Accelerating the adoption of intensive orchard systems:

Full Report

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Apple & Pear Australia

Prepared by

RESEARCH WITHOUT BOUNDS

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Kiri-ganai research

Ph: (02) 6295 6300
Mob: 0409 624 297
Email: richard.price@kiriganai.com.au

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Project team

Dr Richard Price, Managing Director, Kiri-ganai Research Pty Ltd (Project Manager)

Ken Moore, Principal, Boorara Management+Consulting and Director, AgWater Research Pty Ltd

Brian Ramsay, Managing Director, Concept Consulting Group Pty Ltd

Garry Langford, National Coordinator, Australian Pome Fruit Improvement Program Pty Ltd

Paul James, Senior Horticultural Consultant, Temperate Fruits, Rural Solutions South Australia

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EXECUTIVE SUMMARY

'The significant problems we face cannot be solved at the same level of thinking we were at when we created them.' – ALBERT EINSTEIN

1. Purpose of the project and output

The Australian apple and pear industries are facing a period of unprecedented change. The domestic market is increasingly linked with the global market and subject to the pressures of globalisation where international competitiveness is the key factor in industry survival and future prosperity.

This project is one of three initiated through the Australian Government's Industry Partnership Program under the theme of 'Securing the Future of the Australian Apple and Pear Industry'. The other projects are: a strategic review and needs situational analysis; and a scoping study of supply chain efficiency.

The project has designed a proposed national strategy and workplan to accelerate the adoption of intensive orchard systems by Australian apple and pear businesses.

The project's output is presented as three documents:

- a full Project Report that is provided to the industries as a major reference document on the project;
- a Summary Report of the project's findings and proposals; and
- a National Intensification Extension Strategy for the Australian apple and pear industries and a detailed workplan for its implementation covering the period 2005 to 2010.

2. The approach to conducting the project

The project commenced with a workshop organized by APAL on 30 March 2005. This report submitted on 24 June, concludes the consulting team's work in designing a strategy and workplan.

During April and May, the team visited all apple and pear producing States and interviewed more than 100 industry participants across the supply chain from the nursery to the retail sector. A visit was also made to the Hawkes Bay region of New Zealand. This was followed by a mid-project workshop with the Apple and Pear Industry Partnership Program Steering Committee to discuss progress of the projects to that date.

A draft National Intensification Extension Strategy (NIES) and Workplan was distributed to APAL's State affiliates and discussed with Steering Committee members by teleconference in June and a further draft distributed for final comment prior to the submission of the final report on 24 June.

3. Industry operating environment

In developing the proposed NIES, the consulting team considered information on the industries' market environment and supply chain which are critical factors in what happens in orchard businesses.

The Australian apple and pear industries are flat or declining in terms of total production, exports and domestic consumption. There is an imperative for fundamental changes so that the industries can reverse these trends, grow market share and improve profitability against competition from alternative products including, potentially, apple imports.

Most Australian growers have fallen behind world's best practice in orchard systems by not intensifying. The viability of the industry will depend on an urgent and strategic response that includes accelerating adoption of intensive orchards.

The key market drivers – **consumers, productivity and human capacity** – are the platform for making the case to orchard businesses that there are commercial advantages for moving to intensive orchard systems.

4. What are intensive orchard systems?

The essential characteristics of an intensive apple orchard have been defined by industry consultants as an orchard of 2,500 or more trees grown according to the following principles:

- use of rootstocks and management practices that minimise the vertical tree height to 3 to 4 metres in the district and soil type in which the orchard is grown;
- use of nursery trees that are well feathered and capable of achieving sustainable cropping from year two;
- central leader/vertical axis tree training in conjunction with a trellis (ie, a tree support system).
- use of orchard management techniques that can reach production of 55 tonnes per hectare by year five.

For pears, the characteristics are not as clear cut. The above management principles with a planting density of more than 2,000 trees per hectare are considered appropriate by industry consultants. The exception for pears is that although some growers are using rootstocks with dwarfing characteristics, at present there are no 'true' dwarfing stocks available which achieve preferred levels of vigour and precocity. APAL reports that there are systems in Europe that can have pears producing within 3 years instead of 10 years, and at full crop in years 5-6 instead of 15 years.

5. International adoption of intensive orchard systems

In international terms, while Australia can be considered to be relatively technically advanced, yields are generally low and production costs high. Initial plantings of apple orchards with more than 3,000 trees per hectare commenced in Western Europe more than 30 years ago. European apple orchards are said to consistently produce 45 tonnes per hectare by the third year from planting with production levels of 65-80 tonnes per hectare being achieved on an ongoing basis.

Other producing countries have moved to more intensive plantings and in international comparisons, Australia ranks eighth in efficiency of apple production and fifth for pear production. Australian apple orchards average around 650 trees per hectare and produce an average of 20 tonnes per hectare. Although there is some doubt about the accuracy of these figures, it is apparent that Australian orchard intensity and yield per hectare rank lowly in comparison with many other producing countries.

It is also clear that unless there is a major change to the intensive orchard systems that have or are being adopted in other producing and exporting countries, our international competitiveness will decline further.

Australia's situation regarding the extent of adoption of intensive orchard systems could be described as similar to that of the South Tyrol region of Italy in 1980. While the change in South Tyrol commenced in the 1970s, the main shift in planting intensive orchard occurred between 1980 and the early 1990s, a period of more than 10 years.

Most industry commentators agree that the competitive pressures facing the Australian industries will mean that we will need to achieve the advance made in South Tyrol in a shorter time frame. This points to a new approach to accelerate orchard intensification in Australia that uses the lessons of other countries, including New Zealand which the consulting team visited.

Overseas experience suggests that strong government support is necessary to accelerate the adoption of intensive orchard systems. It is unlikely that the type of subsidisation provided in some countries would meet the philosophy and rationale for government support in Australia. However, given the situation facing the Australian industries, a partnership approach is required which includes a package of targeted and non-distorting incentives provided by both government and industry.

6. Australian orchard intensification and extension capacity

While there is limited statistical data available on the extent of intensive planting in Australia, qualitative data indicates that intensification of Australian orchards is in fact occurring, albeit at varying rates of change in different states and to different levels of intensification.

The base knowledge of what constitutes intensive orchard systems for Australian conditions and the management practices involved is available or accessible to the apple and pear industries. The knowledge exists through the personal expertise of a number of Australian specialist advisors and leading orchard businesses, their networks with international specialists, articles in industry publications and research reports. However, there is a significant gap in the information available to growers through a consolidated and practical reference document that can be used by orchard businesses and advisors.

The skills to be able to apply this knowledge are also available. Australian growers are technically competent in international terms, although the industry consultations indicated many may have not developed the skill levels needed to establish and manage intensive orchards successfully.

Similarly, the available technical specialists have the skills to advise on the implementation of intensive orchard systems, but the private advisory sector is very

under-developed in Australia. This relates to the provision of technical, economic and management advice to growers on a commercial basis.

The gaps in information and human capacity need to be addressed by the industries, and suggestions are made in the proposed National Intensification Extension Strategy.

7. Grower perception and segmentation

The strategy to accelerate adoption of intensive orchards is about influencing the investment behaviour of orchard businesses. However, not all owners and managers have the same business priorities and needs, and a segmented approach is fundamental for influencing their decisions.

Australian orchard businesses can be categorised as: **progressive, cautious, lifestyle or exiting**. The major opportunities are for targeting the 'progressive' and 'cautious' businesses which are likely to invest if they have access to the information and resources they need. The proposed National Intensification Extension Strategy takes into account the various motivations and management styles of these groups.

8. Impediments to adoption of intensive orchard systems

Australian orchard businesses have not adopted intensive orchards to the extent of many other producing countries. The absence of competition from these countries in the domestic market due to quarantine barriers has generally insulated Australian producers from the need to adopt more efficient production systems.

The following factors represent more specific impediments to accelerating the adoption of intensive orchard systems:

- the climate of uncertainty of future industry profitability which creates lack of confidence to invest;
- the high capital cost of investment (particularly) which increases the risk of negative returns and creates problems for many orchard businesses in raising sufficient capital;
- the economic case for intensive orchards in Australia in terms of industry competitiveness has been clearly articulated, but for orchard businesses the profitability of replacing existing orchards with intensive systems requires market, commercial and economic assessment appropriate to Australian conditions;
- the industry structure comprising many small and medium sized family orchards creates difficulties in accessing capital to invest in intensive orchard systems;
- grower uncertainty and lack of confidence in managing intensive systems and in the results that can be achieved;
- the age structure of apple and pear growers with an average age of over 60 deters investment from those growers who do not have a succession plan;
- uncertainty in the quality and availability of required nursery trees on appropriate dwarfing rootstock with inadequate two-way flow of information on grower requirements and nursery supplies;

- an underdeveloped commercial extension capacity in Australia that is able to provide professional and practical technical, economic and management advisory services to growers;
- limited industry and government institutional support to motivate and support the industries in this major change program. Overseas experience shows financial incentives will be required to stimulate change, but these need to involve co-investment by the industry and government, be compatible with our policy context and be non-distortionary in production and marketing terms.

All of the above impediments can be dealt with through appropriate strategies to accelerate change and are addressed in detail in the NIES or in the Project Report.

9. An extension and adoption framework

The extension framework and adoption model that underlies the proposed NIES recognises that apple and pear businesses go through different stages of an adoption process at different rates. The stages are: the ***motivation stage*** (creating a need or desire to want to change practice); the ***exploration and trialing stage*** (planning what changes to make and how to make them); and the ***orchard practice change stage*** (taking trial results and adopting the practices across the business).

Each of these stages can be incorporated into extension strategy to satisfy the different needs of orchard businesses at different stages of the adoption cycle. This is reflected in the National Intensification Extension Strategy that accompanies this report.

10. A role for focus orchards, and the need to go beyond them

Focus orchards provide a unique means of demonstrating, over time, the technical and management requirements for operating intensive orchard businesses in the context of the whole business. In particular, they provide growers with an opportunity to observe the process of transition, and the implications this has for the production, financial, social and natural resource factors involved in running small to medium, and in some cases large, enterprises.

However, the New Zealand experience underscores the point that focus orchard businesses by themselves will not be enough to ensure adequate levels of adoption of intensive production systems. Their experience over 10 years shows that focus orchards must be complemented by initiatives that enable growers to make comparisons between intensive systems and non-intensive systems, and between their own systems and those of others.

New Zealand has introduced a new extension strategy that has evolved the concept of focus orchards into a wider network of benchmarking blocks. Today, around 50 blocks have been established across the apple growing regions based on traditional (up to 1000 tress per ha), semi intensive (1,000-1,500 trees) and intensive systems (1,500+ trees).

A similar approach is advocated for Australia, where an extensive network of monitoring blocks should complement a focus orchard business initiative.

11. Proposed National Intensification Extension Strategy and Workplan

The proposed National Intensification Extension Strategy (NIES) for Australia seeks to stimulate the adoption of more profitable intensive orchard systems to produce most of the apple and pear output within the next 10 years.[1]

By demonstrating that intensive orchard systems are more profitable and can achieve sustainable cropping from year 2, it is recommended in the NIES that the industries seek to increase the replacement rate for aging orchards to a level of at least 5% per annum. The actual replacement rate needed depends on the present proportion of orchard area that is under intensive systems (which is not known). Through demonstration, the industries should be aiming to ensure all new and replacement plantings will be intensive within 5 years and preferably earlier.

In the consultations with apple and pear growers, figures of between 3% and 10% were quoted as the required annual replacement rates for aging orchards. There are no quantitative studies on optimum replacement rates to maintain productive and profitable orchards and it is recommended that there be research in this area to provide guidance to orchard businesses. There is also a need to establish baseline data on Australian adoption of intensive orchard systems to confirm or refine NIES targets and to measure progress.

The key tactics of the NIES around which a schedule of activities can be developed to underpin success include: group facilitation/empowerment; communication; training; mentoring and exchanges; technology development; and national extension coordination. Two further tactics might be viewed as flagship initiatives: **focus orchard businesses**; and a **monitoring block network**. Responsibility for implementing these tactics should be driven by APAL, utilizing a national coordinator and State and regional networks.

The tactic areas for national investment and the key aspects of the NIES are:

- **Demonstration through focus orchard businesses**: Establish up to seven focus orchard businesses (six apple and one pear) across Australia on existing commercial apple orchards and one commercial pear orchard to act as focal points for demonstrations, training, discussions, research, monitoring and other tactics outlined in this strategy.
- **Comparisons through monitoring blocks**: Establish up to 60 monitoring blocks in a national network to allow orchard businesses to compare aspects of different production systems (eg, varieties, planting densities, rootstocks, production systems and pack-outs) through visual observation as well as through a NIES website.
- **Group facilitation/empowerment**: Increase the capacity of participants in planning and decision-making and in seeking their own education/training needs based on their situation. Funds should be made available to support regional networks of orchard businesses to come together to guide regional extension activities and to help implement aspects of the NIES.

[1] This relates to coloured apple varieties and acknowledges that green varieties will continue to be produced from less intensive plantings and fuller leaf canopies to reduce colouring.

- **Communication**: Provide essential information (eg, principles and procedures for establishing and managing intensive orchard systems) that orchard businesses can access from a NIES web-site and in other appropriate formats. Investment should be made in communication activities that promote key messages and success stories.
- **Training**: Deliver specifically designed training programs/workshops to targeted groups of orchard businesses to increase understanding or skills in intensive production systems. These should be delivered in a variety of modes and learning approaches to cater for different profiles (ie progressive versus cautious), preferred learning styles, and the stage growers are at in the practice change cycle. Nursery businesses are also an important target audience for training, and here training should concentrate on developing the capacity to meet an increasing demand for appropriate rootstocks suitable for rapid intensification of orchards.
- **Mentoring and exchange**: Provide one-on-one support for orchard businesses involved in intensifying their production systems. This should include recognizing and rewarding local champions who actively seek to influence their peers, supporting technical experts to visit orchard businesses to provide advice, diagnosis and recommendations, and facilitating an on-going mentor relationship between those with knowledge and experience and those seeking it.
- **Technology development and demonstration**: Link apple and pear R&D activities undertaken across Australia with the various tactics outlined in this strategy. For example, Focus Orchards and Monitoring Blocks should be used as sites to demonstrate emerging technologies through regional trials, field days and visits to Australia by international experts.
- **National coordination**: Support a National Coordinator to manage the National Intensification Extension Strategy and work with facilitators at the national, state and regional levels to help implement, coordinate, monitor and report against its tactics. A national steering committee is proposed to provide guidance to the Coordinator, and assist and strengthen the national, state and regional networks required to make the Strategy successful. APAL could consider incorporating the national coordinator and advisory personnel and resources within a subsidiary company structure or within existing companies such as APFIP or AFFCO. It will be important to establish the delivery of these services through a business model that provides focus, coordination of resources and effective management.

The NIES details the specific activities to be undertaken against each tactic, and outlines the relevant scale, responsibility, timeline and budget for each activity.

12. Developing the national extension capacity

It is critical the limited extension capacity of the apple and pear industries and service providers be nurtured and appropriately focused on activities likely to lead to the maximum return on investment (in their time as much as in financial resources). The NIES and Project Report can act as a rallying point around which existing extension experts can focus their efforts, within a coordinated approach that networks activities

across Australia. It is imperative, therefore, for the NIES to be extensively owned but coordinated nationally.

The Strategy proposes an investment in building locally empowered networks of service providers, facilitated by State-based experts. These experts will play a critical role in bridging national and regional aspirations for intensification, but will also play an important role in identifying and involving local champions and mentors who, while not being recognized as extension experts in the traditional sense, will become a fundamental part of the knowledge building network.

13. Monitoring and evaluation of the NIES

The Project Report provides a framework for the monitoring and evaluation of all activities supported under the NIES. The framework provides annual targets leading to the achievement of the overall targets set by the Strategy. This will enable the National Coordinator to monitor progress and respond as necessary should targets not be met.

14. Proposed budget and return on investment

The National Intensification Extension Strategy requires a co-investment commitment of $4.8 million dollars over five years. The budget breakdown is presented in the NIES and allocated according to the eight tactic areas outlined previously.

Without reliable baseline data, a 'best guess' estimate is that this investment would produce a benefit cost ratio (BCR) of 43:1. That is each dollar invested up to 2010 would return around $40 in present values over 20 years. It is also based on an assumption (without knowing what the present situation is) that by 2010, 50 per cent of the present area of apple production will be under intensive systems (ie, 7,812 ha). The estimated BCR roughly transcribes the results of the New York State study of the economic performance of five orchard planting systems. This estimates accumulated profit per hectare (in net present value terms) over 20 years after taking into account orchard establishment, fixed and operating costs. The Project recommends economic analysis be conducted for Australian conditions to arrive at estimates of return on investment that give more confidence to orchard businesses, government and industry in their investment decisions.

15. Enhancing the enabling environment

Facilitating fundamental change in the apple and pear industry production systems is a major strategic initiative by APAL. Rolling out the strategy and workplan for intensive orchards is part of a wider push to achieve a cultural shift across the industry. It is about moving from a focus on growing apples or pears to a focus on managing business. It is about moving from a fragmented, inward looking domestic industry, to a dynamic industry that is coordinated, outward looking and globally connected.

Implementing the NIES will be important to help achieve change, but its success will depend on several complementary or enabling actions. These enabling actions are at two levels:

- the project design, management and oversight arrangements that need to be in place to engage industry effectively in the implementation of the strategy; and

- a series of broader and strategic industry level initiatives that need to run in parallel with the project to help provide the necessary momentum.

These initiatives include decisive industry leadership, an integrated communications strategy, establishment of a technical advisory capability including key reference material, market development, supply chain relationship building and strategies for co-investment by government and the investment community.

RECOMMENDATIONS

The project brief requested recommendations on further investigations or actions required to overcome impediments to accelerating the adoption of intensive orchard systems and to enhance the enabling environment for change in the apple and pear industries. The full Project Report and National Intensification and Extension Strategy provide the context and justification for recommendations in the following areas.

Information and research:

1. Survey work to more accurately determine the present composition of Australian apple and pear orchards in terms of density of plantings and yields per hectare. This is essential baseline data for establishing targets and measuring progress.
2. Quantitative studies on optimum replacement rates to maintain productive and profitable orchards to provide guidance to orchard businesses in their investment plans for replacing aging and unproductive orchards.
3. Preparation of a consolidated reference document of best intensive orchard practice for growers and advisers that covers block site selection; rootstock/nursery tree selection; orchard design and layout; site preparation; irrigation; trellising, planting; management of young trees; training, pruning and canopy management; soil management and nutrition; weed, disease and pest management, picking; mechanisation and instrumentation in orchards; and orchard economics. The Australian wine grape industry provides examples of highly effective reference material.
4. Economic analysis of return on investment from alternative orchard systems be conducted for Australian conditions to arrive at estimates that give more confidence to orchard businesses, industry and government in their investment decisions. The New York study cited above provides an appropriate methodology.
5. Investigation of targeted financial incentives for Australian orchard businesses that will accelerate the adoption of intensive orchard systems, but are non-distortionary in terms of future industry growth, profitability and sustainability.
6. Investigation and assessment of alternative business delivery models for a commercially oriented technical advisory service.

Leadership, strategic planning and communication:

7. Development of a new industry strategic plan and ensure internal resources and levy funded programs are aligned with the new plan to deliver maximum value for orchard businesses.

8. Development and implementation of an integrated communications strategy to promote adoption of intensive orchards and strengthen the reputation and image of the industry as a modern and professional business sector.
9. Promotion of the crucial role of intensive orchards for future industry prosperity with plans to sustain and enhance board and management leadership capacity to meet the challenges ahead.
10. Development of a supply chain stakeholder engagement strategy including the nursery and financial institutions sectors. The strategy would include clear roles and responsibilities and performance targets.
11. Development of a co-investment strategy with government to fund implementation of the workplan for accelerating adoption of intensive orchards.
12. Development of a capital access strategy that engages financial institutions and the capital market for future investment by apple and pear businesses in intensive orchard systems and industry infrastructure.
13. To seek a review of the write-off and effective life rulings of the Australian Taxation Office for intensive apple and pear orchards to ensure that the rulings reflect modern orchard systems and provide appropriate depreciation rates.

In respect to the National Intensification Extension Strategy and Workplan developed by this project, the specific recommendation #11 is crucial to the rapid implementation of the tactics incorporated into the strategy. The establishment of national extension coordination arrangements (tactic 8) and the monitoring block initiative (tactic 2) are viewed by the consultants as the most immediate priorities. However, recognizing the social and economic factors involved in the adoption process, it is important that an investment be made across all tactics outlined in the strategy.

1. PROJECT BACKGROUND

1.1 Introduction

The Australian apple and pear industries are facing a period of unprecedented change with the domestic market being transformed into a global market which will be subject to the pressures of globalization and where international competitiveness is the key factor in industry survival and future prosperity.

> *Quote: 'Becoming fully world competitive and surviving in a market environment where all fruit can expect to achieve no more than world parity prices has become urgent. The pressing need is to prepare the apple and pear industry for the (near) future with a range of activities across several areas of the industry.' (APAL)*

APAL has partnered with the Australian Government's Department of Agriculture, Fisheries and Forestry under the Industry Partnership Program to undertake major research designed to assist the apple and pear industries improve their long term viability and sustainability in a globally competitive market environment.

The overarching research 'Securing the Future of the Australian Apple and Pear Industry' comprises three discrete, but linked, projects:

1. Strategic review and needs situational analysis;
2. A scoping study of supply chain efficiency;
3. A strategy and work plan for accelerating the adoption of intensive orchard systems.

The aims of this (the third) project as stated in the consultant's brief are to determine:

- Why Australian apple and pear growers are not adopting intensive orchard systems;
- What conditions, support and change are required to encourage apple and pear growers to change over to intensive orchard systems;
- Determine, develop and cost strategies required to assist in a high level of adoption.

1.2 Definitions

In this report, the term apple or pear orchard business is generally used in preference to apple and pear grower. While this may be a subtle distinction, the consulting team believes the emphasis should be on orchard business management rather than the job of growing apples and pears.

