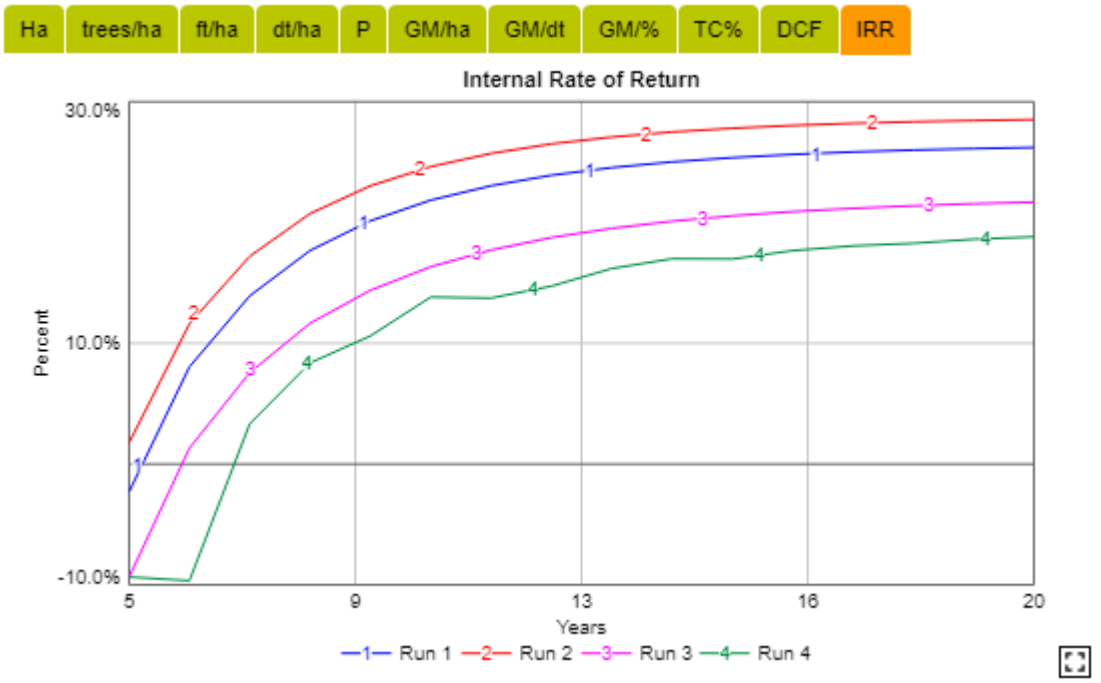


Figure 10: Internal rate of return (IRR) exceeded the criteria of >15% on all simulations.