In addition, the consultant's brief defined intensive orcharding as more than 2,500 trees per hectare for apples and more than 2,000 trees per hectare for pears. This report shows, however, that there is no consensus amongst orchard businesses on optimum tree density.

The essential characteristics of an intensive apple orchard have been defined by industry consultants as an orchard of 2,500 or more trees grown according to the following principles:

- use of rootstocks and management practices that minimise the vertical tree height to 3 to 4 metres in the district and soil type in which the orchard is grown.'
- use of nursery trees that are well feathered and capable of achieving sustainable cropping from year two;
- central leader/vertical axis tree training in conjunction with a trellis (ie, a tree support system);
- use of orchard management techniques that can reach production of 55 tonnes per hectare by year five.

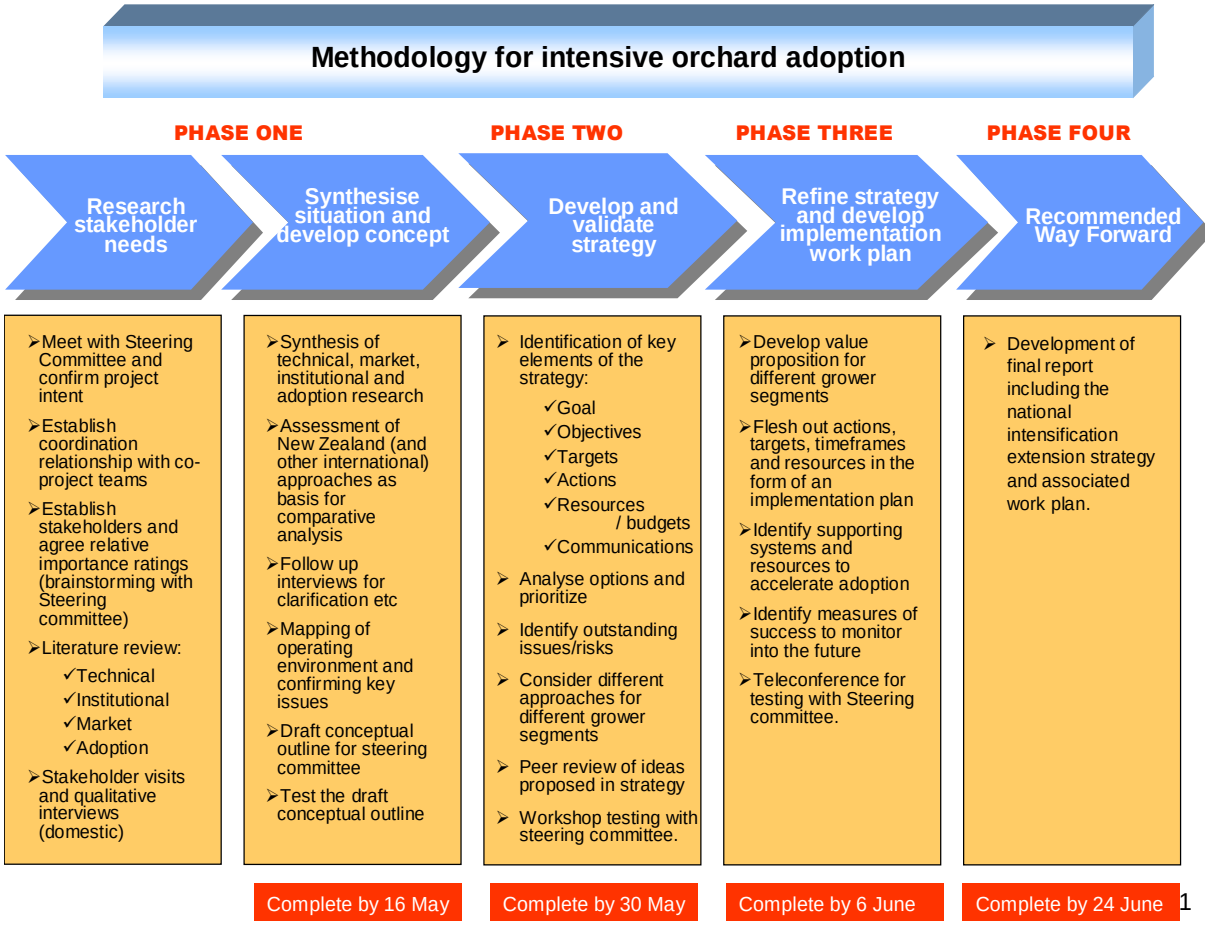
For pears, the characteristics are not as clear cut. The above management principles with a planting density of more than 2,000 trees per hectare are considered appropriate by industry consultants. The exception for pears is that although some growers are using rootstocks with dwarfing characteristics, at present there are no 'true' dwarfing stocks available which achieve preferred levels of vigour and precocity. APAL reports that there are systems in Europe that can have pears producing within three years instead of 10 years, and at full crop in years 5-6 instead of 15 years (Dekkers 2003).

1.3 Project methodology

This final report is based on:

- a systematic approach to the study as shown in the diagram below;
- industry visits and consultations in all apple and pear producing States and New Zealand;
- an extensive literature review covering Australian and international sources;
- an initial workshop with APAL staff and consultants for the related projects, a workshop of the Steering Committee which considered draft reports for the three projects, a teleconference involving the Steering Committee and the Kiri-ganai Research team on the draft National Intensification Extension Strategy and Workplan, and final comments from Steering Committee members on a further draft of the Strategy and Workplan and final report. Prior to the Steering Committee teleconference, the draft Strategy and Workplan was distributed to State representatives of APAL's affiliates for comment;
- consideration of extension and adoption theory and practices in a wide range of industries (see sections 7 and 8 of this report); and
- the broad knowledge and experience of the consulting team (see below).

The approach and timing involved in the completion of this project is represented in the following diagram:



The project commenced with a workshop organized by APAL on 30 March 2005 for the consulting teams involved in the three projects which reviewed the industries' operating environment and set out a collaborative approach for the three studies involving joint industry visits and information sharing.

This was followed by industry visits to all apple and pear producing States during April in which the consulting teams interviewed more than 100 industry participants across the supply chain from the nursery to the retail sector. Having the consultants for the three projects involved in the interviews together provided essential broader context information for the respective projects and enabled each project to be fully briefed on the industry situation including markets, the complete supply chain and production issues in an integrated way.

The visits and discussions included many apple and pear orchard businesses of varying sizes, enterprise types and market outlets. The Kiri-ganai Research team is confident that it gained a full appreciation of the diversity of the issues associated with implementation of intensive orchards in each of the regions; the nature and reasons for regional and orchard variations; the extent to which actual orchard systems generally represent best practice; and the drivers and impediments to the adoption of intensive systems.

In addition to the Australian visits, the Kiri-ganai Research team visited the Hawkes Bay area of New Zealand to prepare a brief case study of focus orchards in that

country. The visit included discussions with industry advisors, Pipfruit NZ and orchard businesses, and provided useful guidance, lessons and implications for the adoption of intensive orchard systems in Australia.

1.4 Project output

The requested output of the project is a final report incorporating a full project design for accelerating the adoption of high density orchard systems by apple and pear growers. The report is also to include recommendations on any further investigations required specifically for the Australian environment.

The content and format of the final report is designed according to the specifications of the consultant's brief. Specifically, it provides:

- an Executive Summary that can be published as a stand alone brief report;
- recommendations that arise from the investigation including inputs from the Steering Committee;
- a presentation, and review, of information on the need to establish intensive orchard systems in Australia for apples and pears, reasons why Australian producers are not adopting intensive systems at an accelerating rate, and the impediments to adoption of such systems;
- a National Intensification Extension Strategy for the Australian apple and pear industries and a detailed Workplan for its implementation covering the period 2005 to 2010.

1.5 Project team and authors of this report

The team for this project brought together skills and knowledge in industry adoption programs, change management, industry structural change aligned to world markets, strategic planning, research, project management, orchard and nursery improvement, orchard management and industry extension.

The team comprised:

- Dr Richard Price, Managing Director, Kiri-ganai Research Pty Ltd (Project Manager)
- Ken Moore, Principal, Boorara Management+Consulting and Director, AgWater Research Pty Ltd
- Brian Ramsay, Managing Director, Concept Consulting Pty Ltd
- Garry Langford, National Coordinator, Australian Pome Fruit Improvement Program Pty Ltd
- Paul James, Senior Horticultural Consultant, Temperate Fruits, Rural Solutions South Australia

This final report represents the combined knowledge of the team members, comments and suggestions made by the Steering Committee and the knowledge and views of all industry participants interviewed during the State visits.

2. INDUSTRY OPERATING ENVIRONMENT

The approach to developing a strategy for accelerating adoption of intensive orchards has been based on insights to key global and domestic market trends. The Australian industry move towards intensive orchard systems is all about markets – profitably supplying domestic and international consumers with Australian apples and pears into the future.

The brief outline of the operating environment below is aimed at highlighting the market trends that have significant implications for intensive orchards at both the industry and farm levels. For a more detailed market review, refer to the complementary projects 'Strategic review and needs/situational analysis' and 'Scoping study of supply chain efficiency'.

2.1 Broad market context

The world apple and pear markets have undergone significant structural change in the last twenty years. These changes have been driven by the emergence of large scale apple and pear producing countries such as China and Chile. The new players are leveraging their access to low labour costs and applying new technologies to more efficiently produce, store and distribute quality fruit around the world.

The Australian market has been insulated from intensifying global competition for the supply of fresh fruit due to quarantine restrictions on imports. A consequence of the protected environment is that the industry has been slow to invest and keep up with best practice around the world. With import competition for apples now under consideration, the apple industry faces the challenge of catching up with global competitors. Leading growers are investing and competing successfully in world consumer markets. However, at an industry level there is an imperative to accelerate structural changes in order to defend and grow markets for Australian fruit.

The leading apple and pear producing countries around the world have embraced intensive orchard systems as the benchmark for competing in the world market. Intensive orchards offer a variety of cost-efficiencies, consistency of fruit quality and other advantages when compared with conventional orchards. Australian orchardists have been aware of overseas trends towards intensive orchards over the last 20-30 years, but only the most progressive growers have invested in these systems.

2.1.1 World market competition is intensifying

- World apple and pear markets are oversupplied with several countries dominating production and/or exports. The outlook is for increasing supply of quality fruit being traded on the world market at highly competitive prices.
- Older apple varieties (e.g. red delicious, granny smith) are traded on a commodity basis with much of the growth in world trade being with newer varieties such as pink lady and royal gala. As world production and trade in each new variety increases, competition drives a shift towards commodity pricing. Developing and marketing new varieties is fundamental for industry profitability.

- Development of new plant variety right (club variety) apples with controlled supply and marketing parameters is an important commercial trend around the world, as growers seek to leverage the opportunity for premium prices from new varieties that appeal to consumer tastes.

2.1.2 Australia is vulnerable to global competition

- Australia is a small player in terms of production and exports. Other countries have higher rates of production expansion, lower costs and greater technical sophistication both at the farm level and through the value chain.
- Australia has modest export volumes of apples and pears relative to the scale of production. While there may be niche opportunities, expansion of exports of common varieties that are traded on a commodity basis is increasingly limited to opportunistic sales. Australian apple and pear production and exports are flat or trending downwards.
- The prospect of import competition for fresh apples is now very real for the Australian industry. Market access for imported fruit will represent a major market shock at the grower level. Growers are concerned about potential disease risk and the impact of competition from lower cost producers such as New Zealand.
- In the case of pears, there is a lack of new varieties to market as fresh fruit for consumers. Australia produces three varieties (Packham, Williams/Bartlett and Buerre Bosc) and most production goes to canneries where competition is price driven.

2.1.3 Growth opportunities in the domestic market

- The Australian consumer market for apples and pears is underdeveloped compared with per capita consumption in many countries. Australians consume around 13-15 kg per capita for apples and 6-8kg per capita for pears.
- Australian consumers are paying more for apples and pears than consumers in competitor countries such as New Zealand. At the same time, consumption is flat or declining in a commercial environment where sales of snack foods to health conscious consumers is expanding rapidly.
- Other fruit industries and manufactures of snack foods are outperforming the apple and pear industries in marketing their products to Australian consumers.
- Australia has two major retailers dominant in the supply chain and these firms are steadily raising the bar in terms of quality specifications.
- There are opportunities for Australian growers to develop a deeper understanding of domestic consumers' buying habits for apples and pears and grow demand for quality Australian fruit at competitive prices.

2.2 Key market drivers for intensive orchards

Growers will take the business decision to plant intensive systems if they can deliver commercial advantages to their business. While intensive systems have a variety of attributes, three key market drivers underpin the case for accelerating the adoption of these production systems.

- **Consumers**. Domestic and international consumers are increasingly health conscious and demand consistent, high quality food.

  Growers who can meet consumer demand for consistent quality fruit will have more choices of potential customers and the opportunity for the best market prices for a high proportion of their crop.

  Intensive systems represent the best production technology to consistently meet consumer quality expectations. They also offer the prospect of a faster response to changing consumer tastes, by coming into production more quickly than conventional systems. Thus, growers who choose to plant newer varieties (including club varieties) in intensive systems can respond more rapidly to changing consumer demand.

  > *Quote: The market is relentless these days. Everything has to be perfect. (Apple grower)*

- **Productivity**. The costs of running an orchard are rising while competition intensifies.

  In an increasingly competitive environment, innovations that can improve returns for growers from existing resources are critical. In many regions, water availability and rising costs are a major limitation on the capacity of growers to increase production. Growers who can increase production from the same amount of water will have a commercial advantage. Intensive orchards offer the opportunity for increased production from a grower's existing land and water resources.

  > *Quote: Water is a massive issue. The industry won't grow in this region because of water. (Apple grower)*

- **Human capacity**. The supply and cost of labour is a major issue for apple and pear producing industries around the world. Attracting and retaining skilled and unskilled labour (in the case of seasonal pickers) is crucial.

  The lower tree height and increased yields of quality fruit make intensive orchards more appealing for fruit pickers to work on. Thus, orchards that have intensive systems will be better placed in the increasingly competitive environment for supply of fruit picking labour.

  > *Quote: Pickers will by preference go back to an intensive orchard. It is easier to work. (Apple grower)*

2.3 Implications for the project

The Australian apple and pear industries are flat or declining in terms of total production, exports and domestic consumption. There is an imperative for fundamental changes so that the industry can reverse these trends, grow market share and improve profitability against competition from alternative products including, potentially, apple imports.

Most Australian growers have fallen behind world's best practice in orchard systems by not intensifying. The viability of the industry will depend on an urgent and strategic response that includes accelerating adoption of intensive orchards.

The key market drivers – consumers, productivity and human capacity – are the platform for making the case to growers that there are commercial advantages for moving to intensive orchard systems.

3. INTERNATIONAL ADOPTION OF INTENSIVE ORCHARD SYSTEMS

APAL has crystallized the production issue for Australia in needing to compete globally:

> *Quote: 'To compete globally, Australian orchards need to be able to produce high proportions of premium quality fruit at lower cost than today, be able to change varieties relatively quickly and reach commercial production levels early.'*

To meet these requirements, APAL has indicated that an intensive orchard production system with trees grown on dwarfing rootstocks at a density of 2,500 trees per hectare for apples and 2,000 trees per hectare for pears should be considered as a minimum benchmark for future international competitiveness.

3.1 Origin of the intensive orchard system of production

The Netherlands was the first to adopt intensive orchards and it was due in a large part to the soaring cost of land and the need to produce more from less land. During the 1970s, Flueren Nursery in the Netherlands developed the 'Knip Boom' nursery tree. This is a two-year old tree that has a minimum of 10 feathers (branches) with the lowest around 700mm from the ground. This nursery tree type revolutionised orchard plantings and allowed growers to plant a tree that was ready for production. Growers then had the tools that they needed in the dwarfing and precocious rootstocks and the nursery tree ready to produce quickly.

3.2 International comparison of apple and pear producing countries

Initial plantings of apple orchards with more than 3,000 trees per hectare commenced in Europe more than 30 years ago. European apple orchards are said to consistently produce 45 tonne per hectare by the third year from planting with production levels of 65-80 tonne per hectare being achieved on an ongoing basis.

Similar intensive systems are commencing to be developed for pears that produce within three years instead of 10 and have full crops in 5-6 years instead of 15 years. A significant constraint to intensive systems for pears is the lack 'true' dwarfing and tested rootstocks.

Other producing countries have moved to more intensive plantings and in international comparisons, Australia ranks eighth in efficiency of apple production and fifth for pear production.

Table 1: Production Efficiency World Ranking

Rank	Apple Production Efficiency	Rank	Pear Production Efficiency
1	Netherlands	1	South Africa
2	New Zealand	2	Austria
3	Austria	3	Netherlands
4	Belgium	4	Argentina
5	South Africa	5	**Australia**
6	Chile	6	United States
7	France	7	France
8	**Australia**	8	Germany
9	Japan	9	New Zealand
10	Brazil	10	Belgium

Source: AgEconsPlus (2005) based on the World Apple Review 2004 and World Pear Review 2004

The following table shows characteristics of selected countries in apple production.

Table 2: Apple production characteristics of selected countries

Country	Production (tonnes)	Planting density (trees/ha)	Average yield (tonnes/ha)
Italy	2 M	3,200 – 4,700	55
New Zealand	0.558 M	900 to 1,500	42
Chile	1 M	800 to 1,250	50
USA	4 M	1,700 to 2,400	42
Poland	2 M	1,000 to 1,250	34
Australia	0.255 M	700 to 900	17-23
China	20 M	500 to 900	16

Source: Du Bruille and Barritt 2004. Australian figures are from AgEconsPlus (2005) based on ABS data.

Australian apple orchards average around 650 trees per hectare and produce an average of 20 tonnes per hectare. Industry opinion is that this is an underestimate of the average yield due to the inclusion of non-bearing trees in the statistics, but it is clear that Australian orchard intensity and yield per hectare rank lowly in comparison with many other producing countries.

For Western European countries such as the Netherlands, Austria, Belgium, France and Italy, the majority of production is from technically advanced intensive systems. In Italy, orchards planted in the past decade are the most technically advanced in the world. Trees are planted at high densities of 3,200 to 4,700 trees per hectare and only on clones of the dwarfing M.9 rootstock. The nursery trees are high quality two-year old knip cut trees that are ready to produce. They are trained on a vertical trellis of 3-4 wires that support the tree to a height of 3 metres.

New Zealand has also moved significantly to intensive orchards. For example in Hawkes Bay, which is the main production area, all orchards have an intensive block. However, New Zealand defines intensive systems as greater than 1,500 trees per hectare, semi intensive as 1,000 to 1,500 and standard as 600 to 900.

The density of New Zealand plantings is not as intensive as in Western Europe for a variety of reasons. This includes the high establishment costs of intensive orchards, lower land values and the absence of government subsidization to the level applying in Europe.

Traditional picking practice in New Zealand is to perform multiple pickings, but increasing labour costs may encourage higher density planting. A further driver for change is the need to defend their international markets from emerging exporters like Chile.

While the majority of Chilean orchards have been planted at medium densities of 800 to 1,250 trees per hectare on semi-dwarfing MM.106 rootstocks, some growers are moving to more intensive plantings of 1,350 to 2,000 on M.9 and M.26 rootstocks.

For USA (principally Washington State), about one-half of all trees are planted on M.9 rootstock at 1,730 to 2,500 trees per hectare with M.26 also being important and planted at 1,235 to 1,480 trees per hectare.

South Africa is slowly moving to more intensive plantings, although there has not been a great push for change as there is a ready supply of cheap labour and growers have felt that the climate and soil types do not suit dwarfing rootstocks. Grower attitudes to dwarfing rootstocks are changing from the perspective of fruit quality, but cheap labour is considered to be the key component of their competitiveness.

Poland is also emerging as an exporter with low production costs and a strong industry goal to update varieties and strains. The majority of orchards are planted at tree densities of 900 to 1,235 per hectare, but some progressive orchardists have established densities at 1,850 to 2,500 per hectare.

In China, which is by far the largest producer of apples and a rapidly growing exporter, orchard management techniques are much less advanced than in Western Europe and North America. Tree densities are between 500 to 900 trees per hectare which is comparable with Australian averages, but average yields are lower. However, where local extension services are being developed and advice on nutrition, irrigation and pruning being applied, much higher yields are being achieved. China's present international competitiveness is based on plentiful supplies of cheap labour.

3.3 Drivers in the adoption of intensive orchard systems overseas

A number of case studies are considered below in relation to drivers in the adoption of intensive orchard systems.

In the case of Western Europe, competition between countries and competitive pressure for limited land from many uses required these countries to increase production efficiency and yields per hectare. The development of intensive orchard systems was accompanied by significant investment in research into pome fruit production and the establishment of an extensive advisory service. In addition, legislatively based certification systems were established in every European country (EU15) to ensure that growers had access to "virus free" planting material. The European Union (EU) has minimum certification requirements described by the European Plant Protection Organisation to which all EU countries must adhere.

3.3.1 South Tyrol region of Italy

A case study of change driven by competitive land use pressures supported by government subsidisation

This is an excellent case study of the change to intensive production and resulting efficiency in production which has important lessons for Australia, particularly in relation to the time required for major change to occur.

SOUTH TYROL

In a paper presented to the 2002 INTERPOMA Congress in Bolzano Italy, Herman Oberhoer, former head of the Beratungsring (South Tyrolean advisory service), stated:

Quote: 'the economic crisis (of the late 1960s with oversupply and unprecedented low prices) pushed us into a new way of fruit production.'

He also described the four major drivers for implementation of the changes:

- 'innovation in the nurseries through high quality certified trees at competitive prices';
- 'self-publicity of the modern orchards' (lower cost of production);
- 'growers wives favoured high density plantings' (almost all orchards in the region are family based); and
- having a team of 'highly motivated advisors'.

The changes were far from immediate as Walter Waldner of the Beratungsring reported at the 2002 INTERPOMA: 'In 1969, there were only 30ha of intensive orchard planted in the region; by 1980 this had risen to 2,000ha, but by the early 1990's there were 16,000ha planted' - almost 100 per cent of the planting area. In this case, the change took place over a period of more than 30 years with the major advances taking place in 10 years.

A key driver of the change process in South Tyrol was that the provincial government offered planting subsidies to growers to assist the process of orchard intensification. In addition, the advisory service (funded equally by the growers, cooperatives and the provincial government) took on the task of modernising the seedling-based orchards as the costs of production for the existing large trees meant that the growers were unviable. The advisory service arranged for the importation of the high quality nursery trees and supervised and advised on all aspects of their maintenance.

The outcome of the South Tyrol experience is that over a 10-year period production costs of the same level of output were halved. This was a major gain that allowed growers to remain financially profitable in a very competitive European marketplace. The entire region is now planted at around 3,000 trees per hectare or above using high quality certified nursery trees on dwarfing and precocious rootstocks. The provincial government still supports the industry with growers not paying any tax on orcharding/farming income.

The SouthTyrol case example, illustrates the time frame that may be involved in a major shift to intensive orchard systems (ie,10 years) even in the most pressing circumstances. It points to the need for a new approach to accelerate orchard intensification if Australia is to achieve in a shorter time the magnitude of change that occurred in South Tyrol.

3.3.2 New Zealand

A case study of change driven by need for exports and to defend export markets

New Zealand illustrates a case study of the need to export and the development of an export culture which positions them for performing successfully in an increasingly competitive international market. Current emphasis is on defending their export markets particularly from growing exporters such as Chile.

NEW ZEALAND

New Zealand was a major supplier to the United Kingdom prior to it joining the European Common Market in the late 1960s which resulted in the loss of its preferred supplier status. One of the outcomes of this was the focus of the industry on new varieties so that it could have a point of differentiation to maintain iTs position in the European and UK markets.

As there is only a small domestic market in New Zealand, the industry has always had a strong export culture and has responded to competitive influences. The varieties Gala and Braeburn became, in effect, New Zealand apple trademarks with production expanding rapidly though the late 1980s and into the 1990s. The orchards were grown on vigorous rootstocks resulting in large trees with high production per hectare and high grower returns.

By the middle of the 1990s, the rest of the world had followed the 'new variety phenomenon' with plantings of the New Zealand varieties expanding rapidly in the rest of the growing world. Fruit quality issues then began to impact on returns to growers as they could no longer sell what would fit into a box and the move to dwarfing rootstocks began, as they were a proven way to improve fruit quality and lower input costs.

The industry sees new varieties as the means to maintain its competitiveness and given that they need early returns are planting intensively, although not to the same densities as western European orchards. The New Zealand orchard benchmarking project defines an intensive orchard as 1,600 trees and above.

Anecdotal information gathered from NZ nurseries in 2004 for a paper Garry Langford presented to the 2004 INTERPOMA in Bolzano Italy indicated that growers were seeking only nursery trees that had dwarfing rootstocks.

3.3.3 Okanogan Valley region of Canada

A case study of change driven by land use regulation supported by government subsidisation

British Columbia is not a large producer of apples in world terms, but achieved major change in the adoption of intensive orchards through government regulation and subsidies.

OKANOGAN VALLEY

In the Okanogan Valley region of British Columbia, the provincial government has decreed that farming/orcharding is to be a key component of the region. A land use system has been developed that set aside areas for farming and restricted subdivision to specific areas around the valley's major towns. The provincial government introduced a range of planting subsidies in the middle of the 1990s to encourage new plantings. As a result of poor soil quality and subsidization from the government, orchards are planted very intensively using M9 rootstock in super spindle systems.

Under the 2003-2006 Replant Program Grants, the government pays CAN$5 per tree to a maximum of 1,400 trees per acre (3,460/ha). For pears, the subsidy is CAN$750 per acre plus $5.00 per tree to a maximum of $4,810 per acre (ie, up to tree plantings of 2,380/ha). If fencing is required to keep out wild life, the government pays 33 per cent of the set up cost.

Growers tend to plant bench grafted trees (rootstocks grafted with the scion and planted directly into the orchard) and sleeping eyes (rootstocks with a dormant bud planted directly into the orchard), the cost of which is less than the tree subsidy and they then use the balance of the tree subsidy for other infrastructure (irrigation, trellis etc.).

During a visit that Garry Langford made to the region in 2002, there was discussion with growers about the full value of the subsidy. If it was calculated on a per hectare basis in the year of planting, the figure of AUD$26,000 was not disputed.

An increases in land values outside the farming areas has delayed the end of the subsidy scheme. Land suitable for subdivision is selling for up to AUD$290,000 per ha. Farming land inside the reserved areas is worth AUD$73,000 per ha. This situation is causing a great deal of angst for growers in areas that are unable to sell for subdivision. However, the Orchard Replant Program is due to end in 2006.

The Orchard Replant Program guidelines recommend a minimum of 1,200 trees per acre (2,964 trees/ha) based on economic analysis that they report shows that best returns are obtained from plantings of 1,200 – 2,000 trees per acre (4,940 trees/ha).

3.3.4 New York State

A case study of orchard economics and the systems decision

In a paper to the IDFTA Orchard Systems Workshop in Geneva, New York State, DeMarree, Robinson and Hoying (2003) evaluated the economic performance of five orchard planting systems (central leader/M.26 @ 840 trees/ha, vertical axis/M.9 @ 1,536 and 2,240 trees/ha, tall spindle/M9 @ 3,310 trees/ha, and super spindle @ 5,380 trees/ha). The systems were considered to represent the range of tree densities growers were using and the analysis considered system performance over 20 years.

The authors reported that the economic measures that are important to growers are the costs of establishment, the cost of orchard operations, the time required to pay back the investment, the annual cash flows of expenditures and receipts, the discounted cash flows taking into account the time value of money (i.e., money received today is more valuable than money received in future), the annuity of the net present value and the expected life of the orchard.

NEW YORK STATE

The authors concluded 'that most economic studies have shown higher density systems have greater investment costs and annual labour costs than low density systems. However, due to higher early yield and higher cumulative yield, profitability is generally increased with increased tree density. However, due to the law of diminishing returns which gives less gain in cumulative yield as more trees are planted per hectare, extremely high densities are not necessarily more profitable than more moderate densities. In addition, risk increases with increasing investment making the very high density systems riskier.'

In terms of this study, the moderate density plantings are the central leader and vertical axis systems and the high density plantings are the tall spindle and super spindle systems.

In contrast to this work, there appears to be an absence of high quality, up-to-date and credible economic analysis of orchard system performance in Australia.

There is a pressing need for the Australian industries to provide guidance to orchard businesses with illustrative economic analysis of various orchard systems that show for various orchard systems: the economic costs of intensive orchard establishment; operation and maintenance costs; potential income streams based on likely yields and price scenarios; and returns on the investment. This is fundamental information for growers who have a future in the industry.

3.4 Implications for the project

In international terms, while Australia can be considered to be relatively technically advanced, yields are generally low and production costs high. It is clear that unless there is major change to world best practice, our international competitiveness will decline.

Australia's situation regarding the extent of adoption of intensive orchard systems could be described as similar to that of South Tyrol in 1980. However, most industry commentators would agree that the competitive pressures facing the Australian industry will mean that we will need to achieve in a shorter time frame the advance made in South Tyrol from 1980 to the early 1990s. In that time, the area planted with intensive systems went from 2,000 hectares to 16,000 hectares (ie, to almost 100 per cent of plantings). Key drivers in the enabling environment were:

- the economic and commercial pressures forcing change;
- the motivation and commitment of orchard businesses to change;
- the development of a nursery sector that supplied high quality certified trees at competitive prices;
- the development of a high quality and readily accessible advisory service to growers;
- strong backing from government for change supported by financial incentives in the form of high subsidies and tax breaks.

It is unlikely that the type of government support and subsidization described in the South Tyrol and Okanogan Valley case examples would meet the philosophy and rationale for government support in Australia. However, overseas experience suggests that strong government support backed by financial incentives is necessary to accelerate the adoption of intensive orchard systems.

Recommendation: That APAL and DAFF commission an investigation of targeted financial incentives for Australian orchard businesses that will accelerate the adoption of intensive orchard systems, but are non-distortionary in terms of future industry growth, profitability and sustainability.

Overseas economic analysis of the performance of intensive orchards has shown that profitability increases with increased tree density. However, due to diminishing returns with increasing densities, professional detailed studies are required on a regional basis to determine the optimum tree density and orchard system based on economic performance for a particular region.

There is recognition amongst growers consulted and industry organizations that economic studies are needed on orchard performance of traditional, semi-intensive and intensive orchard systems.

> *Quote: 'Growers don't have a good handle on the rates of return of their investment in new orchards or replacement blocks and don't know what the break even point is. There is a need to show the economic reasons to change. If we can't compete on price, we're dead anyway.' (SA grower)*

Recommendation: That APAL commission economic analyses of the performance of alternative orchard systems in order to provide up-to-date and credible guidance to orchard businesses in their investment decisions.

4. AUSTRALIAN ORCHARD INTENSIFICATION AND EXTENSION CAPACITY

4.1 Current situation – orchard intensification

Intensification of Australian apple orchards has been occurring slowly since the introduction of central leader training systems to the industry in the 1980s. Prior to this time, the predominant training system was the 'traditional' Vase shaped tree characterised by widely spaced orchards and multi-limbed trees.

This system could be roughly described as a triangle balancing on its point (∇). It had been the dominant tree form used in Australia for decades and remains a suitable system for the production of Granny Smith apples where green colour and freedom from sunburn/blemish remains a major quality characteristic. This production system has some significant disadvantages (colour development, quality and maturity) for coloured varieties where fruit colour and storage is vitally important.

With the advent of new varieties such as Gala, Braeburn, Fuji and others in the 1980s, an increased focus on fruit colour and greater awareness of the significance of the central leader/vertical axis production systems used overseas, Australian orchardists began switching to orchards based on this general tree shape. This shape could be roughly described as a triangle on its broad base (Δ).

It offers many advantages over the traditional vase system for coloured varieties. The basic advantages are that:

- the shape allows greater management flexibility/control over tree growth,
- the system allows greater use of dwarfing rootstocks;
- it enhances the use of more intensive production systems by allowing better light distribution throughout the whole tree canopy and enhancing a more even colour development;
- it brings the main fruit production area down to levels where the majority of work is carried out at ground level (not on ladders); and
- makes pest and disease control activities easier and more efficient.

Examples of European-type orchards had been established on several research centres such as Lenswood in the 1970s, although they did not attract strong grower interest.

> *Quote: 'At the time the industry saw little benefit in changing to them and many of the plantings were viewed with scepticism rather than serious intent.' (Apple research and extension officer)*

The use of these central leader/vertical axis systems in commercial orchards began to occur in significant levels during the mid 1980s supported by key research and extension staff from agencies such as the Tasmanian Department of Primary Industries and Environment and the Victorian Department of Primary Industries. The extensive research and development network that existed within government departments at that

time facilitated general awareness of these systems as did articles in industry newsletters, field days and talks to industry groups.

During this time, most government departments operated research centres where various trials using these orchard systems were either used for demonstration purposes or as bases for research work. During this period significant R&D work was undertaken in Orange, Grove, Tatura and Lenswood.

While there is limited statistical data available on the extent of intensive planting in Australia, qualitative data indicates that intensification of Australian orchards is occurring, albeit at varying paces in different states and to different levels of intensification:

- South Australia, Tasmania and Victoria are the main states developing intensive orchards (as defined by tree densities of 2,500 or more trees/hectare);
- Batlow has adopted more intensive systems than Orange;
- Stanthorpe has focused more on hail protection than intensification; and
- Western Australia still has a significant proportion of wide-spaced to semi-intensive orchards.

Notwithstanding these generalizations, there are individual orchardists in all growing regions who are planting intensive orchards and most growers are increasing their planting densities when (or if) they replant a block. However not all growers or regions are planting orchards of 2,500 trees/ha or more. Many are using a more cautious approach building up their confidence and skills step by step. South Australian and Tasmanian growers are the most likely to use densities above 2,500 trees per hectare in new plantings.

Many different factors are contributing to the slow adoption of intensive orchards and these are discussed in section 6 below.

4.2 Current situation - extension

The current extension approach towards the increased use of intensive orchards in Australia revolve around seven main activities:

1. demonstration plantings of intensive orchards on Lenswood (SA) and Grove (Tas) and associated extension activities;
2. growers own experimentation;
3. use of growers' plantings for demonstration purposes;
4. use of visiting overseas orchard and nursery specialists;
5. articles in industry publications;
6. ad hoc advice from range of areas; and
7. a formalized training program.

4.2.1 Demonstration plantings

Currently there are two significant research plantings of high-density apple orchard systems. One is located on Grove Research Centre (Tasmania). This planting was set

up with HAL funding and focused on the importance of quality nursery trees and early fruit production. Information from the trial has been disseminated to industry through a combination of on-site field days, conference presentations and articles in industry publications including 'Tree Fruit'. Access to the site is available to growers through contact with the Grove Centre. It currently does not receive any research funding from the industry through HAL, but is operated on a commercial base by the research centre.

The second is located at the Lenswood Centre and is currently in the last year of HAL/industry funding. The planting focuses on comparing the practical and economic performance of a range of rootstocks, planting systems and plant densities using the Pink Lady™ and Sundowner™ varieties. Information from the trial is disseminated to industry through a combination of on-site field days, grower visits, conference presentations and articles in industry publications such as 'Tree Fruit'.

The planting is also used for practical "hands on training" in tree training and management practices. This planting is the third in a series of plantings on Lenswood demonstrating the management and performance of increasingly intensive orchards to the industry.

A major commercial high density planting was established in the Goulburn Valley using HAL funds. An economic assessment of the planting performance was undertaken and some information has been disseminated to industry. However the information and use of this block by industry has been relatively low.

A high-density pear orchard demonstration trial was also established in the Goulburn Valley and information from this trial has been disseminated to industry.

A new high density planting has been recently established on Stanthorpe Research Centre for use in demonstrating the performance of orchards using varieties developed by the Queensland apple breeding program.

4.2.2 Grower initiatives and demonstrations

Many growers are experimenting with more intensive orchards as and when they develop new or replant their existing orchards. Much of this experimentation is based on information growers have gleaned from various sources and from their own travels. Growers want to see examples for themselves on a commercial rather than a research scale of how intensive orchards can be established and managed. They are looking for practices which are achievable and practical.

The density of these grower blocks varies from region to region and many are not at 2,500 trees per hectare or above. A significant proportion of these trial plantings are using 'the step by step' principle whereby they are incrementally increasing the densities of the new plantings' and becoming familiar with the practices slowly.

In the absence of any purpose developed focus blocks, extension of intensive orchards relies on using examples of commercial orchards that are considered to be 'doing it right.' This is a commonly used practice in the industry and the basis of industry requests for the 'Focus Orchard' concept to be implemented.

4.2.3 Use of visiting overseas orchard and nursery consultants

The use of visiting overseas orchard and nursery specialists has been widely supported throughout Australia, albeit on an ad hoc and opportunistic approach. A number of orchard intensification specialists have visited Australia and made presentations to industry. The specialists have come from Cornell Geneva University (USA); Washington State University (USA); University of Arkansas (USA); South Tyrol (Italy); the Netherlands; Switzerland; New Zealand; and Belgium (a pear specialist); amongst others.

4.2.4 Industry publications.

Discussions with growers during the industry consultations indicated that growers are actively seeking information and are increasingly using "grower networks", the web, service providers (i.e. chemical resellers) and publications.

Numerous articles on intensive orchards have been produced for the national industry publication 'Tree Fruit'. These have included general awareness articles, specific project reports and observations of growers and industry representatives involved in overseas travel. Amongst the publications available: 'Tree Fruit', 'The Good Fruit and Vegetable Grower'; and state producer organisation newsletters and publications are regularly cited by growers, and to a lesser extent the New Zealand 'Orchardist' and US 'Good Fruit Grower.'

4.2.5 Training

As part of a strategy to improve fruit quality, particularly export fruit quality, a training program has been developed and written for the industry using funds provided through the AAA FarmBis program. This training program, 'Improving Export Apple Quality and Performance' consists of a comprehensive manual and a facilitated workshop. It has attempted to bring all of the current information available from world-wide sources into a specialized training program. The program itself is divided into three sections: Meeting Market Requirements; Post Harvest Handling; and Orchard Production.

The Orchard Production module has detailed information on developing and managing intensive orchards. The program is designed to be presented as three main workshops or it can be broken down into individual components that can be addressed in more detail. This program has only just been completed and has been tested with focus groups.

4.3 Implications for the project

The **base knowledge** of what constitutes intensive orchard systems for Australian conditions and the management practices involved is available or accessible to the apple and pear industries, although this has not been consolidated into a comprehensive reference document or documents. The knowledge exists through the personal expertise of a number of specialist advisors and leading growers, networks with international specialists, articles in industry publications and research reports.

Recommendation: That APAL commission the preparation of a consolidated reference document of best intensive orchard practice for growers and advisers that covers block site selection; rootstock/nursery tree selection; orchard design and layout; site preparation; irrigation; trellising, planting; management of young trees; training,

pruning and canopy management; soil management and nutrition; weed, disease and pest management, picking; mechanisation and instrumentation in orchards; and orchard economics. The Australian wine grape industry provides examples of highly effective reference material.

The **skills to be able to apply this knowledge** are also available. Australian growers are technically competent in international terms, although the industry consultations indicated many may have not developed the skill levels needed to establish and manage intensive orchards successfully.

Similarly, the available technical specialists have the skills to advise on the implementation of intensive orchard systems, but as will be discussed in section 6 below the private advisory sector is very under-developed in Australia. This relates to the provision of technical, economic and management advice to growers on a commercial basis.

5. GROWER PERCEPTION AND SEGMENTATION

Planting an intensive orchard is a significant business decision for a grower. It offers potential commercial advantages, but it also has risks. In order to design an effective adoption strategy, it is critical to have an appreciation of existing grower perceptions towards the industry outlook and intensive orchards. During the study, the consulting team met with growers and other industry stakeholders in Queensland, New South Wales, Western Australia, Victoria, Tasmania, South Australia.

A 'free flowing' discussion format was used to encourage participants to raise issues of importance to themselves and express their impressions, thoughts and ideas in their own terms.

5.1 Perceptions of industry outlook

Perceptions about the commercial outlook are a major influence on any business considering an investment decision. Most apple growers perceive that the industry market environment is going to be tougher in the future. The main rationale for this pessimistic view is that:

- the major supermarkets are setting quality specifications that are increasingly difficult to meet. This means that less production from the orchard is getting premium prices (and thus an increased proportion could go to second grade or juice markets at nominal returns);
- the risk of import competition for fresh apples driving down prices to world parity. Balancing this uncertainty is the hope that quarantine barriers may stay in place and block or limit imports in some way;
- apple and pear growers have concerns about the impact of fireblight if apple imports are permitted from New Zealand;
- there are limited prospects for expansion of exports due to the high Australian dollar and growing competition from other exporters;
- the influence of the 'corporate' players in the Australian apple industry and their linkages with the category management approach taken by the two major retail supermarkets is growing.

> *Quote: There are clouds on the horizon. I don't want too much debt, just in case. (Apple grower)*
>
> *Quote: Imports will come. The biggest problem will be working with low prices all the time. There won't be seasonal highs. (Apple grower)*
>
> *Quote: The industry mood is very uncertain. Some people are investing and some are putting the brakes on. All are worried about fireblight. (State association)*

The most common view was that within the next 5-10 years, the industry will have fewer and larger growers and the business environment will be characterised by more

competition and tighter margins. Some apple growers speculated that grower numbers could contract to as few as 300-500 growers nationally.

5.2 Perceptions about intensification

Besides the uncertain industry future, there is conflicting information for growers to balance on the benefits and costs of intensification:

- Growers hear the view that adoption of an 'intensive orchard system' is fundamental for a competitive business. However, what constitutes an 'intensive orchard system' for their farm is not well defined. It is an uncertain 'product' for farmers. Even though the system is being advocated, most communications involve explaining what is not known about all the variables or, if it is known, emphasising that it might not be the case in all regions and needs to be customised or tested.
- Growers hear that intensive systems are complex to establish and manage and that they will need access to first class technical advice. However, the technical advice is not readily available.
- Growers are aware that it is crucial to plant high quality trees in intensive orchards. However, their experience is that the nursery industry is not able to reliably supply what is needed.
- Growers hear that to secure their future, it's important to accelerate intensification due to global competition being on the doorstep right now. However, the best-case timeframe for getting a new orchard system in place and producing commercial crops is measured in years.

> *Quote: The nursery sector is providing expensive crap. In Europe, they deliver perfect product for half the cost. (Apple grower)*

Clearly, there are conflicting messages for growers to weigh up. They perceive that intensification is only one strategy to consider implementing if they are going to survive in business.

Many growers are sceptical about the advantages of intensive systems compared to what they do now. Instead, they are actively looking at and/or adopting proven technologies that can enhance the performance of their existing business. They would like solutions that fit with what they do now, rather than radical change – which they regard as exposing too much of their capital to high risk in an industry with an uncertain future.

Intensive orchard 'advocates' dispute the above incremental approach and argue that growers should focus on the 'end point' rather than the variety of tools that are available to enhance yield and/or quality. The advocates see these growers as missing the point and seeking a 'silver bullet' rather than confronting the need for major change in managing an orchard business. Further, they question the financial case for what can be significant 'band-aid' investments compared to investing to move into a whole new (intensive) system.

5.3 Segmenting the market

The study found that the attitudes of growers towards intensive systems vary widely. However, variables such as farm size or grower age are not necessarily indicative of grower attitudes and information needs.

There are some differences in priorities between regions. These differences tend to be about either regional business issues such as access to water or investment in netting to reduce crop damage, or market issues such as domestic versus export market development. For example, growers interviewed in Tasmania tended to be more aware of and active in developing export markets and taking a global perspective in order to compete. In contrast, growers from the eastern Australian states tended to be more concerned about relationships with the two major retail supermarkets.

For the purposes of accelerating intensification, a workable grouping of different grower segments can be defined as:

1. **Progressive**. These growers intend to be part of the apple industry of the future. They are well-informed about markets for their own products, are actively building relationships and searching for and applying new approaches and innovations to improve competitiveness. They tend to identify themselves as business people rather than as apple or pear growers. They include a mixture of age groups and farm scale – the common thread is a determination to adapt and grow their business. They tend to be aware of international trends and many have already invested in intensive orchard systems and see these systems as fundamental for the future of the industry.

   Access to capital and technical know-how is important to these growers.

   > *Quote: Export with new varieties is always an opportunity. (Apple grower)*
   >
   > *Quote: The bright light is the local market – knowing what they (customers) want, how they want it and when they want it. (Apple grower)*
   >
   > *Quote: Only the good business people will be in the industry in the future. (Apple grower)*

2. **Cautious**. These growers are weighing up their future in the industry. They are uncertain or sceptical about the need to change to intensive systems. Their approach is to wait and see. They perceive that there are gains to be made in conventional systems that have served them well, without going to the cost and risk of intensive systems. These growers are concentrating on managing or improving their existing production system and monitoring how the market unfolds. In many cases, they are holding off on further investment in the business. They tend to identify more with being apple or pear growers, rather than as business managers.

   These growers are looking for evidence of the commercial advantage of intensive systems, before seeking access to capital and technical know how.

Quote: A lot of growers are unsure. Land is cheap and you don't need to go intensive. Why not stick with the system you know and improve that to increase profitability. (Apple grower)

Quote: We have seen some stuff ups. There is a real question over whether these new systems will grow on our soils. (Apple grower)

Quote: I think there are lots of gains without intensifying. (Apple grower)

3. **Lifestyle**. These growers manage smaller, lifestyle farms and are not fully dependent on the farm for income. Growing apples has provided them with a good income in the past and they enjoy the lifestyle. They have little interest in making the investment to move into intensive systems.

   These growers may be open to leasing their orchard to another grower who is looking to increase production.

4. **Exiting**. These growers don't see a future for themselves in the industry. They are working longer hours with declining returns and can't see things improving. They are looking to sell the orchard and exit the industry, taking as much equity as they can.

   These growers are looking for information on how to access financial advice and support programs.

   Quote: The future looks pretty serious. We are working huge hours per week running on family labour. It's too hard……a seven day a week job. (Apple grower)

5.4 Implications for the project

The strategy to accelerate adoption of intensive orchards is about influencing the investment behaviour of growers. Not all growers have the same business priorities and needs and a segmented approach is fundamental for influencing their decisions. The major opportunities are for targeting the 'progressive' and 'cautious' growers who are likely to invest if they have access to the information and resources they need.

Pessimism about the industry outlook is a significant barrier to accelerating investment for adoption of intensive orchard systems and this issue is explored further in the following section.

6. IMPEDIMENTS TO ADOPTION OF INTENSIVE ORCHARD SYSTEMS

Table 2 shows that Australian orchard businesses have not adopted intensive orchards to the extent of many other producing countries. The absence of competition from these countries in the domestic market due to quarantine barriers has generally insulated Australian producers from the need to adopt more efficient production systems.

Australia's relative inefficient production traditionally based on free standing widely spaced trees has resulted in a loss of competitiveness in export markets and a trend of finding it more difficult to compete in new markets. The supply of Pink Lady™ apples to the UK is an exception to this general position, but this market is facing competitive pressure from other lower cost producers.

There are many impediments and barriers that are constraining investment by orchard businesses in the replacement of less efficient orchard systems. These are discussed below and need to be addressed by the industries.

6.1 Uncertainty of future industry profitability

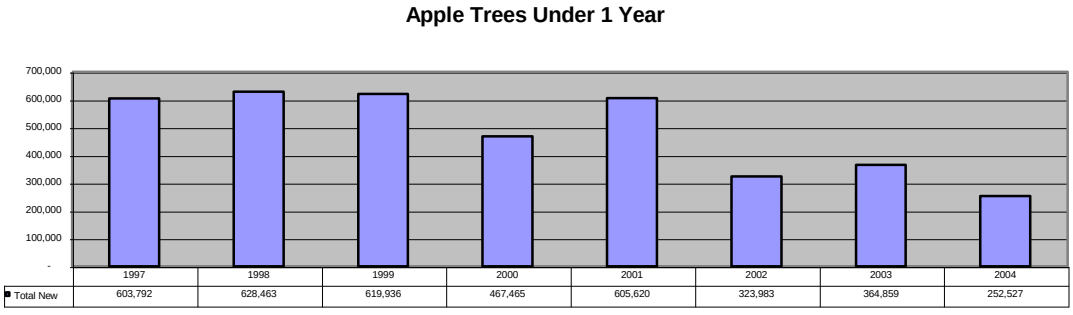
As noted in section 5 above, the industry consultations indicated a pessimistic outlook from many growers for the industries' future profitability. Much of the pessimism relates to the threat of imports, expectations of low prices and the perception of lack of influence in marketing and price setting. A frequent comment is that the industries are 'price takers and not price makers'.

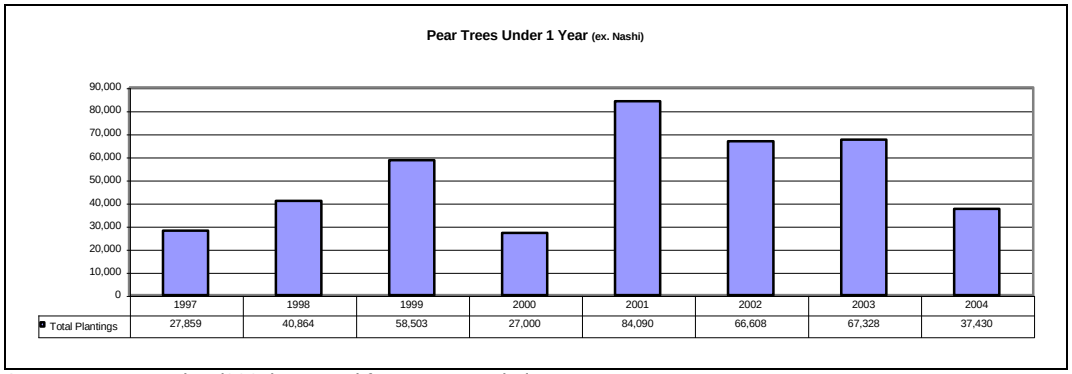
High levels of investment in new capital intensive production systems are unlikely in any industry in such a climate due to the risks of borrowing and low or negative returns on investment.

The apple and pear industries are currently experiencing declining investment in new plantings either for replacement of aging orchard blocks or in new blocks. For apples, there is a declining trend in the number of trees under one year for the period shown (1997-2004). For pears, the number has dropped since 2001, although new plantings since 2001 substantially exceed new plantings in the late 1990's.

AgEconsPlus (2005) reports that 'Australia's area of young trees (percentage of acreage non bearing) is the same as the international average.'

Figure 1: Apple and Pear Trees Under 1 Year





Source: AgEconsPlus (2005) sourced from APAL website

In the consultations with apple and pear growers, figures of between 3 and 10 per cent were quoted as the required annual replacement rates for aged orchards. There are no quantitative studies on optimum replacement rates to maintain productive orchards and the impact on orchard profitability. The important issue is that part of good orchard management practice is to have a feasible program of orchard renewal in place to maintain orchard profitability.

Recommendation: APAL commission quantitative studies on optimum replacement rates to maintain productive and profitable orchards to provide guidance to orchard businesses in their investment plans for replacing aging and unproductive orchards.

6.2 High capital cost of investment

Establishment of an intensive orchard system is a high capital cost venture with figures quoted between $40,000 and $90,000 per hectare. The latter figure includes hail netting which in some regions is an essential part of risk management.

For a 10ha block, the above figures mean that total establishment costs per hectare are between $400,000 and $900,000. Growers frequently cited this as a major constraint in both replacing existing orchard blocks and planting new blocks.

While high capital costs are cited, there appears to be an absence of up-to-date and reliable indicative budgets for the establishment and operation of intensive orchard systems. Such information is required to provide orchard businesses with necessary data for making investment decisions and in negotiating suitable financial packages to undertake the investment.

Apart from orchard establishment costs, businesses reported that the new intensive systems required outlays on new orchard machinery in order to be able to operate in the rows.

> *Quote: 'We know some growers who have based the row width of an intensive planting on the width of their slashers.' (Apple grower)*

6.3 The economic case has not been clearly demonstrated

At an industry level, the economic case for intensive orchards has been clearly articulated by APAL. However for individual businesses, the decision on whether or not to plant an intensive orchard depends on many factors. Ultimately, it is the potential profitability that will be the major determinant.

In making a decision, orchard businesses need full details on establishment costs for a given sized block and estimated operating costs over a defined period (usually 10 – 20 years), estimated yields and income over the same period and then return on investment (measured as net present value, the internal rate of return or pay back period).

The US study cited in section 3.3 found that due to higher early yield and higher cumulative yield, profitability is generally increased with increased tree density. However with diminishing marginal returns as tree densities increase, the study concluded that extremely high densities are not necessarily more profitable than more moderate densities. In addition, investment risk obviously increases with the capital costs involved making the very high density systems much riskier.

This type of information is fundamental for good investment decision making, but is unlikely to be carried out by most individual businesses. For this reason, there is a need for Australian studies along the lines of the New York study to provide better decision making information to orchard businesses.

6.4 Difficulty of accessing capital to invest

Investment originates from the internal funds of businesses; borrowing; or outside investment from managed funds, corporate ventures or superannuation funds. Availability of internal funds depends on profitability over a sustained period and the extent of debt financing (indicated in debt:equity ratios). There is little information on these items for the apple and pear industries.

The structure of the industry with many small and medium sized growers suggests that investment in new/replacement orchard blocks by this group of growers would be limited by the availability of internal funds. Approximately 70 per cent of apple orchards are less than 12 hectares and 65 per cent of pear orchards are less than 4 hectares.

Table 3: Range in size of Australian apple & pear orchards 2003-04

Industry	0-3.9 ha	4-11.9 ha	12-39.9 ha	40-99.9 ha	100-199.9 ha	>2000 ha
Apples	485	383	268	79	15	1
Pears	505	158	86	19	5	1

Source: AgEconsPlus (2005) from ABS Apple and Pear Survey 2004

Larger growers have more capacity from internal resources to invest in intensive orchards unless they are carrying high levels of existing debt. A number of large growers consulted during the industry visits considered that they had the scale and financial capacity to invest in intensive systems.

Some medium sized growers looking to increase their scale indicated that funds that would otherwise be used for orchard replacement are being used to buy out smaller

growers. Similarly where offspring are taking over the family orchard, available investment funds are being used to buy out the parents in succession arrangements.

There is no information available on outside investment in the apple and pear industries from investment funds, superannuation or corporate investors. During the consultations a number of larger growers indicated that they were managing blocks from such investment. However, anecdotal evidence is that the extent of this investment in the apple and pear industries is small and not of the scale which resulted in the rapid expansion of the wine grape industry over the past decade.

6.5 Grower uncertainty and lack of confidence in managing intensive systems

The industry consultations indicated a wide variation in understanding of what constituted an intensive production system, particularly about the density of planting and appropriate rootstocks. To date, an accepted definition of intensive orchard systems has not been articulated. Section 1.2 above provides a suggested definition from APAL that is accepted by industry consultants. It is important for more thinking on this to occur because there are different systems, site variables and options available. The end result needs to be a robust definition of the 'product' being sought with descriptions and explanations of the variations that have technical and economic standing and have relevance to orchard businesses.

The opinion of growers consulted during the industry visits is that many of their colleagues do not have the knowledge, skills and confidence to manage intensive systems. The main means of acquiring information is reported to be observation of other orchards and discussion with growers. While this is an important and valuable source of acquiring new knowledge, the downside is that understanding varies and poor practices can be communicated. There is clearly a need for consolidated reference information on intensive orchard systems for orchard businesses. Publications available to wine grape growers during the rapid expansion of vineyard plantings provide a good example of what can be achieved.

A further area of lack of knowledge and confidence is in rootstock selection and nursery tree purchase. This is an important issue, given that planting material is the major cost item in establishing an intensive orchard, and is discussed in section 6.7 below.

6.6 Age structure of apple and pear growers

The average age of apple and pear growers is estimated by APAL to be above 60. Most older growers consulted reported that where there is no succession to offspring, they are reluctant to undertake the high capital investment in intensive orchards, particularly with current industry uncertainty.

The intention of some older growers is to continue producing with the current orchard system for as long as this is profitable and then to sell the property. This is more pronounced in areas such as Orange and the Adelaide Hills where land is in high demand from urban residents seeking a country property or from city commuters. However, this intention can be thwarted by zoning restrictions on agricultural land that prevent subdivisions under 25 hectares.

As noted above, where offspring are taking over orchards, scarce capital resources are being used in buying out the parents. There is clearly a need for some industry level encouragement and support for appropriate succession planning within orchard businesses to address these issues. Encouragement of more young people to remain in or enter the industry is important for future industry development and investment in intensive systems and this is addressed in the project, 'Strategic review and needs situational analysis'.

6.7 Uncertainty in the quality and availability of nursery stock

Of particular importance to intensive orchard systems is that Vase training systems require the use of vigorous rootstocks to obtain appropriate tree size, strong anchorage and reasonable tree vigour. The Australian orchard and nursery sectors have traditionally been geared to using vigorous and semi-vigorous rootstocks. When the industry started using central leader/vertical axis based systems, it still used these vigorous rootstocks, in preference to dwarfing rootstocks. The result has been sub-optimal outcomes and a poor attitude amongst some growers to intensive orchard systems.

The 'quality' of nursery trees available to the industry is of major significance. Nursery tree quality can be described according to two major categories – virus freedom and physical tree characteristics.

Latent viruses are a significant factor affecting both fruit quality and tree performance. Research overseas and in Australia has shown that the presence of latent viruses can reduce the yield potential of infected trees by over 30 per cent. In Western Europe and other countries, apple nursery trees are available as either 'virus free' or 'virus tested' having been derived from clean propagating material. Industry consultants report that no such quality system has been commercially used by the Australian nursery sector.

The Australian Pome Fruit Industry Program Pty Ltd (APFIP) is currently developing and increasing the availability of virus tested propagation material and linking it to a certification trademark. The trademark signifies virus status, trueness to type and minimum nursery tree standards for nursery trees.

The physical quality of nursery trees has a major impact on the economic performance of any orchard, but is of greater importance in the performance of intensive orchards. Extension officers report that despite extension activities that have communicated the importance of tree requirements, orchard businesses continue to be unable to access the desired quality nursery tree.

The industry consultations indicated a lack of confidence of growers in the capacity of the nursery sector to supply high quality nursery trees and this is being cited as a major factor in their reluctance to invest in intensive plantings. It is a two-sided issue and requires relationship building between orchard businesses and nurseries.

On the orchard business side, a number of issues were reported in the industry consultations including:

- lack of knowledge of rootstock characteristics and nursery tree selection resulting in poor specification of requirements in orders;
- insufficient lead time being allowed in ordering; and

- a willingness of growers to plant whatever trees of the desired varieties they could obtain and a reluctance to insist on their rootstock and tree choice.

There is a need for improvement of business practices for selecting and ordering nursery trees.

On the other side, the nursery industry has not matured to the level where it is able to supply commercial apple and pear business with the quality and volume of nursery trees required at a high level of consistency. To a large extent this will be driven by the market for rootstocks required for intensive systems, but a greater two-way flow of information between orchard businesses and nurseries is important to improve performance in this vital sector.

6.8 An underdeveloped commercial extension capacity in Australia

Associated with the lack of grower reference material is an underdeveloped commercial advisory sector that can provide on-ground services to growers in development and management of intensive orchards.

'Extension' in terms of technology transfer and adoption support has been undergoing significant change in Australia during the past decade. State departments of primary industry/agriculture, which have been the traditional providers of extension services to the apple and pear industry, have either reduced their extension services, introduced 'fee for service' arrangements, readjusted their delivery methods to facilitated workshops or are no longer providing one-on-one services. Despite this trend in publicly funded extension activities, growers reported that they continue to use the services of government research and extension staff, usually specifically targeting individuals for information.

A number of industry organisations provide technical services and assistance such as Growcom in Queensland, the Apple and Pear Growers Association of South Australia, the Western Australian Farmers Federation, and the Northern Victorian Fruitgrowers and the Orchardist and Coolstores Association.

The private sector has not developed the capacity to date to fill the gaps in production and economic advice that are now evident. There are some private industry advisors where fees are more accepted such as in plant nutrition and irrigation management, or where advice is provided in conjunction with sales of products such as pesticides and fertilisers.

Currently (outside of the growers themselves) there is limited practical expertise on intensive orchard development and management. There are seven key Australian R&D staff and consultants with specific expertise, but most of these are employed by government and have other roles which restrict their flexibility to provide specific services to the apple and pear industries.

A common view is that the apple and pear industries do not have a culture or history of paying for consultancy or 'fee for service' advice on general production issues as is the case with other agricultural industries such as grains, dairying and the intensive animal industries. The observation is that growers will only pay for services when there is a significant problem that leads to an economic loss for the business. Some growers will use the services of consultants, but there is also a negative view of the value of such

advisors. Correspondingly, people with the required capabilities are reluctant to provide general consultancy services on production issues because of the uncertain financial returns.

As with the nursery sector, the development of a mature advisory sector will be market driven as progressive and larger orchard businesses increasingly use technical and economic advice. There are some industry level activities that could accelerate this process and the National Intensification Strategy and Workplan proposed in this project will in itself give the importance of advisory services a strong focus.

6.9 Need for strengthening of industry and government institutional support

While industry organizational arrangements are well developed in the apple and pear industries, current arrangements may be seen as an impediment for successfully implementing a major change program.

In section 3.4, it was concluded that the South Tyrol case example [which illustrates the time frame that may be involved in a major shift to intensive orchard systems (ie,10 years)], points to the need for a new approach to accelerate orchard intensification if Australia is to achieve, in a shorter time, the magnitude of change that occurred in South Tyrol.

In order to drive such change, the leadership role of APAL and the state based organizations will need to be strengthened. APAL in particular will need to be a champion in guiding and supporting the industry in circumstances that will be complex and controversial. This will require review and enhancement of communication strategies and efforts to lift the profile and image of the industries.

The efforts of the other industry organizations, HAL, APFIP and AFFCO will need to be effectively engaged and coordinated.

APAL has partnered with the Australian Government's Department of Agriculture, Fisheries and Forestry under the Industry Partnership Program to assist the apple and pear industries improve their long term viability and sustainability in a globally competitive market environment. However, lack of government support is often cited by growers as a disincentive to invest in intensive orchard systems and the extent of subsidization in other countries is provided as an example of what is required in Australia.

The incentive suggested most often is the accelerated depreciation of new orchards as was the case in the wine grape industry where the cost of establishing vineyards (excluding trellises) was written off over 4 years. The existing depreciation rates for horticultural plants are as below and the Australian Tax Office's ruling on the effective life of apple trees is 20 years and 25 years for pears. This gives an annual write-off rate for both of 13 per cent (ie, over a maximum period of 7.7 years). This depreciation deduction covers the costs of acquiring and planting the trees, and part of the cost of ploughing, contouring, fertilising, stone removal and topsoil enhancement (but does not include initial clearing). If the effective life of an orchard is three or more years, an orchard business can write off the establishment costs over the maximum write-off period, which generally commences at the start of what is expected to be the orchard's first commercial season.

Plants with effective life of three or more years	Annual write-off rate	Maximum write-off period
3 to less than 5 years	40%	2 years 183 days
5 to less than 6 2/3 years	27%	3 years 257 days
6 2/3 to less than 10 years	20%	5 years
10 to less than 13 years	17%	5 years 323 days
13 to less than 30 years	13%	7 years 253 days
30 years or more	7%	14 years 105 days

With the depreciation rate at 13 per cent, assuming the establishment cost for plants and land and soil preparation is $40,000 per hectare, this gives an annual write-off rate of $5,200. However, if the ruling could be changed to allow intensive orchards to fall into the 10-13 year category (or the category changed to 10-15 years with a 17 per cent write-off), the annual write-off would be $6,800. Getting a higher 20 per cent depreciation ruling would give an $8,000 per annum write-off. An intensive orchard allows for claiming the establishment cost deduction in year 2/3, hence allowing earlier write-off.

Recommendation: That APAL seeks a review of the write-off and effective life rulings of the Australian Taxation Office for intensive apple and pear orchards to ensure that the rulings reflect modern orchard systems and provide appropriate depreciation rates.

The key issue with government support is that it shares some of the risk of the industries' move to new systems and experience overseas suggests financial incentives are required to accelerate change. However, it is important that this fits in with the broader principles of government support to industry and is non-distortionary in production and marketing terms.

6.10 Implications for the project

To re-iterate the discussion above, the following factors represent impediments to accelerating the adoption of intensive orchard systems:

- the climate of uncertainty of future industry profitability which creates lack of confidence to invest;
- the high capital cost of investment (particularly) which increases the risk of negative returns and creates problems for many growers in raising sufficient capital;
- the economic case for intensive orchards in Australia in terms of industry competitiveness has been clearly articulated, but for orchard businesses the profitability of replacing existing orchards with intensive systems requires market, commercial and economic assessment appropriate to Australian conditions;
- the structure of the Australian apple and pear industries comprising many small and medium sized family businesses creates difficulties in accessing capital to invest in intensive orchard systems;

- the extent of grower uncertainty and lack of confidence in managing intensive systems and in the results that can be achieved;
- the age structure of apple and pear growers with an average age of over 60 deters investment from those growers who do not have a succession plan;
- the lack of confidence in the quality and availability of required nursery trees on appropriate dwarfing rootstock with inadequate two-way flow of information on orchard business requirements and nursery supplies;
- an underdeveloped commercial extension capacity in Australia that is able to provide professional and practical technical, economic and management advisory services to growers;
- the need for strengthening of industry and government institutional support to motivate and support the industries in this major change program. Overseas experience shows financial incentives will be required to stimulate change, but these need to involve co-investment by the industry and government, be compatible with our policy context and be non-distortionary in production and marketing terms.

All of the above impediments can be addressed through appropriate strategies to accelerate change, and recommended actions are discussed in the National Intensification and Extension Strategy and Workplan and this report.

7. AN EXTENSION AND ADOPTION FRAMEWORK

Prior to the commencement of this project, APAL indicated an interest in the establishment of focus orchards to enhance the adoption of intensive orchard systems. However, before accepting focus orchards as the pivotal, or even as just one potential extension avenue to maximise adoption, it is important that the adoption process be understood and that a wider extension framework be considered. Without such an understanding and framework, focus orchards will lack the required strategic platform to ensure their effectiveness and ultimately would be subject to levels of failure experienced in other industries with focus farms.

7.1 The practice change model

The adoption model and extension framework outlined in this section recognises that apple and pear growers go through different stages of an adoption process at different rates; something that must be taken into account in developing an overall extension strategy. Section 5 of this report suggests a typology of four different apple and pear growers: *progressive, cautious, lifestyle* and *exiting*. However, even within these categories growers remain heterogeneous and the adoption process cannot be generalized.

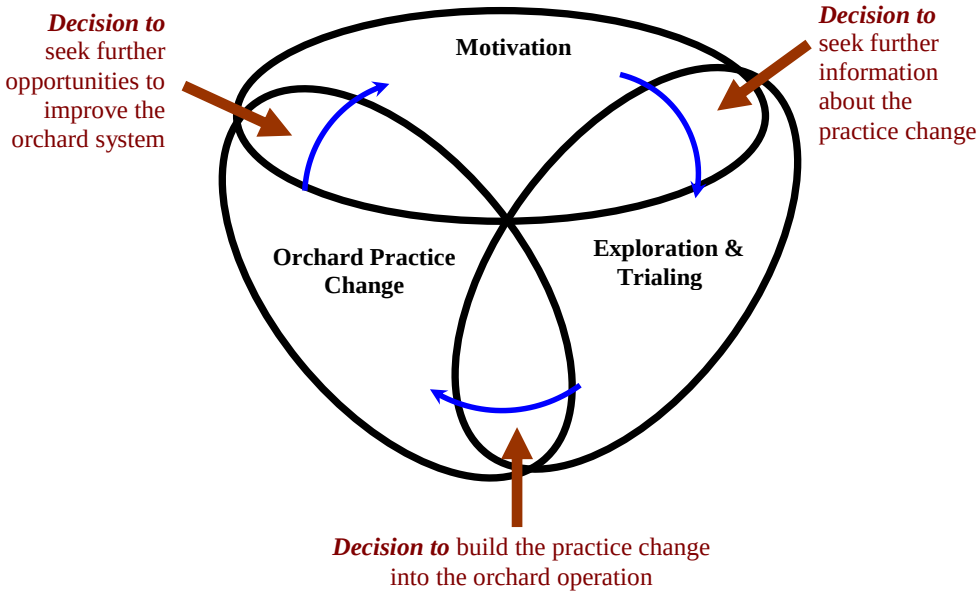
In effect, the consultations confirmed current adoption theory suggesting that there are three stages growers generally go through in adopting new practices, irrespective of whether they are progressive, cautious or simply coasting. These stages are:

> ***The motivation stage*:** creating a need or desire to want to change practice.
>
> ***The exploration and trialing stage*:** planning what changes to make and how to make them.
>
> ***The orchard practice change stage*:** taking trial results and adopting the practices across the farm.

Between each stage, growers have to contend with a series of critical decisions that will enable them to progress through to the next stage. These decisions include:

- the decision to seek further information about the practice change (enabling producers to exit the motivation stage and enter the exploration and trialing stage);
- the decision to build the practice change into the orchard operation (enabling producers to leave the exploration and trialing stage and enter the practice change stage); and
- the decision to seek further opportunities to improve new practices (enabling producers to move into a new motivation, exploration and practice change cycle).

The practice change cycle can be represented thus:



Each of these stages can be incorporated into extension methods that involve intensive focus orchards. What the model suggests is that focus orchards need to be used in a very flexible manner and in more than one way so as to satisfy the different needs of growers at different stages of the adoption cycle. For example, the activities undertaken on an intensive focus orchard dealing with motivation would by necessity be very different to activities undertaken that deal with exploration and trialing and with practice change.

Detail of the stages of the practice change model follows.

7.1.1 Motivation stage

During the motivation stage, five elements may play a role in progressing growers to decide to seek further information about practice change:

1. Highlight relative advantage: It is important to expose growers to situations where they come to believe that they may capture an advantage by changing practice. *This often occurs through the observation of a local example that is already yielding a fellow producer benefits that meet financial, social or environmental objectives of importance to that producer* (Nicholson *et al. 2003)*

2 Ensure continual exposure to the opportunities created by practice change: There is a need to recognise that most growers are overloaded with information, and where and how information can be used is often serendipitous. To counteract this, it is critical that information be conveyed in many ways and on many occasions, including through non-threatening means such as newspapers and journals. Consistency of the message is, however, paramount.

3 Provide a non-threatening learning environment to test if there is possible advantage: Most people do not like to be pressured into change, and are more

likely to make change when they can reflect on what they hear and come to their own realisation. This may mean, in addition to proving the kind of information suggested in the previous point, making available simple self assessment tools that producers can use on their own orchards in their own time.

4 Link production opportunities with either positive economic, social or environmental benefits (or all): Highlighting more than one benefit can trigger a wider range of motivational factors, as long as the benefits are realistic and expressed in positive terms. Relying on overcoming negative factors (i.e. 'if you don't do x, y will happen to you') can be less effective.

5 Personal contact is required to encourage involvement: Gaining initial attention of growers to get involved in extension activities is most effective when personalised contact is made (Trompf 2001). Successful extension programs have shown that even the most sceptical of growers can change their mind about attending extension activities when invited in-person (Nicholson 2003). That way, initial doubts and hesitations can be discussed on the spot.

7.1.2 Exploration and trialing stage

The second stage of the practice change cycle involves growers planning changes and thinking about how to make them. These are growers who have already become aware of the need for change and are motivated to do so. There are four important elements in this next stage:

1 Seeking information: Motivated growers will seek out information on potential issues relevant to their particular circumstances. They will often seek out a range of solutions, concerned about silver bullet approaches. A critical part of the multiple investigation stage is an ability to compare alternative solutions. The provision of information free of judgment is highly valued by producers and greatly aids the formulation of a preferred solution.

Because producers process solutions through a gradual filtering process, and the first filter often involves assessing whether a new practice can be adopted without drastic disruption to current practice, a fundamental shift for apple and pear growers towards intensive orchard systems will be a major challenge.

When information about various alternative options has been sought, producers generally discuss change with *significant others* (family, close friends, business associates and the like, but not distant professionals). *For decisions with significant consequences, the weighing of alternatives can be stressful, because there is usually insufficient information to be sure of making a decision. Seeking close social support for change is to be encouraged* (Nicholson 2003). It also tells us that extension activities should not stop at the individual grower, but also take into account the family and broader social support network.

2 Gaining skills and understanding: This stage involves growers who have gone past "tyre-kicking", where most time is spent considering risks, identifying skill requirements and examining financial impacts. These growers now seek hard information about the impacts of changes, their complexity, compatibility and

reversibility. Here, when a grower observes a new practice, he wants to see financial figures, input requirements, and management techniques in practice.

Realistic demonstrations with realistic data is crucial at this point. For apple and pear growers, it is important to appeal to the visual senses as well as to the senses of logic.

Participation is also crucial at this stage. Training courses that complement visual demonstrations enable producers to practice new techniques and gain confidence when time comes to actually make change.

3 Developing a future picture: Adoption of significant, or disruptive, technologies requires that growers have a good picture in their minds of what they want to see different on their orchards. This is in part about goal setting, but it is also about providing extension support at the right time in an individual's planning process to help visualise the change. The right time for each individual will no doubt differ among individuals.

Holding onto a vision requires a grower to have a clear understanding of all the foreseeable positive and negative consequences of practice change. Janis and Mann (1977) describe dealing with the negative impacts as *an inoculation against future short-term implementation difficulties.*

4 Trialing practice change: Growers seldom make holistic changes across their orchards in one hit. Trialing new methods in one small part (block) of the orchard is important in a risk management sense. More importantly, it also gives the grower an opportunity to learn-by-doing; by learning from the successes and mistakes in the privacy of his/her own orchard.

In the case of the apple and pear industry where the imperative for significant change across the entire industry is immediate, many small trials can be established to enable small groups of producers to test for themselves ideas they see elsewhere (such as on focus farms), still maintaining an environment that is locally supportive and non-threatening.

Key to maintaining growers interest in change is demonstrating results in a very short period (1-3 years at most). It is not enough they be expected to take a leap of faith, on trust, that particular changes will come. Fortunately this is consistent with the growing and harvesting cycle of apples and, to a lesser extent, pears.

Combining trialing with group discussions and a skills development program greatly adds to the effectiveness of trials. It is important that growers get to discuss the downsides associated with practice change, and to be exposed to other growers who have overcome these.

Establishing many trial sites provides an opportunity for growers to also look beyond their own orchard businesses through the organisation of field visits, worker exchanges and the like. Trial sites might complement focus orchards by looking at a broader range of issues than any one site can credibly deal with. Finally, returning to the issue of involving *significant others,* involving friends,

family, advisors and close business associates in trials would improve the quality and speed of the decision-making process leading to change.

7.1.3 Orchard practice change stage

This final stage in the practice change cycle is not simple just because growers are already motivated to make change and now have the skills and knowledge to do so. Many industry programs tend to cease their support at the exploration and trialing stage on the assumption that by now adoption is axiomatic. However, it is critical to ensure adoption that the farm practice change stage be supported by three elements to reinforce and realise benefits from the efforts leading to this stage:

1 Providing peer support and encouragement: Developing long-term structures that build a peer support group around producers motivated to change is essential. As discussed previously, motivation does not automatically lead to adoption, particularly if the level of change required is significant, disruptive and, therefore, stressful. Facilitated groups is one form of an ongoing support structure.

2 Ensuring effective answering of questions: The adoption of new technologies does not necessarily lead to more certainty. Indeed, it is likely to lead to more questions about the technology. If these are not answered, then the outcome can result in the discontinuation of trials. Nicholson *et al* (2003) argue that *where a reversion to previous practices occurs because of technological ambiguity rather than clear failure of the technology, the outcome may be worse than if the technology had not been adopted in the first place.*

3 Developing a supportive structure between growers, researchers and extension agents: Successful adoption programs break down the distinction between producers, researchers and extension agents. While each plays a distinctive role in the adoption process, it is important that each has an appreciation of the others' perspectives and deals with issues from the standpoint of egalitarianism (Vanclay 2004; Price 2003).

Providing opportunities for growers, researchers and extension agents to interact formally and informally, to make decisions together (for example, about the aims, design and management of focus orchards), and to have an ongoing relationship that makes their professional background less important than the ideas they bring forth, should be built into the design of any adoption strategy.

An important element in a supportive environment is acceptance that it is possible for non-adoption to take place for very rational reasons given the complex socio-economic mix of factors involved in running an orchard. Sometimes it is just a matter of timing (Roberts *et* al 2002).

7.2 Forms of extension across the practice change cycle

In a recent study on capacity building and extension undertaken on behalf of all industry research corporations, Coutts and Roberts (2004) defined five complementary extension methods that, when combined, form best-practice in extension practice. These methods, or models, can all be used in conjunction with focus orchards and

repeated in varying forms at different stages of the practice change cycle. They include:

*The **Group Facilitation/Empowerment Model*:** This model focuses on participants increasing their own capacity in planning and decision-making and in seeking their own education/training needs based on their situation. Groups may undertake their own research. The project will often provide or fund a facilitator to assist groups to define their own goals and learning needs and to help them realise these.

*The **Technological Development Model***: This model is about individuals working together to develop specific technologies, management practices or decision support systems which will then be available to the rest of the industry or community. It often involves local trials, demonstrations, field days and on-site visits.

*The **Programmed Learning Model***: This model is about delivering specifically designed training programs/workshops to targeted groups of landholders, community members, government personnel and others to increase understanding or skills in defined areas. These can be delivered in a variety of modes and learning approaches.

*The **Information Access Model***: This model is about providing a range of blanket information that individuals and groups can access from a distance and at a time that suits them. It can be based on a web-site, information centre or other centralised locations.

*The **Personalised Consultant Model***: This model recognises the interaction between a mentor or consultant who works over time with an individual or community to improve their managerial, technological, social or environmental situation – or individuals from different backgrounds working together on a 1:1 basis.

7.3 Implications for the project

Consultations undertaken with growers during this study showed some to be sceptical about the relevance of focus orchards to their personal situation. In many cases, the leading orchard businesses felt that they had progressed beyond what an intensive focus orchard could demonstrate to them, but indicated that they were still actively seeking new knowledge not currently being met. On the other hand, many growers also indicated that they could learn immensely from focus orchards that demonstrated new knowledge relevant to their particular business needs.

The implications to be drawn from this are twofold. First, if the apple and pear industries are to maximize intensification of production systems, then they must take a broad yet strategic approach to extension that goes beyond the use of focus orchards. This will require the development of an overall extension strategy, aimed at supporting aspirations for the intensification of production systems. Second, if focus orchards are to play an important role within a broader extension framework, then their design needs to allow for the different learning stages of growers; that is, they need to be capable of supporting a range of different extension activities that satisfy different grower needs.

8. A ROLE FOR INTENSIVE FOCUS ORCHARDS

8.1 What is a focus orchard?

Focus farms have long been used in agricultural extension as a means of demonstrating successful production and farm management methods in a setting that is not simulative, but real. That is, the methods demonstrated are done so on commercial farms, under the same conditions that other farms in the region face. As such, the demonstrations are grounded in reality and their success can be monitored in real-time and compared to alternative district practice. In this way, three important elements of extension are dealt with: demonstration, monitoring and comparison.

A focus orchard is simply a focus farm established in the context of horticultural production, in this case demonstrating intensive apple and pear establishment and production practices.

Ideally, a focus orchard is a commercial operation owned by a respected grower within a region, and that the practices demonstrated are a normal part of the focus orchard's operation.

8.2 Why use focus orchards?

An effective industry extension program uses a diversity of extension methods to ensure the widest uptake of new or improved technologies relevant to the industry. Different growers learn in different ways and at different paces, and no one extension method will prove universally applicable.

Focus Orchards can be an important element of an extension and adoption strategy as they can:

- complement other extension strategies by showing theory in practice;
- provide a physical location where different extension methods can be used (i.e. group work, farm walks, field days etc.);
- provide the whole-farm context within which new or improved technologies and practices fit;
- enable realistic economic monitoring of costs, receipts and other transactions (i.e. hidden or subsidised costs associated with government or generic industry trials are made explicit);
- use growers and their champions as the advocates for change; and
- enable growers to monitor particular practice over time on the same territory (i.e. the many variables associated with demonstrating different methods over different times and across different locations is reduced).

8.3 What makes an effective focus orchard?

There is no simple answer to this question. What is effective in one region may not be effective in another because of different social, economic and environmental factors.

Despite this, evaluations of the use of focus orchards elsewhere across the world show us that there are some general principles associated with effective focus orchards:

- not too many new technologies or management practices are demonstrated all at once;
- the chosen focus orchards represent as many regional factors as possible (i.e. dominant soil types, physical and climatic conditions, and realistic economic and social circumstances);
- relatively homogeneous systems are advocated (i.e. intensive production systems);
- economic monitoring is a fundamental component;
- validation of the advocated systems can also be demonstrated on other (satellite) orchards;
- the focus orchards are seen to fit into a wider extension strategy that offers alternative and/or complementary means of learning;
- the orchard owner is well respected within the region, and plays a significant role in the extension activities undertaken on the focus orchard;
- the extension methods used on the focus orchards are diverse and recognise that different people learn in different ways and at different paces; and
- the extension methods used are themselves effective and well run by people seen to have industry credibility.

8.4 What are the limitations of focus orchards?

To some extent, the limitations of focus orchards are the inverse of some of the success principle outlined above.

The New Zealand experience of focus orchards has shown that they can be restrictive in what they can demonstrate because results are confined to only one set of soil, physical, climatic, economic and social factors (MAFF 2004). The experience there also shows that focus orchards are best used for demonstrating homogeneous production systems tied to an economic goal, and that demonstrating complex issues of environmental sustainability can be problematic on a single orchard. The New Zealand experience with focus orchards has resulted in that country progressing beyond the use of focus orchards to the use of an extensive network of benchmarking blocks (see boxed case study)

The major limitation of focus orchards, however, is tied to the way they are incorporated (or not) within an overall industry extension strategy. If focus orchards are seen as THE pivotal means of advocating the adoption of new production systems, then it is likely that they will take on a level of liability more than any single extension method can successfully bear. That is, there is a danger they will become all things to all people, and ultimately take on traits contrary to the success factors previously outlined.

8.5 Focus orchards within the context of an industry extension framework

The practice change cycle and models of extension outlined in Section 7 need to be taken into account if a concept of focus orchards is to be successful in the apple and pear industries. Using the lessons to be learnt from the preceding, a framework emerges for the establishment of a network of focus orchards, each supported by a

further network of benchmarking blocks that can be used for more localised trials and demonstrations. This framework takes into account that:

- different producers start at different stages on the practices change cycle;
- different producers proceed through or exit the cycle at different paces;
- the different stages require often require different extension techniques, or require the same techniques undertaken with a different emphasis;
- focus orchards can act as a rallying point for moving producers through the practice change cycle;
- other extension elements complementary to the focus orchards are an essential part of moving producers through the cycle and, indeed, of ensuring that the focus orchard experience is meaningful to producers.

CASE STUDY: NEW ZEALAND FOCUS ORCHARDS AND BEYOND

The New Zealand apple industry commenced supporting the use of focus orchards in 1997, following the use of focus farms in the New Zealand wool industry. They were supported under two series of projects; the first (1997-2000) using just a single orchard in the Hawkes Bay region aimed at demonstrating novel management practices within the context of a whole orchard; the second (2000-04) using four orchards spread across three regions demonstrating more specific aspects of production management.

When first mooted, individual growers the New Zealand apple industry were highly competitive and reluctant to share information about their own business to other growers. At the same time, industry extension was fragmented, relying heavily upon the use of private consultants. The establishment of the first focus orchard owed much to the drive of one individual grower and a supporting industry body (Pipfruit NZ).

The focus orchards, all based on existing commercial orchards) proved relatively successful in terms of the numbers of producers they attracted to field days. In some cases, the major field days (held just prior to harvest and just after pruning) attracted up to 400 grower participants, some traveling great distances. However, objective data was not collected on the uptake of technologies demonstrated by the focus orchards, and their ultimate success is left to anecdotal evidence.

CASE STUDY: Cont. . . .

One criticism of the focus orchards was that they did not enable objective comparison of what was being demonstrated as best practice with conventional practice. Moreover, the scheme required the small number of grower owners of the focus orchards to dedicate an enormous amount of their time, and hence proved somewhat stressful for them at times. Towards the end of the second scheme, attendance numbers at focus orchard events were beginning to fall, owing to an over-familiarity growers had reached with the orchards. As a result, Pipfruit NZ reconsidered their strategy of relying on focus orchards.

In 2004, a new extension strategy was put in place that evolved the concept of focus orchards into a wider network of benchmarking blocks. Today, around 50 blocks have been established across the apple growing regions of New Zealand based on traditional (up to 1000 tress per ha), medium (1,000-1,6000 trees) and high (1,600+ trees) intensity production systems. Participating producers complete a pro-forma data template on an annual basis, providing information about their management practices, associated costs and production output. This enables New Zealand growers to compare the benefits of high intensity systems to more traditional systems, thereby addressing the need to demonstrate their relative advantage.

In time, information on the 50 blocks will be made available on the Pipfruit NZ website, so that all growers can compare their production practices and achievements in a process akin to benchmarking. The blocks, however, contribute much more to extension than underpinning

8.6 A strategy and workplan

Assessing the role and effectiveness of focus orchards reinforces the key messages highlighted in Section 7; that is, focus orchards in and by themselves will not be enough to ensure adequate levels of adoption of intensive production systems. Indeed, the New Zealand experience underscores this point, suggesting that focus orchards must be complemented by initiatives that enable growers to make comparisons between intensive systems and non-intensive systems, and between their own systems and those of others'.

8.6.1 Monitoring blocks as an essential complement to focus orchards

Focus Orchards can play an important role in achieving the apple and pear industries' aspirations for a more competitive and dynamic production market, but the case for going beyond such an initiative is compelling. As noted in previous sections, Focus Orchards have limitations that complementary activities can overcome. In this respect, complementing a Focus Orchard initiative with a range of ongoing extension methods is important. In particular, the New Zealand experience tells us that it is critical to provide for a means of enabling growers to compare their own performance with other growers. Monitoring blocks achieve this, and also enable growers to compare recommended practices with alternative practices.

The following is a brief description of the elements of the focus orchard and monitoring block initiatives.

Attribute	Focus Orchards	Monitoring Blocks
Aim	To demonstrate industry best practice in the establishment and ongoing management of intensive apple and pear orchards on fully operational commercial orchards.	To enable growers to share information about, and compare, the performance of different apple and production systems to facilitate informed choices to adopt new systems.
Scale	Whole orchard, minimum of 15 ha run on a commercial basis.	Single blocks, minimum of 2 ha, within a network of commercial orchards.
Emphasis	Holistic management of an intensive orchard, demonstrating a range of technologies and practices and the management of the transition from less intensive to more intensive systems. Research will play a role alongside demonstration. The focus orchards must reflect what the industry sees as a vision of its future.	Specific management of a production block, providing data easily collected by growers that can be shared through a common database. The blocks need to involve traditional, medium and high intensity production systems to provide the basis for comparison. The Monitoring Blocks must reflect what growers recognise as reality.
Activities	Extension • Group facilitation • Multiple technology demonstrations • Training • Field days • Case study materials • Research • Instrumented monitoring of orchard • Triple-bottom-line data analysis • Soil, water, plant, climate interaction management • Labour, management, skills, planning	Extension • Benchmarking • Specific technology demonstrations • Field days • Case study materials • Research • Instrumentation for verification of block management
Number	Seven (six apple and one pear)	Possibly up to 60, with around eight from each major production region
Management	• National coordinator responsible for overseeing the overall focus orchard and monitoring block initiatives • National grower steering committee responsible for ensuring the focus orchard and monitoring block initiatives are tied to industry-wide aspirations • Regional facilitators responsible for the specific regional focus orchard and Monitoring Blocks • Regional grower steering committees providing advice on the establishment and ongoing management of the initiatives	

A detailed Workplan to implement the above strategy is incorporated into the National Intensification extension Strategy, and in the Appendices. The Workplan includes proposed targets, budgets and tactics for rolling out a combination of Focus Orchard Businesses and Monitoring Blocks as part of a wider extension strategy that supports broad industry goals and strategies.

Recommendation: This report recommends that the apple and pear industries, at the instigation of APAL, adopt a combination of Focus Orchard Businesses and Monitoring Blocks, incorporated into a wider National Intensification Extension Strategy, as flagship initiatives for enhancing the adoption of intensive orchard systems.

9. A NATIONAL INTENSIFICATION EXTENSION STRATEGY

9.1 Rationale for the strategy

APAL has stated a need to see the apple and pear industries become fully world competitive as a matter of urgency. The pressing need is to prepare the apple and pear industry for a rapidly changing future. This may include imports within 1-3 years and increasing competition from low cost producers in export markets.

To meet this need, APAL has envisaged a future industry which is based on more intensive production systems that are profitable and satisfy market requirements for improved quality. This vision is far from the position that is seen in most apple and pear regions of Australia today, and therefore requires a major investment in stimulating change to current practice.

The recommended Strategy sets out a range of tactics that the apple and pear industries will invest in as a part of the change process. These tactics relate to communication, extension and adoption, and are tied to the broader goals for intensification set out in APAL's strategic plan.

9.2 Targets for change (the goal)

This National Intensification Extension Strategy seeks to stimulate the adoption of more profitable intensive orchard systems to produce most of the apple and pear output within the next 10 years.[2]

By demonstrating that intensive orchard systems are more profitable and can achieve sustainable cropping from year 2, it is recommended that the industries seeks to increase the replacement rate for aging orchards to a level of at least 5% per annum. The actual replacement rate needed depends on the present proportion of orchard area that is under intensive systems (which is not known). Through demonstration, the industries should be aiming to ensure all new and replacement plantings will be intensive within 5 years and preferably earlier.

In the consultations with apple and pear growers, figures of between 3% and 10% were quoted as the required annual replacement rates for aging orchards. There are no quantitative studies on optimum replacement rates to maintain productive and profitable orchards and it is recommended in the Final Project Report that there be research in this area to provide guidance to orchard businesses.

Recommendation: That APAL commissions survey work to more accurately determine the present composition of Australian apple and pear orchards in terms of density of plantings and yields per hectare.

Current data on planting densities and yields are not considered by the industry to be reliable. This is critical base information that needs to be collected initially and then periodically during the transition period to measure progress.

[2] This relates to coloured apple varieties and acknowledges that green varieties will continue to be produced from less intensive plantings and fuller leaf canopies to reduce colouring

By 'intensive systems', the Strategy means for apples and pears respectively:

- apple orchard blocks of 2,500 or more trees per hectare, grown according to the following principles:
  - use of rootstocks and management practices that minimise the vertical tree height to 3 to 4 metres in the district and soil type in which the orchard is grown.'
  - use of nursery trees that are well feathered and capable of achieving sustainable cropping from year two;
  - central leader/vertical axis tree training in conjunction with a trellis (ie, a tree support system).
  - use of orchard management techniques that can reach production of 55 tonnes per hectare by year five;

- pear orchard blocks of 2,000 or more trees per hectare, grown according to the above principles. The exception for pears is that although some growers are using rootstocks with dwarfing characteristics, at present there are no 'true' dwarfing stocks available which achieve preferred levels of vigour and precocity.

APAL has suggested that these planting densities be regarded as representing intensive systems. However, there is no consensus amongst Australian producers that 2,500 apple trees per hectare and 2,000 pear trees per hectare represents the optimal system in terms of profitability for all regions. New Zealand defines intensive orchards as 1,500 or more trees per hectare.

Recommendation: That APAL commissions studies of the economic performance of orchard systems of varying planting densities, rootstocks and trellis systems in order to determine the optimal (or benchmark) system for each of the major producing regions.

The New York State 'case study of orchard economics and the systems decision' provides a methodology for the economic studies (DeMarree, Robinson and Hoying, 2003).

It is proposed that the National Intensification Extension Strategy be applied in each major apple and pear growing region in Australia (see Figure 1).

Figure 1: Map of Apple and Pear regions

9.3 The regional challenge

A situational analysis of the apple and pear industry highlighted the variability within and across regions in terms of production output, business capacity, orchard income and demographic attributes regarding population density, age, education and access to public and private services. Moreover, access to scientific, extension and private advisory skills was also seen as variable.

These differences present an enormous challenge to any strategy dealing with change processes and time bound adoption targets.

9.4 Tactics

The National Intensification Extension Strategy is a framework which illustrates a range of tactics, that in combination, will ensure adoption targets outlined in the goal are met.

The tactics outlined in this strategy are based on those recommended by the Cooperative Venture for Capacity Building for Innovation in Rural Industries. The Cooperative Venture takes a very broad perspective about what extension is and how it can be structured to maximise potential adoption of new farm/orchard practices:

> *Extension comprises of activities that may provide: a facilitative framework for group learning, a specific learning event; a process for developing/modifying specific management practices or technologies; individual mentoring; and on-going access to needed knowledge and information. Each of these different activities complements the others in the overall process of capacity building. Coutts and Roberts (2003)*

Below are the tactics from which a schedule of activities can be based around to underpin success:

1. Group facilitation/empowerment;
2. Communication;
3. Training;
4. Mentoring and exchange (providing opportunities to share experience;)
5. Technology development (incorporating best practice guides); and
6. National extension coordination

Together, these tactics form the backbone of an extension strategy for the apple and pear industries. Within the strategy, two further tactics might be viewed as flagship initiatives:

- focus orchard businesses; and a

- monitoring block network

Responsibility for implementing these tactics should be driven by APAL, utilizing a national coordinator and its state and regional networks.

9.5 Why is the strategy important?

Without a cohesive and coordinated strategy for supporting a significant change process, the adoption of intensive orchard systems would be left to chance, and the industries as a whole would continue to lose competitiveness. This framework provides the necessary mix of activities that takes into account the different contexts and experiences of orchard businesses and the different ways in which they prefer to learn and do business.

It also provides a monitoring and evaluation framework to ensure that progress towards intensification is understood, so that lack of progress can be responded to effectively.

9.6 Total budget

The National Intensification Extension Strategy requires a budget commitment of $4.8 million dollars over five years. It was developed in consultation with regional and national participants of the apple and pear industries. The budget breakdown is presented in Appendix A and allocated according to the eight tactic areas.

9.7 Return on investment

The recommended investment in the National Intensification Extension Strategy (NIES) is $4.795M over 5 years. Without reliable baseline data, a 'best guess' estimate is that this investment would produce a benefit cost ratio (BCR) of 43:1. That is each dollar invested up to 2010 would return around $40 in present values over 20 years. This estimate relates only to apples and does not take into account NIES expenditure on pears. It is also based on an assumption (without knowing what the present situation is) that by 2010, 50 per cent of the present area of apple production will be under intensive systems (ie, 7,812 ha). If a greater area is replanted to intensive systems, the return will be higher.

The estimated BCR roughly transcribes the results of the New York State study of the economic performance of five orchard planting systems (De Marree, Robinson and Hoying, 2003) to the Australian situation. This study is used to calculate the accumulated profit (net present value over 20 years) at AUD$26,650 per hectare for an approximate intensive system. NPV analysis estimates orchard cash flows per hectare over 20 years taking into account establishment orchard establishment, fixed and operating costs. The results are highly sensitive to price, cost of production and interest rate assumptions. Obviously, the assumptions of the New York study are based on conditions in the US industry that are significantly different from Australia. For this reason, the Final Project Report recommends economic analysis be conducted for Australian conditions to arrive at estimates of return on investment that give more confidence to orchard businesses, government and industry in their investment decisions.

9.8 Target audience

The current apple and pear industries can currently be summed up as comprising four kinds of orchard businesses:

- Progressive (early adopters, willing to try new things);
- Cautious (conservative adopters, waiting to see the 'evidence');
- Lifestyle (content at doing what they are doing, seeing no reason for change);
- Exiting (those seeing out their remaining time prior to leaving the industry).

The broader stakeholder base of the industry can be further divided into two categories, which are important to separate in terms of this strategy:

- those that seek to make change;
- those that support and influence change.

Change seekers:

This is the ultimate target audience for the National Intensification Extension Strategy, and comprises mainstream orchard businesses. These businesses are highly variable in size as shown in the following table.

Table 4: No. of apple and pear orchard businesses by size, Australia (2003-04)

	0-3.9ha	4-11.9ha	12-39.9ha	40-99.9ha	100-199.9ha	>200ha
Apples	485	383	268	79	15	1
Pears	505	158	86	19	5	1

Source: ABS Apple and Pear Survey 2004 and 1999

The NEIS does not exclude certain types of businesses from participating in its activities. It does, however, recommend that the nature of the activities will need to vary to suit the circumstances of different business profiles. One form of market segmentation for the purposes of varying the implementation of various tactics described in this workplan clusters orchard business owners into the profiles previously described: progressive, cautious, lifestyle and exiting. These business profiles are described more fully in the accompanying report "A strategy and workplan for accelerating the adoption of intensive orchard systems".

A good extension program will target activities at each of the segmented profiles, recognizing that the changes each seek will either be different or, if the same, achieved through different means. This applies particularly to the progressive and cautious profiles, where the majority of the effort should be focused. However, it should be recognized that those in the other profiles will not be ignorant of activities within this strategy, and may be stimulated to move into the cautious profile as they observe the implementation of activities in their region. It is important that regional facilitators and local mentors become attuned to and recognize this interest, and encourage participation in appropriate ways.

Change supporters:

This is a critical target audience, without whose support adoption of intensive orchard systems will be difficult to effect. Groups in this audience include:

- APAL and its State affiliations;
- Horticulture Australia Limited
- Apple and pear nursery businesses
- Regional research groups;
- Federal government;
- State departments of agriculture;
- Research groups such as CSIRO, CRCs and Universities;
- Participating private consultants;
- Agribusiness & financial institutions;
- The general public in the apple and pear growing regions; and
- The broader general public.

9.9 Establishing targets for change

The target of all new and replacement plantings to be intensive within 5 years of the commencement of this extension strategy is supported by a hierarchy of targets that sees the business owners move through a cycle of practice change. The hierarchy of targets deals with targets for awareness and participation, as well as adoption.

A breakdown of the National Intensification Extension Strategy targets for practice change follows.

9.9.1 Awareness

- By 2007 100% of apple and pear orchard businesses are aware of National Intensification Extension Strategy activities.

This phase can be seen as a continuum ranging from passive to active awareness of the strategy. For example – a general media release may increase a person's awareness with no further action taken (passive) compared with a person who actively reacts and wants to pursue involvement or come to a field day etc. which may be considered a more active response to becoming involved. The above target is for at least passive awareness by 2007.

9.9.2 Participation

- By 2009 >66% of apple and pear orchard businesses have participated in National Intensification Extension Strategy activities.

This phase can be seen as a continuum ranging from low level to high level participation in the strategy. On the whole though, a person in the participation phase

would be actively engaged in the learning process and seeking opportunities to support their learning needs through participating in training, attending field activities, sharing experiences through orchard group networks, trailing ideas on their orchards and generally raising their level of knowledge and skills to enhance decision making and change management on their orchard businesses.

9.9.3 Adoption

- By 2010, >50% of apple and pear orchard business have adopted desired intensification systems on their orchards.

This phase can be seen as a continuum ranging from targeted change management (perhaps at the block scale) through to broad based systems change (perhaps at the whole orchard business scale). Overall, this phase indicates that intensive orchard systems have been adopted where profitable, social and natural resource benefits can be measured as a direct result.

9.9.4 Target summary

In terms of percentage of the potential market (50% of around 1200 apple orchard businesses and50% of around 750 pear orchard businesses adopting intensive orchard systems), these targets represent a substantial proportion that will require a staged process to achieve. The following table outlines how these targets will pursued in annual increments:

	Awareness of Intensification Extension Strategy activities	**Participation in Intensification Extension Strategy activities**	**Adoption of Intensification Extension Strategy practices**
2006	50%	10%	Baseline to be calculated (see recommendation p3)
2007	80%	30%	Baseline +15% of total orchard businesses
2008	100%	50%	Baseline +25% of total orchard businesses
2009	100%	66%	Baseline +40% of total orchard businesses
2010	100%	>66%	Baseline +>50% of total orchard businesses

9.10 Practice change model

Underpinning the National Intensification Extension Strategy is a practice change model (see section 7) based on:

- stimulating motivation;
- facilitating trials; and
- demonstrating benefits from change (see model below).

It has been successfully used in a range of rural industry programs and corresponds logically to the hierarchy of targets involving awareness, participation and adoption.

How can it be used?

To re-iterate the discussion in section 7, the practice change model recognises that different participants in the National Intensification Extension Strategy will move through the cycle in different ways and at different paces. In response to this, the model establishes a framework which can deal with very different demands for specific kinds of information and activities when and as needed by different participants. Examples of this are provided in the detailed appendixes to the NIES.

9.11 A summary of the tactic areas for national investment

9.11.1 Tactic 1 Demonstration through focus orchard businesses

This tactic focuses on establishing and maintaining up to seven focus orchard businesses (six apple and one pear) across the Australia on existing commercial apple orchards and one commercial pear orchard to act as focal points for demonstrations, training, discussions, research, monitoring and other tactics outlined in this strategy.

These focus orchard businesses will highlight all aspects of intensive production systems, including the transition from less intensive systems; selection of varieties; selection and acquisition of rootstocks and nursery trees; the establishment of intensive orchard systems (including costs); production management and costs; packing and storage; marketing; labour management; financial performance; and planning and business management among other things. Appendix B outlines in detail the Focus Orchard Business initiative.

9.11.2 Tactic 2 Comparisons through monitoring blocks

This tactic focuses on enabling orchard businesses to compare different production systems as a way of moving them towards adopting more intensive systems. It is based on the premise that orchard business owners like to compare for themselves the benefits of alternative productions systems and techniques.

Producers can nominate existing commercial blocks for inclusion in the national network with the total number limited only by available support funds. It is envisaged that Monitoring Blocks would enable comparison between different varieties, planting densities, rootstocks, and production systems (tree support, training, pruning, picking, irrigation management, nutrition management, disease and pest management, etc).

Funds will support the collection and analysis of data from Monitoring Blocks across Australia, with reports made available directly to participating orchard businesses, and summaries provided through the National Intensification Extension Strategy web-site to enable any orchard business to compare their block performance with the participating blocks. Appendix C outlines in detail the Monitor Block initiative.

9.11.3 Tactic 3 Group facilitation/empowerment

This tactic focuses on increasing the capacity of participants in planning and decision-making and in seeking their own education/training needs based on their situation. Funds will be made available to support regional networks of orchard businesses come together to guide regional extension activities and to help implement aspects of the National Intensification Extension Strategy.

9.11.4 Tactic 4 Communication

This tactic focuses on providing essential information that orchard businesses can access from a distance and at a time that suits them. It will be based on maintaining a central National Intensification Extension Strategy web-site, investing in communication activities that promote strategic intensive production system messages as well as providing a range of ongoing stories through targeted mediums as identified. It will also provide web-based and hard copy documentation of intensive production principles and procedures for establishing and managing intensive orchard systems.

9.11.5 Tactic 5 Training

This tactic focuses on delivering specifically designed training programs/workshops to targeted groups of orchard businesses to increase understanding or skills in intensive production systems. These will be delivered in a variety of modes and learning approaches to cater for preferred learning styles of participants. There will be a focus on accrediting some packages for delivery via FarmBiz funding as well as in less formal delivery frameworks which will be regionally driven.

Nursery businesses are also an important target audience for training, and here training will concentrate on developing the capacity to meet an increasing demand for appropriate rootstocks suitable for rapid intensification of orchards.

9.11.6 Tactic 6 Mentoring and exchange

This tactic focuses on providing one-on-one support for orchard businesses involved in intensifying their production systems. It will include supporting technical experts to visit orchard businesses to provide advice, diagnosis and recommendations and to facilitate an on-going mentor relationship – providing an essential sounding board for decision-makers. Funds will also be made available for orchard businesses to facilitate and host grower to grower exchanges.

9.11.7 Tactic 7 Technology development and demonstration

This tactic focuses on linking apple and pear R&D activities undertaken across Australia with the various tactics outlined in this strategy. For example, it will help facilitate the use of Focus Orchards and Monitoring Blocks as places to demonstrate emerging technologies through regional trials, field days and visits to Australia by international experts.

9.11.8 Tactic 8 National coordination

This tactic supports a National Coordinator to manage the National Intensification Extension Strategy and work with those at the national, state and regional levels to help implement, coordinate, monitor and report against its tactics. A national steering committee will provide guidance to the Coordinator, and assist strengthen the national, state and regional networks required to make the Strategy successful.

APAL could consider incorporating the national coordinator and advisory personnel and resources within a subsidiary company structure or within existing companies such as APFIP or AFFCO. It will be important to establish the delivery of these services through a business model that provides focus, coordination of resources and effective management.

The table at Appendix A details the specific activities to be undertaken against each tactic, and outlines the relevant scale, responsibility, timeline and budget for each activity.

9.12 Developing the national extension capacity

Many in the apple and pear industries fear the lack of capacity that exists to deliver an ambitious, national extension strategy such as the one outlined here. It is critical, therefore, that what capacity does exist at present be nurtured and appropriately focused on activities likely to lead to the biggest return on investment.

This document should act as a rallying point around which existing extension experts can focus their efforts, within a coordinated approach that networks activities across Australia. It is imperative, therefore, for the NIES to be owned and coordinated nationally, but with opportunities for local extension expertise to be exposed to, as well as contribute to, activities beyond their immediate domain. Forming a network of extension operatives involved in implementing the strategy, and providing them with the opportunity to own it, will provide the basis for the peer support upon which extension expertise has been known to thrive.

Tactic 3 in this workplan suggests a major investment in building locally empowered networks of businesses, facilitated by State-based experts. These experts will play a critical role in bridging national and regional aspirations for intensification, but will also play an important role in identifying and involving local champions and mentors who, while not being recognized as extension experts in the traditional sense, will become a fundamental part of the knowledge building network.

9.13 Monitoring and evaluation of the National Intensification Extension Strategy

Appendix D provides a framework for the monitoring and evaluation of all activities supported under the National Intensification Extension Strategy.

The framework provides annual targets leading to the achievement of the overall targets set by the Strategy. This will enable the National Coordinator to track progress and respond as necessary should targets not be met. It is important that monitoring and evaluation activities take place annually so that no surprises/disappointments suddenly appear at the end of the initiative.

The framework is based on a modified Bennett's Hierarchy. This enables mangers to track activities from the input stage through to the output stage and ultimately the outcome stage. The initial features outlined in the framework are inputs, the final features are outcomes.

9.14 Prioritisation

In respect to the National Intensification Extension Strategy and Workplan developed by this project, the establishment of national extension coordination arrangements (tactic 8) and the monitoring block initiative (tactic 2) are viewed by the consultants as the most immediate priorities. However, recognizing the social and economic factors involved in the adoption process, it is important that an investment be made across all tactics outlined in the strategy.

10. ENABLING ENVIRONMENT AND ACTIONS

Facilitating fundamental change in the apple and pear industries' production systems is a major strategic initiative by APAL. Rolling out the strategy and workplan for intensive orchards is part of a wider push to achieve a cultural shift across the industry. It is about moving from a focus on growing apples or pears to a focus on managing business. It is about moving from a fragmented, inward looking domestic industry, to a dynamic industry that is coordinated, outward looking and globally connected.

A key message is that transformational change of this scale and complexity takes time. Overseas experience is that achieving such a change is measured in decades. Nonetheless, the Australian industry can leverage overseas experience to accelerate the process.

Establishing a system of focus orchards and monitoring blocks will be an important program to help achieve tangible change at the individual farm level. However, the success of the program will depend on several complementary or enabling actions.

These enabling actions are a series of industry level initiatives that need to run in parallel with the project to help provide and sustain the necessary momentum. The critical enabling actions are outlined below. Deeper analyses of the enabling environment can be found in the final reports of the complementary projects 'Strategic review and needs/situational analysis' (AgEconPlus 2005) and 'Scoping study of supply chain efficiency' (Ridge Partners 2005).

10.1 Industry level initiatives

10.1.1 Leadership

There are many financial pressures on growers and much uncertainty about the future for the industry. Significant structural changes are likely and needed over the next 5-10 years. In this environment, industry participants will look more than ever to APAL as their peak body to take a clear and consistent position on the type of future envisaged for the apple and pear industries. APAL's leadership and direction will help instill the confidence needed in the industry for the necessary investment to flow. Some growers will invest over time in intensive orchards and others will decide to leave the industry.

> *Quote: We have a lot of astute people – we can adapt to survive and compete (industry leader).*

The industry disruption and change processes are significant and will take place over a 5-10 year period. The implication is that a strategic approach is needed by APAL to start and sustain momentum. The starting point is APAL's candid assessment and communication of the industry situation and outlook. Individual growers need quality information to weigh up risks and opportunities and make decisions about the future for their business.

> *Quote: Industry associations should be lean and mean. We need new blood onto boards and management to bring fire and energy (apple grower).*

As the structural changes take place, continuity of leadership direction and capability will be important. For example, the mix of skills and expertise within APAL's board and management may need to vary as the change process gains momentum. Initiatives such as succession planning for the APAL board and management will help ensure the mix of skills and experience is matched to the demands on the organization over time.

Recommendation: That APAL actively promote the crucial role of intensive orchards for future industry prosperity and ensure plans are in place to sustain and enhance board and management leadership capacity to meet the challenges ahead.

10.1.2 Communication

Linked with the need for strong leadership is the supporting communications strategy to 'market' the industry initiative to move decisively into intensive orchards systems. The strategy will target growers but also help raise the profile and image of the apple and pear industries as being progressive and professional with the supply chain and decision-makers.

> *Quote: Intensive orchard production is really, really important to the future of the apple industry. (young apple grower).*

The leadership positioning and communications strategy will need to combine to promote a sense of urgency and direction. The strategy will need to be carefully crafted, and tailored to the different audiences (growers, packers, retailers, exporters, consumers, government). Potential messages delivered by the strategy are that:

- the apple and pear industries have a positive future and intensive orchards are integral to the prosperity of the industry and individual farm businesses;
- the industry is mobilizing to respond to growing competition from alternative products (other fruits and manufactured snack foods) to grow domestic market share;
- the industry is preparing to take on competition from overseas exporters – both internationally and at home.

Recommendation: That APAL develop and implement an integrated communications strategy to promote adoption of intensive orchards and strengthen the reputation and image of the industry as a modern and professional business sector.

10.1.3 Technical and business advice and information

Growers require access to the best technical advice available nationally and internationally to support the decision to intensify and to manage the new blocks that are planted. Establishing a cohesive network of commercially aware technical advisers that can provide these services to growers is a precondition for successful transition by the apple and pear industries to intensive orchards. Key issues are:

- Identifying the people and overseas experts who can provide advice;
- Designing and implementing a management structure for delivering advice; and

- Consolidating and preparing a reference document of best intensive orchard practice that is practical and 'reader friendly' to growers and advisers.

There are a small number of highly regarded technical advisers with specialist knowledge on intensive orchards. Most of these advisers are currently working with State government agencies that are winding down extension services. Also, Australian advisers and many progressive growers have developed networks and relationships with overseas advisers. The key point is that there is an existing pool of domestic and overseas talent that can serve as a starting point for the accessing technical advice for the Australian industry.

> *Quote: If you plant intensively and don't manage intensively, then you intensify your problems (apple grower).*

Many apple and pear growers are not accustomed to paying for technical advice, which differs from the normal practice of most commercially successful agricultural industries. An important principle is that the advisory service should be established on a commercial footing as soon as possible.

A commercial structure will provide the required focus, consolidation of resources and effective management. APAL can have a strong role in launching commercially driven activity in this area. For example, the national coordinator and advisory personnel could be placed within a company structure established by APAL or within existing industry companies such as APFIP or AFFCO.

Recommendation: That APAL and the national coordinator for accelerating adoption of intensive orchards identify and assess alternative business delivery models for a commercially oriented technical advisory service.

10.1.4 Growing, profitable markets

Grower investment in intensive systems will be accelerated when there is confidence that growing, profitable markets exist for their fruit. At present, the industries are losing market share domestically to alternative fruit or manufactured snack foods (while consumer demand for healthy snack foods has expanded dramatically). Also, the Australian industries are losing market share overseas as rising production from lower cost suppliers increasingly dominates the international trade. Investment will flow where there is growing consumer demand for Australian apple and pears.

Economy-wide variables such as interest rates and exchange rates are a significant influence on profitability, but are beyond the control of individual business and the industry bodies. All agricultural industries must manage their businesses within the broader macroeconomic environment.

Market development through commercial competition and entrepreneurial activities by firms through the supply chain rests primarily with individual businesses. However, there are several areas where APAL has the capacity to influence the apple and pear value chain to benefit growers. For example:

- Finding ways to streamline and stabilize the value chain (ie by facilitating flows of market information, relationship building, encouraging development of networks and alliances and so on);
- Fostering innovation through research and development and adoption of new technologies and business systems that align to changing market demand (ie by influencing the investment of R&D levies); and
- Stimulating consumer demand for Australian apples and pears (ie by influencing the industry investment in marketing and promotion through statutory levies).

Quote: The R&D system is serving us pretty poorly (apple grower).

A levy increase that will boost resources available for marketing of apples and pears was recently approved by industry and the Federal Government. The challenge for APAL now is to ensure that industry levy funds are invested in programs that achieve optimal impact. The aim is to reverse the declining consumer demand in the domestic market. Will the existing and additional levy funds be directed to do more of the same? If so, does APAL expect a different result? Are new approaches needed?

Quote: There's a bit of a lack of direction for apple and pear R&D in Australia (apple grower).

The current industry strategic plan was prepared three years ago and it is timely for APAL to formulate a new plan. Given the current and emerging challenges facing growers, the successful execution of the new strategy (including acceleration of intensive orchards) will be critical. Ensuring effective utilisation of levy funds is one of the key levers available to APAL to influence the future of the apple and pear industries.

There appears to be a case for reviewing apple and pear marketing strategies and the alignment of management structures and activities for domestic and export market development. The purpose of such a review would be to assess whether growers are receiving maximum value from existing strategies and structures, or if more effective and efficient approaches could be implemented.

Recommendation: That APAL develop a new industry strategic plan and ensure internal resources and levy funded programs are aligned with the new plan to deliver maximum value for growers.

Relationship development and management

The industry is fragmented with poor linkages between nurseries, growers, wholesalers and retailers. There is an opportunity for APAL to drive initiatives and build those relationships at a strategic and working level to facilitate flows of information and to resolve business issues of common interest (eg quality assurance, product specifications to match changing consumer demand and so on).

Quote: The majority of growers need to change their thinking. They still want to ring up today for trees tomorrow (nursery manager).

The relationship between growers and nurseries will require particular attention to ensure growers have access to the required quality and volume of trees for planting intensive blocks.

> *Quote: We are running a business these days, not growing apples (apple grower).*

Recommendation: That APAL work with HAL to develop a supply chain stakeholder engagement strategy including the nursery and financial institutions sectors. The strategy would include clear roles and responsibilities and performance targets.

Co-investment

The investment required for intensification is significant for growers, at $40,000-90,000 per hectare. International experience is that access to capital from commercial sources and, in most instances, from governments is critical to accelerate adoption. A specific strategy should be developed to formulate and negotiate a co-investment partnership between the industry and government. The strategy should set out the respective roles and the investment required to ensure the success of the project.

While government and industry level investment will help catalyse change, the main challenge for individual growers is accessing commercial finance. The industry has an opportunity to prepare a capital access strategy between the industry and financial institutions to provide the necessary financial packages at the grower level that will enable the investment in change to take place and maintain the profitability of growers.

> *Quote: You don't need to be Einstein. Once you see it (intensive orchards) you can do it with some trial and error. The main impediments are choosing the variety and getting the finance (apple grower)*

Engagement with the financial institutions will be important to communicate the changes being experienced by the apple and pear industries, to share APAL's vision of the commercial opportunities to demonstrate that the Australian industry is positioned to exploit these opportunities.

Recommendation: That APAL develop a co-investment strategy with government to fund implementation of the workplan for accelerating adoption of intensive orchards.

Recommendation: That APAL develop a capital access strategy that engages financial institutions and the capital market for future investment in by apple and pear businesses in intensive orchard systems and industry infrastructure.

INDUSTRY VISITS AND ORGANISATIONS/INDIVIDUALS INTERVIEWED

Date	Places visited	Number of people interview	Sectors
11-12 April	Stanthorpe	19	State industry organization, technical advisor, grower/packers, growers, DPI
13-15 April	WA (Donnybrook, Manjimup, Cannington Markets)	10	Category manager/ packer, marketer and exporter, grower/packers, apple and pear growers, PL coordinator, national breeding program
18-19 April	NSW (Batlow, Orange, Bilpin)	16	Apple grower, Batlow Cooperative, orchard advisor, Juicing Cooperative
20-22 April	Victoria (Goulburn Valley, Yarra Valley, Melbourne)	21	APAL, HAL, AFFCO, NVFA, grower/packers, apple and pear growers, young growers, Coles, Montague Fresh, National Fresh
26-27 April	Tasmania (Hobart, Huonville, Grove, Hillwood)	10	Growers, grower/packers, nursery, state industry organisation
28-29 April	South Australia (Lenswood)	31	Apple and pear growers, grower/packers, young growers, Lenswood Cooperative, State industry organization, PIRSA and SARDI
11-12 May	NZ (Hawkes Bay)	4	Industry body, technical advisor and growers

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APPENDIX A: NATIONAL INTENSIFICATION EXTENSION STRATEGY

Tactic 1: Demonstration through Focus Orchard Businesses

Description: This tactic focuses on establishing and maintaining up to seven focus orchard businesses across the Australia on existing commercial properties to act as focal points for demonstrations, training, discussions, research, monitoring and other tactics outlined in this strategy.

Activity	Description	Responsibility	Timeline	Budget
1.1 Focus Orchard selection	Selection of focus orchard businesses against selection criteria (six for apples, one for pears). These criteria are outlined in Appendix B. Where a region that has not been selected to have a focus orchard business under this strategy can attract local financial support for one, it should be encouraged to do so, with the business then incorporated into the broader network.	National Steering Committee	October 2005	Nil
1.2 Focus orchard characterization	Detailed triple bottom line description of the focus orchard for use in extension materials and as baseline for research and monitoring activities. The description should include the 'story' of what is taking place on the business, including the motivations for moving towards intensification, the challenges and the rewards.	National coordinator overseeing a contracted project	December 2005	Up to $6,000 per orchard Total (2005-06) $42,000

Tactic 1 Cont . . .				
Activity	**Description**	**Responsibility**	**Timeline**	**Budget**
1.3 Focus orchard instrumentation	Installation of equipment to capture ongoing data for monitoring and comparative purposes. This activity might not be a high priority depending on how a region wants to use its focus orchard business. However, funding would enable soil, water, nutrient, plant growth and other issues to be monitored with some precision, and provide a deeper level of understanding of the intensification process and its benefits.	National coordinator overseeing a contracted project	April 2006	$40,000 per orchard Total (2005-06) $280,000
1.4 Focus orchard monitoring	Collection and analysis of Focus Orchard data (economic and production). This provides for the analysis and reporting of data from instrumentation established under 1.3. Again, the priority for this activity will depend on the how a region wants to use its focus orchard business, and the relative importance it places on credible data to support statements made about the intensification process on the orchard.	National coordinator overseeing a contracted project	2006-2010	$80,000pa for four years Total (2005-2010) $320,000

Tactic 1 Cont . . .				
Budget	**Description**	**Responsibility**	**Timeline**	**Budget**
1.5 Focus orchard business events	Use of Focus orchard businesses to conduct a range of activities outlined in Tactics 2-8.	National coordinator overseeing a network of extension specialists	2006-2010	(Embedded within other budgets)
			Total budget	$642,000

Tactic 2: Comparisons through Monitoring Blocks Description: This tactic focuses on enabling orchard businesses to compare different production systems as a way of moving them towards adopting more intensive systems.				
Activity	**Description**	**Responsibility**	**Timeline**	**Budget**
2.1 Monitoring Block selection	Nomination of monitoring blocks by growers and selection against specified criteria. These criteria are outlined in Appendix C. A target of 60 monitoring blocks is suggested, although where producers volunteer to have their block included in the network, this should be encouraged.	National Steering Committee	August 2005	Nil
2.2 Monitoring Block characterization	Brief description of the monitoring blocks for use in extension materials and as baseline for comparative analyses. The description should include the history of the blocks, including past and present practices, and the personal story behind the growers' decisions.	National coordinator overseeing a contracted project	November 2005	$1,500 per orchard Total (2005-06) $90,000
2.3 Establishment of Monitoring Block Database and website	Development of a database and analysis framework to enable benchmarking and comparisons on an annual basis. The database should be uploaded onto an easily accessible website, with flexible data retrieval functions and readily understood information presentation format.	National coordinator overseeing a contracted project	December 2005	Total (2005-06) $100,000

Tactic 2 Cont . . .				
Budget	**Description**	**Responsibility**	**Timeline**	**Budget**
2.4 Coordination of Monitoring Block project data analysis and reporting	Collection, analysis and reporting of Monitoring Block data (economic and production). Data is collected by the participating businesses against a standard template. Short, paper-based reports should be prepared annually for participating orchard businesses, summarizing an analysis of the block's data. An annual summary presenting aggregated data at regional, state and national levels should be provided. The summary should comment on the economic and production performance of different systems under different intensities.	National coordinator overseeing a contracted project	2006-2010	$80,000pa Total (2005-10) $400,000
2.5 Monitoring Block events	Use of Monitoring Blocks to conduct a range of activities outlined in Tactics 2-8	National coordinator overseeing a network of extension specialists		(Embedded within other budgets)
			Total budget	$590,000

Tactic 3: Group facilitation and empowerment Description: This tactic focuses on increasing the capacity of participants in planning and decision-making and in seeking their own education/training needs based on their situation.				
Activity	**Description**	**Responsibility**	**Timeline**	**Budget**
3.1 Establishment of a regional network of orchard businesses	Establish up to 12 regional advisory groups of orchard businesses to oversee the implementation of the National Intensification Extension Strategy in their respective regions. Particular emphasis will be on the connection to the Focus Orchards and Monitoring Blocks.	National coordinator with State affiliations of APAL	June 2006	$5,000 operating costs per region per year Total (2005-10) $300,000
3.2 Ongoing facilitation of the regional network	Appointment of state-based regional network facilitators (0.5FTE) to drive the process of change and ensure that activities consistent with the National Intensification Extension Strategy meet local needs for intensification. These facilitators will play a critical role in focusing the limited extension capacity towards activities likely to have the greatest return on investment. They will also have a role in building the capacity among extension operators (public and private) and growers (particularly by providing support to the grower mentors and champions).	National coordinator with State affiliations of APAL to make 6 appointments	December 2005	$30,000 per facilitator pa per state ($15,000 for six months in 2005-06) Total (2005-10) $810,000

Tactic 3 Cont . . .				
Budget	**Description**	**Responsibility**	**Timeline**	**Budget**
3.3 Inter-regional coordination and forums	Support annual gatherings of regional facilitators and key orchard business owners to share their experiences and provide accountability for their activities to the national steering committee.	National coordinator and regional facilitators	2006-10	$50,000 per forum pa (four years) Total (2005-06) $200,000
			Total budget	$1,310,000

Tactic 4: Communication Description: This tactic focuses on providing a range of blanket information that orchard businesses can access from a distance and at a time that suits them.				
Activity	**Description**	**Responsibility**	**Timeline**	**Budget**
4.1 Development and implementation of a communication plan	National level communication plan targeted towards awareness raising and motivation to participate in National Intensification Extension Strategy activities. Components include: • Internal partnership communication • Visual identity and brand building • On-line strategy (website) • Media strategy • Publications	National coordinator	Completion of a communication plan by December 2005. Implementation over 2005-10	$100,000pa Total (2005-06) $500,000
			Total budget	$500,000

Tactic 5: Training Description: This tactic focuses on delivering specifically designed training programs/workshops to targeted groups of orchard businesses to increase understanding or skills in intensive production systems.				
Activity	**Description**	**Responsibility**	**Timeline**	**Budget**
5.1 Intensification training manual development	Development of a national training manual and regional modules specifically dealing with intensification of production systems. The manual will be accredited in line with Farmbiz requirements.	National coordinator overseeing a contracted project	June 2006	Total [2005-06] $100,000
5.2 Delivery of intensification training modules	Delivery of intensification training modules across Australia by a network of specially selected trainers	National coordinator and regional facilitators	2006-10	$2,000 operating costs per course (12 courses pa x 4 years) Total [2006-10] $96,000
5.3 Train the trainers	Provide training to regional training deliverers to enhance their extension capacity. The training should be provided by the developers of the training manual (see above), to ensure the material is effectively presented.	National coordinator and regional facilitators	December 2006	Total [2005-06] $60,000
5.4 Train the mentors	Provide training to regional mentors to support their capacity to motivate their regional peers. This activity relates to Tactic 6 (activity 6.1)	National coordinator and regional facilitators	2006-10	$1,000 per mentor (12 regions, 4 years) Total [2006-10] $48,000

Tactic 5 Cont . . .				
Budget	**Description**	**Responsibility**	**Timeline**	**Budget**
5.6 Visits by overseas experts	Sponsor visits by overseas nursery and orchard experts to provide advice and training to Australian orchard businesses and advisors. These experts should visit a range of key regions across Australia.	National Coordinator	2005-2010	$20,000 per year Total (2005-10) $100,000
			Total budget	$404,000

Tactic 6: Mentoring and exchange Description: This tactic focuses on providing one-on-one support for orchard businesses involved in intensifying their production systems.				
Activity	**Description**	**Responsibility**	**Timeline**	**Budget**
6.1 Mentor support scheme	Identify at least one orchard business owner per region per year and support their role as mentors to regional growers who might not normally participate in group activities. This might entail the mentor making personal visits to other orchard businesses or hosting one-on-one visits to the mentor's orchard business.	National coordinator and regional facilitators	2006-2010	$3,000 per mentor (12 regions, 4 years) Total [2007-10] $144,000
6.2 Best practice orchard business promotion	Promote best practice orchard business case studies throughout regions, and support case study orchard business owners to conduct field days at their orchards.	National coordinator and regional facilitators	2006-2010	Built into communication and other budgets
6.3 Regional exchange scheme (focus regions)	Through a competitive process, jointly support at least one grower per region per year over the life of the strategy for orchard business owners to visit, learn from and report back to fellow growers on at least one other region. The payment might be a partial subsidy calculated on the contribution made by the applicant.	National coordinator and regional facilitators	2007-2010	$30,000pa (four years) Total [2007-10] $120,000
			Total budget	$224,000

Tactic 7: Technology development and demonstration Description: This tactic focuses on linking apple and pear R&D activities undertaken across Australia with the various tactics outlined in this strategy, and in particular supporting the demonstration of relevant activities.				
Activity	**Description**	**Responsibility**	**Timeline**	**Budget**
7.1 Field days, orchard walks, sticky-beak days	Support regular demonstrations of best and emerging best practice in intensive orchard systems. These activities should be based around the Focus Orchards and Monitoring Blocks.	National coordinator and regional facilitators working with state and private extension networks	2006-2010	Operating budget of $1,000 per event (min 25 events per year x 5 years) Total [2005-10] $125,000
7.2 Best practice manual	Develop a best practice guide to the establishment and maintenance of intensive orchard systems, including information on production, economics and financial business skills and professional management of intensive orchards (labour etc). The guide should be compatible with the training manual (activity 5.1), but written as a self standing document for those who don't attend training or who want constant access to a reference document to support their decision making.	National coordinator overseeing a contracted project	December 2006	Total [2005-07] $100,000

Tactic 7 Cont . . .				
Budget	**Description**	**Responsibility**	**Timeline**	**Budget**
7.3 Research and development	Facilitate the use of the Focus Orchards and Monitoring Blocks as sites for research investigations where appropriate.	National coordinator and regional facilitators working with state, federal and private research groups	2006-2010	Use existing resources dedicated to research
			Total budget	$225,000

Tactic 8: National coordination

Description: This tactic supports arrangements to manage the National Intensification Extension Strategy and work with those at the national, state and regional levels to help implement, coordinate, monitor and report against its tactics.

Activity	Description	Responsibility	Timeline	Budget
8.1 National extension coordinator	Support for a National Intensification Extension Strategy National Coordinator position to facilitate the implementation of the National Intensification Extension Strategy	APAL	August 2005	$140,000 per annum including travel and overhead costs Total [2005-10] $700,000
8.2 Establishment of a National Intensification Extension Strategy Steering Committee	Support for a national steering committee responsible for the strategic directions, monitoring, evaluation and accountability for funds expended in relation to the National Intensification Extension Strategy	APAL	December 2005	$20,000 per annum operating and secretarial costs Total [2005-10] $100,000
8.3 Protocols for consistent implementation of National Intensification Extension Strategy activities	Develop, distribute and advise on protocols for the consistent implementation, monitoring and assessment of National Intensification Extension Strategy activities across regions	National coordinator	December 2005	Nil

Tactic 8 Cont . . .				
Budget	**Description**	**Responsibility**	**Timeline**	**Budget**
8.4 Monitoring and evaluation	Monitor, evaluate and report against the annual progress towards the achievement of National Intensification Extension Strategy targets	National coordinator and National Steering Committee	2005-2010	$20,000pa Total [2005-10] $100,000
			Total budget	$900,000

Budget Summary

Tactic	2005-06	2006-07	2007-08	2008-09	2009-10	TOTAL
1. Focus Orchards	$322,000	$80,000	$80,000	$80,000	$80,000	$642,000
2. Monitoring Blocks	$270,000	$80,000	$80,000	$80,000	$80,000	$590,000
3. Regional facilitation	$150,000	$290,000	$290,000	$290,000	$290,000	$1,310,000
4. Communication	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
5. Training	$180,000	$56,000	$56,000	$56,000	$56,000	$404,000
6. Mentoring		$56,000	$56,000	$56,000	$56,000	$224,000
7. Technology development and demonstration	$75,000	$75,000	$25,000	$25,000	$25,000	$225,000
8. National coordination	$180,000	$180,000	$180,000	$180,000	$180,000	$900,000
TOTAL	$1,277,000	$917,000	$867,000	$867,000	$867,000	$4,795,000

APPENDIX B: FOCUS ORCHARD BUSINESSES

PURPOSE

Focus Orchard Businesses aim to demonstrate best practice in the establishment and ongoing management of intensive apple and pear orchards on fully operational commercial orchards.

The Focus Orchards Businesses will play an important role in moving the apple and pear industries towards intensification by:

- Focusing on the demonstration of best practice in intensive orchard management
- Focusing at the whole enterprise scale
- Focusing on business skills as well as orchard management skills
- Focusing on different phases in the transition from conventional to intensive systems
- Focusing on specific orchards as rallying points for different forms of extension.

NUMBER AND SCALE

This strategy will initially support six Focus Orchard Businesses in the apple industry and one Focus Orchard Businesses in the Pear industry. While the number of Focus Orchard Businesses is less than the number of apple and pear growing regions of Australia, the Focus Orchard initiative is complemented by a Monitor Block initiative that will support around 60 Monitoring Blocks across all apple and pear growing regions.

Each Focus Orchard Business should be between 15 and 50 ha in size, already have intensive systems using best practice in place on at least 3 blocks and be in a transition phase towards moving the entire orchard to intensive production.

LOCATION

The desired locations for the Focus Orchard Businesses are:

Apples: Goulburn Valley or Yarra Valley, Vic, Adelaide Hills, S.A., Stanthorp, Qld, Batlow, N.S.W., Manjimup, W.A and Huon Valley, Tas

Pears: Goulburn Valley, Vic

ACTIVITIES

Activities to be undertaken on Focus Orchard Businesses include:

Extension

- Group facilitation
- Single and multiple technology demonstrations
- Training
- Field days, orchard walks
- Case study materials

- Soil, water, plant, climate interaction management
- Labour, management, skills, planning

Research

- Instrumented monitoring of orchard
- Triple-bottom-line data analysis

Some of these activities will be supported under the National Intensification Extension Strategy funding. Others will be negotiated through partnerships with local and state extension agents, whereby they will be encouraged to use the Focus Orchards for some of their ongoing extension activities.

A matrix of possible extension activities, aligned to the Practice Change Model outlined in the National Intensification Extension Strategy follows at the end of this Appendix.

ACCESS

Most extension and research activities on Focus Orchard Businesses will be undertaken at times negotiated as suitable to the owners. The Owner must, however, be prepared for events to be fairly regular, reflecting the need to run different kinds of events and provide different kinds of messages for different target audiences or for people at different phases in their learning cycle.

Because of the way some people learn, it is also important that individuals, potentially with their advisers, family and peers, have access to the Focus Orchard Businesses at times critical to their own decision-making cycles.

This will require agreement from Focus Orchard Business owners, and protocols for such visits so as not to disrupt the normal operation of the Focus Orchard Business or interfere with the privacy of the owner.

WHAT WILL THE OWNER GET OUT OF IT?

- Mentoring support (see NEIS tactic 6) which may provide some financial assistance to recompense time owners dedicate to mentoring visitors.
- Participation in decision making in the National Intensification Extension Strategy (optional position on the Steering Committee)
- Free technical and other reports
- Immediate access to technical and other support where it benefits the wider strategy

CRITERIA FOR THE SELECTION OF FOCUS ORCHARD BUSINESSES

The following selection criteria are suggested as a minimum core set to be applied across the selection of all Focus Orchard Businesses:

1. Orchard size of a minimum of 15 ha, preferably closer to 50ha
2. At least three blocks are already grown under intensive systems (around 2,500 trees per ha)

3. The block approximates the soil, climatic, water and other natural features of the region
4. There is an enthusiastic orchard business owner willing to participate
5. A business plan, including an intensification strategy, exists and is being pursued to increase the level of intensification
6. The owner has the respect of regional orchard business owners
7. The owner is a good communicator and motivator (desirable, not essential)

MANAGEMENT OF THE FOCUS ORCHARD BUSINESS INITIATIVE

National Coordinator and National Steering Committee

The Focus Orchard Business initiative should be managed by a National Coordinator responsible for all facets of the National Intensification Extension Strategy. The coordinator should be accountable to APAL through a specific Steering Committee comprising regional representatives. An alternative arrangement whereby this process run through a company structure is outlined in the Strategy itself (under Tactic 8).

Regional Management (Orchard Business Groups)

Regional facilitators appointed under the National Intensification Extension Strategy will be responsible for coordinating activities undertaken on Focus Orchard Businesses falling within their region. Each region should establish an Orchard Business Group comprising the Focus Orchard Business owner, neighbours and other interested parties. These groups will act as focal points for discussion about intensification in the region and provide guidance on the use of the Focus Orchard Businesses and other regional extension activities to move towards greater intensification levels. Members of the Orchard Business Groups may be owners of Monitoring Blocks (see Appendix C).

BUDGET

The following budget has been extricated from the overall National Intensification Extension Strategy.

Activity	Budget
1.1 Focus Orchard Business selection	Nil
1.2 Focus Orchard Business characterization	$6,000 per orchard Total (2005-06) $42,000
1.3 Focus Orchard Business instrumentation	$40,000 per orchard Total (2005-06) $280,000
1.4 Focus Orchard Business monitoring	$80,000pa Total (2006-2010) $320,000
1.5 Focus Orchard Business events	(Embedded within other budgets)
Total budget	$642,000

Focus Orchard Business Activity Framework (an example)

Practice change cycle stage	Implications for Focus Orchards	Complementary extension activities
1. Motivation stage		
1.1 Highlight relative advantage	• Focus orchards must be selected on the basis that relative advantage can be demonstrated. The orchard owner must show that his systems have an advantage over others. • The relative advantages must be documented, possibly as a case study, and made available to all those visiting the focus orchard.	• Case studies based on the focus orchard should be incorporated into extension materials, media and other forms of communication and training packages. Each of these must clearly articulate the relative advantage of the system.
1.2 Ensure continual exposure to the opportunities created by practice change	• Focus orchard events must be varied, recognising that different people learn in different ways. To entice growers to return, a different learning experience must be offered. • Messages provided at different focus orchard events must be consistent, and repeated in many guises.	• Messages emanating from focus orchards need to be repeated through other extension methods, including bus trips and field trips to non-focus orchards, media, personal contact and training programs.
1.3 Provide a non-threatening learning environment to test if there is possible advantage	• Focus orchard events should be run in different ways that suit different individuals. In some cases this may involve hosting group discussions on a focus orchard; in others it may mean allowing private visits by a grower and his family, friends and/or adviser. • Growers themselves should be encouraged to select their region's focus orchard and be closely involved in the design of various extension activities engaging the orchard. They must have some sense of ownership over the orchard, while still respecting the owner's rights. • The owner of the orchard must be seen as credible, and preferably have a good relationship with the region's growers.	• Growers involved in focus orchard activities should be encouraged to discuss the meaning of what they see in their own good time and in ways that they feel comfortable with, away from the orchard itself. • Self-assessment tools and other simple decision support systems should be provided to growers to enable them to analyse their own situation and compare it to the focus orchard. These tools should be easily applied by growers in their own good time.

Focus Orchard Activity Framework cont . . .		
Practice change cycle stage	**Implications for Focus Orchards**	**Complementary extension activities**
1.4 Link production opportunities with either positive economic, social or environmental (or all) factors	• All benefits of a focus orchard should be documented and discussed. Key motivations should be recognised and the benefits the focus orchard has to offer in this regard should be highlighted. However, other benefits, which might be of lesser interest to a grower, should be discussed where they occur without additional effort (ie they are a side-benefit of achieving the primary objective of a grower).	• Complementary extension activities should reinforce the total range of benefits to be gained from practice changes advocated through the focus orchards.
1.5 Personal contact is required to encourage involvement	• Invitations to attend focus orchard activities should be followed up with either a round of phone calls or a round of personal visits to discuss the benefits of attending the event. • A network of growers should be established that have an overseeing role connected with each focus orchard, and these growers should be encouraged to make personal contact with potential or reluctant participants.	• The network of growers established to help oversee the activities associated with a focus orchard should be supported to have ongoing regular contact with growers across the region. • APAL may wish to consider the establishment of a mentoring network to support particular industry champions perform a personal mentoring role for others throughout the industry.

Focus Orchard Activity Framework cont . . .		
Practice change cycle stage	**Implications for Focus Orchards**	**Complementary extension activities**
2. Exploration and trialing stage		
2.1 Seeking information	• While participants at focus orchard events may only see one production system, they must be encouraged to compare it with other systems before they leave the orchard (per chance they leave sceptical, feeling like they have been provided at best a single version of what is happening or at worst propaganda.) • Extension methods used on focus orchards for people at this stage should be free of judgement. Facts about the focus orchard should be provided, and comparisons offered with alternative production methods, in particular addressing full range of benefits and the associated costs. These facts should be used as the basis for discussion and for growers to draw their own conclusions. Some guidance may be necessary, but should not be seen as advocacy of agency or personal interests. • If the change advocated is a disruptive technology, such as a change from non-intensive to intensive production systems, then information provided at focus orchards needs to demonstrate that the transaction cost of change far outweighs the cost of not-changing. Again, facts need to be provided, and growers need to discuss these and come to a logical conclusion themselves. • In addition to providing information on costs and benefits, extension material should be provided that clearly and simply draws out the steps required to reach the point at which a focus orchard has evolved.	• Focus orchard events should be complemented by extension activities held off-site (ie field days, district tours, orchard walks, publication articles etc) that enable growers to compare the methods advocated on focus orchards with alternative solutions. • These alternative events should provide space for discussion specifically enabling comparisons to the focus orchards. Significant others should be permitted to attend events together with growers.

Focus Orchard Activity Framework cont . . .		
Practice change cycle stage	**Implications for activities on Focus Orchards**	**Complementary extension activities**
	• Focus orchards should be accessible by individual growers and their family, friends and advisers at times mutually acceptable to the orchard owner, so that growers can discuss aspects of change in their own good time and the company of *significant others*.	
2.2 Gaining skills and understanding	• A diversity of material ranging from simple facts to complex technical procedures should be available for people to see, discuss and learn from. While these should always be made available, good extension staff should recognise what is appropriate for who at the right time and emphasise the key messages that move the grower along a continuum of skill development and understanding. • Focus orchards would do well to enable people to practice production techniques in situ (within the bounds of appropriateness given the season, production cycle and the willingness of the orchard owner). If the activity is seen to be a real part of the orchard's operations, all the better.	• Training activities that boost skills and confidence and are complementary to the practices advocated on the focus orchards should be provided. These training activities might be done on other orchards, or at other venues, but should make reference to what is happening on the focus orchard.
2.3 Developing a future picture	• Growers should be encouraged to set goals and envisage change on their orchard. This should not be a simple, one-off strategic planning or whole property management exercise. Rather it should be undertaken more subtly and repeatedly as growers gain new knowledge, understanding and skills. The vision of the orchard owner should be incorporated into extension devices, and be discussed openly with visitors.	• Each extension activity should draw reference to each grower's vision of a more effective orchard operation.

Focus Orchard Activity Framework cont . . .		
Practice change cycle stage	**Implications for activities on Focus Orchards**	**Complementary extension activities**
2.4 Trialing practice change	• To the extent possible, extension activities on the focus orchard should involve hands-on practice of new techniques (or at least new to the participants). • At the very least, the orchard owners activities should be logged, monitored and used as the basis of discussion at various focus orchard activities. • The results of monitoring should be compared to monitoring non-focus orchards as the basis for comparative analysis and discussion. Benefits should be identified and highlighted within three years.	• A network of small satellite trials should be established that complement the focus orchard. Although the effectiveness of a focus orchard may be diluted by attempting to demonstrate too many practices, it could provide a more macro-level context for techniques and practices aimed at very specific issues addressed on the satellite trials. • As with the focus orchards, it is important that growers be involved in selecting the locations and aims of the satellites, and have ongoing involvement in the management and monitoring of the trials and associated extension activities. • Intra- and inter-regional visits between trials should be encouraged, and information comparing results of similar trials should be made available. • While the trials should be essentially run by the growers, researchers should ensure that some simple protocols are followed that will give validity to the trials and allow for a basis of comparison.

Focus Orchard Activity Framework cont . . .		
Practice change cycle stage	**Implications for activities on Focus Orchards**	**Complementary extension activities**
3. Orchard practice change stage		
3.1 Providing peer support and encouragement	• Activities associated with 1.5 and 2.1 are pertinent here. That is, it is important to establish a network of growers associated with each focus catchment, and to enable them to have an ongoing role in eliciting the support of other regional growers. • It is also important that growers' *significant others* are provided the opportunity to participate in key events.	• Again, activities associated with 1.5 and 2.1 are pertinent here, and should be established for the long-haul.
3.2 Ensuring effective answering of questions	• At the same time as establishing a network of focus orchards, it will be necessary to establish a network of researchers and extension practitioners intimately involved in the activities of the focus orchard. • This network of researchers extension practitioners should also be involved in the monitoring and comparative analysis activities associate with the network of focus orchards and trials so that they deal with questions not just associated with their own regional sites. This will also enable them to facilitate discussion about alternative solutions and results associated with activities not dealt with on the focus orchards. • A network of grower mentors should also be trained and accessible to answer growers' questions.	• A range of mechanisms should be established that enable growers to voice their questions, and have them heard and responded to. This might include space dedicated to this purpose within industry journals and newsletters, an email-based discussion network (the effectiveness of which will depend on the moderator) and time made available at each and every extension event.

Focus Orchard Activity Framework cont . . .		
Practice change cycle stage	**Implications for activities on Focus Orchards**	**Complementary extension activities**
3.3 Developing a supportive structure between growers, researchers and extension agents	• The grower, researcher and extension practitioner networks previously discussed should have a regular forum enabling them to share their experiences across regions and focus orchards, participate in the management of cross-focus and trial orchard activities, such as comparative analyses, and to develop a camaraderie essential to building a new and more dynamic industry in the face of a rapidly changing environment.	• The various networks associated with the focus and trial orchards should be exposed to wider market and supply-chain considerations, through formal and informal interaction with non-grower industry representatives. Involving these representatives in various extension activities complementary to focus orchard activities would be highly valuable where supply chain issues are crucial.

APPENDIX C: MONITORING BLOCKS

PURPOSE

Monitoring Blocks aim to enable orchard businesses to compare different apple and pear production methods at varying levels of intensification as a means of assessing the costs, benefits and implications of change.

The Monitoring Blocks will play an important role in moving the apple and pear industries towards intensification by:

- Enabling comparisons to be made between blocks of different intensification (seeing the proof)
- Demonstrating that there is more than one way to achieve higher density blocks (offering options)
- Providing an opportunity for orchard businesses to assess their performance against others as they move towards intensification (reinforcing practice change)
- Provide a variety of focal points beyond the Focus Orchards to discuss intensification management practices (peer support)

NUMBER AND SCALE

This strategy will initially support up to fifty Monitoring Blocks in the apple industry and ten Monitoring Blocks in the Pear industry. Preferably there would be at least five Monitoring Blocks per region. Should additional orchard businesses want to participate, they should be encouraged to do so, as an important part of extending the peer support network and providing a greater database for comparing alternative systems.

Each Monitor Blocking should be approximately 2ha in size. It is important that in each region blocks cover a range of intensities (<1200 trees per ha, 1,200- 2,000 and >2000), although the more blocks at the higher intensity scale the better.

LOCATION

Monitoring Blocks should be selected in all regions of substantial apple and pear production, although orchard businesses from smaller areas should not be precluded from participating should they choose to do so. They should be existing commercial blocks.

ACTIVITIES

The primary activities associated with Monitoring Blocks include:

- collection of production and management data from all participating blocks
- storage of the data within a single, accessible data base (subject to anonymity provisions)
- professional analysis of the data enabling comparisons to be made between different blocks according to intensification and management regime
- provision of tailored reports to participating orchard businesses
- facilitation of discussion groups comparing results.

Other activities that can be undertaken on Monitoring Blocks include activities that complement and reinforce the Focus Orchard initiative. This may include using Monitoring Blocks for:

- group facilitation
- specific technology demonstrations
- field days, orchard walks
- case study materials.

ACCESS

An important element of the process of making comparisons is seeing the participating blocks in person, and not simply comparing data associated with them. As such, it will be important that orchard business owners have the opportunity to visit participating blocks either as part of facilitated events or individually (potentially with their advisers, family and peers). Monitoring Block owners, therefore, must be prepared to have their blocks scrutinized at times convenient to all parties.

As with the Focus Orchards, this will require protocols for visits so as not to disrupt the normal operation of the Blocks or interfere with the privacy of the owner.

WHAT WILL THE MONITORING BLOCK OWNERS GET OUT OF IT?

- Free analysis of their data for the initial years of the strategy
- Free technical and other reports
- Immediate access to technical and other support where it benefits the wider strategy

CRITERIA FOR THE SELECTION OF MONITORING BLOCKS

The following selection criteria are suggested as a minimum core set to be applied across the selection of all Monitoring Blocks:

1. Block size of approximately 2 ha
2. The block approximates the soil, climatic, water and other natural features of the region
3. There is an enthusiastic orchard business owner willing to participate.
4. The orchard business owner is willing to enter into reciprocal visiting right arrangements with other orchard businesses.

EXAMPLE MONITORING BLOCK DATA-SETS

Initial background (characterization)

- owner details, property size, block size and location
- physical characteristics such as soil type, topography etc
- block and orchard history, including management regime,
- tree density, type, planting system etc
- irrigation / water management
- photographic identification
- financial (where possible) including establishment costs

Annual data collection

- financial – yield, output to packhouse, packing cost

- financial – recovery and returns
- financial – income
- financial – expenses, pruning, training, thinning, harvesting, freight, packing, packaging, storage, labour, management etc
- physical – photographic
- physical – TRA and TRV, canopy dimensions etc.

It is important that the National Coordinator, steering committee and regional groups have a role in finalizing the required data-sets so as to maximize ownership.

It is recommended that a core data-set be established for all participating Blocks. Should specific regions want to collect data beyond the core set, this should be done so at local cost (including costs covering additional analysis and reporting).

MANAGEMENT OF THE MONITORING BLOCK INITIATIVE

National Coordinator and National Steering Committee

Together with the Focus Orchard initiative, the Monitoring Block initiative should be managed by a National Coordinator responsible for all facets of the National Intensification Extension Strategy. The coordinator should be accountable to APAL through a specific Steering Committee comprising regional representatives.

Regional Management (Orchard Business Groups)

Regional facilitators and regional orchard business groups will be responsible for coordinating activities undertaken on Monitoring Blocks falling within their region. The orchard business groups will, in addition to their responsibilities in respect to the Focus Orchards, act as focal points for discussion regarding comparisons of data between blocks and regions.

Data Analysis and Report Preparation

A project should be publicly tendered to provide the following services:

- Coordination of annual collection of production and management data from all participating blocks
- ongoing management of the data
- development of a web-based system of accessing data, including capability for data comparison
- professional analysis of the data supporting comparisons to be made and reports to be prepared
- provision of tailored reports to participating orchard businesses
- provision of an overall summary report.

The project leader should be accountable to the National Coordinator and establish close links to the regional facilitators.

BUDGET

The following budget has been extricated from the overall National Intensification Extension Strategy.

Activity	Budget
2.1 Monitoring Block selection	Nil
2.2 Monitoring Block characterization	$1,500 per orchard Total (2005-06) $90,000
2.3 Establishment of Monitoring Block Database and website	Total (2005-06) $100,000
2.4 Coordination of Monitoring Block project	$80,000pa Total (2005-10) $400,000
2.5 Monitoring Block events	(Embedded within other budgets)
Total budget	$590,000

APPENDIX D: MONITORING AND EVALUATION FRAMEWORK

NATIONAL INTENSIFICATION EXTENSION STRATEGY MONITORING & EVALUATION FRAMEWORK							
BENNETT'S HEIRARCHY ACTIONS/OBJECTIVES	**INDICATORS OF ACHIEVEMENT**	**CUMULATIVE TARGETS**					**MEANS OF VERIFICATION**
		Jun 06	**Jun 07**	**Jun 08**	**Jun 09**	**Jun 10**	
1. The National Intensification Extension Strategy supports projects against each of the Strategy's tactics.	i. Number of focus orchards selected and characterised	7	7	7	7	7	Orchard characteristics documented
	ii Number of Monitoring blocks selected and characterised	30	60	>60	>60	>60	Block characteristics documented
	iii. Number of state-based regional facilitators contracted	6	6	6	6	6	Contracts in place
	iv. Communication plan written and revised annually	Committee approval	Committee approval	Committee approval	Committee approval	Committee approval	Committee approval
	v. Training manual in preparation	Completed	In use	In use	In used	In use	Manual documented. Courses running (see Action 3)
	vi. Number of mentors supported		12	12	12	12	Activities documented
	vii. Number of Focus Orchards used as sites for R&D		6	6	6	6	R&D activities documented
	Best practice guidelines contracted		Completed	1000 distributed	2000 distributed		Guidelines documented, and distribution list sited
	viii. National coordinator contracted	Appoint-ment made	Meets annual appraisal	Meets annual appraisal	Meets annual appraisal	Meets annual appraisal	Contract in place and appraisals sited
2. National Intensification Extension Strategy projects demonstrate intensive orchard systems that, if adopted, would meet the targets of the Strategy.	i. Number of sites demonstrating the benefits of intensification	>20	>30	>40	>40	>40	Activities documented in an annual report
	ii. Cumulative number of orchard businesses participating in intensification activities	50	300	600	1000	1500	Database of participation and survey outputs
3. National Intensification Extension Strategy projects improve orchard business owners' knowledge about the requirements of intensive orchard systems, and increases the skill level of the businesses to enable them to affect change.	i. Cumulative number of orchard businesses reporting increase in intensification skills and capacity	30	200	500	800	1300	Annual survey
	ii. Cumulative No of orchard business owners having undertaken accredited training	30	150	400	600	1,000	Database of participation and survey outputs

NATIONAL INTENSIFICATION EXTENSION STRATEGY MONITORING & EVALUATION FRAMEWORK							
BENNETT'S HEIRARCHY ACTIONS/OBJECTIVES	**INDICATORS OF ACHIEVEMENT**	**CUMULATIVE TARGETS**					**MEANS OF VERIFICATION**
		Jun 06	**Jun 07**	**Jun 08**	**Jun 09**	**Jun 10**	
4. National Intensification Extension Strategy projects contribute to trialing of practice change on participating orchards pointing towards more increased adoption of intensive orchard systems across Australia.	i. Cumulative No. of new orchard businesses trialing intensive orchard systems on at least one block (over and above existing orchard businesses involved in intensive systems)	20	150	400	600	1,000	Database of intensive systems monitoring
5. Adoption of intensive orchard systems that meet the targets of the National Intensification Extension Strategy and the individual aspirations of apple and pear orchard businesses.	i. Cumulative No. of new orchard businesses that have moved permanently to intensive orchard systems on multiple blocks (over and above existing orchard businesses involved in intensive systems) .	10	100	300	500	900	Database of intensive systems monitoring