Potato Australia

PUBLISHED BY THE AUSTRALIAN POTATO INDUSTRY COUNCIL

VOLUME 14 SEPTEMBER 2003 ISSN 1036–8558

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Our cover photo was shot at Bruce Ure's potato property at Gembrook in Victoria. Many thanks to Bruce, friend Julian Dyer and niece Tina Pantorno who braved near freezing conditions for at least three hours to help us set up and conduct the shoot. Thanks also to Diana Wolfe and Bruce Sanders, our talent, who donned scanty evening wear despite the weather and still managed to keep good humour throughout!

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Potato Australia

Australian Potato Industry Council

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APIC report

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Chairman
Australian
Potato Industry
Council

Roger Kirkham
has retired

I don't need to remind anyone how tough the past 12 months have been on the potato industry and Australian agriculture in general.

The water debate has strengthened dramatically with increasing demands for water from agriculture, industry and the environment, all wanting their share of a (currently) diminishing resource. Let us hope governments will see reason with equitable water sharing plans implemented for all.

Although many areas along the eastern seaboard have received substantial falls, little rain has fallen in the catchment areas of our major dams with some areas receiving little or no rainfall.

For those with sufficient water allocation to at least grow a crop, the last six months has seen some of the highest market prices for ware potatoes over the past decade. For many growers these prices reflect the effort required to produce the crops this year and hopefully offset some of the pain from last year, when many crops produced only marginal returns.

Without doubt, the next 12 months will be harder again if significant rainfall does not occur over our agricultural lands during winter and spring.

On a brighter note, and being the eternal optimist, there are signs El Nino is over (at least for the time being) and there is the prospect of at least average rainfall occurring over most areas.

Potato R&D Committee

The last 12 months has seen the formation of the new Potato Industry Advisory Committee responsible for allocating the potato levy money for research and development. Separate fresh and processing subcommittees are responsible for allocating funding from their respective industry sectors.

This new format should result in a more equitable distribution of funding into research projects of high priority to the industries contributing to the levy.

As a result of the restructure, the Potato Processors Association of Australia has agreed to continue to contribute its current level of funding subject to an annual performance review.

An important research project completed over the last 12 months determined whether the $15 million of R&D investment over the past 10 years from the potato levy was worth the investment. A summary of the project report, Shareholder value from *Australian levy-funded potato research and development*, is provided in this issue and is well worth the time to read. Determining which areas of research have provided the greatest return on investment in the past can help guide future allocation of funding to ensure the best possible outcomes for all contributors. Notable research projects that provided significant returns on investment included work on Integrated Pest Management, Cadmium, Potato Cyst Nematode, Potato Quality Assurance programs and some targeted industry development programmes such as the Victorian Potato Crisping Research Group extension and R&D project.

World Potato Congress

A large contingent of Australian potato producers, processors, researchers and merchants were preparing to attend the World Potato Congress to be held in China in April. Unfortunately, due to the outbreak of Sudden Acute Respiratory Syndrome (SARS) across the region, the congress was postponed. The World Potato Congress is a marvellous forum for potato industry personnel across the globe to come together to discuss the latest developments within our industry. Australia is not a large player in the global industry and its remoteness often makes travel to other larger potato producing countries difficult. The 2003 congress was to be a great opportunity for Australians to network with international colleagues, glean information and make our presence felt in the international community.

International travel restrictions on countries such as China have now been lifted. The Chinese congress organisers are now seeking to hold the congress in March 2004. Should the congress be successfully rescheduled I would encourage as many industry people as possible to attend.

Retirement of Roger Kirkham

It is with regret that we learned of Roger Kirkham's retirement from the Victorian Department of Primary Industries. Roger has served the Australian potato industry well during his long career. Roger successfully bred a number of lines of potatoes that have been used throughout the industry eg. *Wilstore, Wontscab, Dawmor, Riverina Russet, Shine* and *Ruby Lou*, just to mention a few. To have delivered such successful varieties considering the limited funding available in Australia (relative to some of the larger overseas programs) is a credit to his ability, dedication and focus on the requirements of our local industry. Roger will be sorely missed and on behalf of the entire Australian potato industry I want to thank him for his past contributions and wish him well in his future endeavours.

APIC

The Australian Potato Industry Council represents all members of the Australian potato industry and includes growers, merchants and processors on the council. Should you feel the council needs to address any issue that impacts on the industry I would encourage you to make the issue known to either your state industry representatives to raise with their national bodies (i.e. Ausveg, Merchants Association, Potato Processors Association) or contact a council member directly. Remember, your representative body can only function effectively if its members are fully informed on issues that impact on the Australian potato industry. The future is in all of our hands.

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Levy funded research - changes

It has been year of change in the management and direction of the potato R&D program.

In mid 2002 we commissioned a review of the outcomes from levy-funded projects to benchmark our R&D progress. The review highlighted some very impressive results. The financial, environmental and social benefits from the levy investments have been, and will continue to be very positive for the potato industry. An article on the review from Jeff Peterson and Bob Batterham is on p18.

The majority of projects showed good return on investment. If you'd like your own copy of the review, PT02033 '*Review of potato research & development program*', please contact publications@horticulture.com.au.

A summary of the report, which contains an economic evaluation of the outcomes of selected programs within the potato levy over the last ten years, can be found on the Horticulture Australia website, www.horticulture.com.au.

A high priority is placed on transferring results from the R&D program; to this end, information on the outcomes of levy-funded R&D projects is available through several publications. Outcomes and progress on levy-funded work is published in *Potato Australia*, as are recently completed final reports. *Eyes on Potatoes* also lists final reports as they become available. We are compiling a booklet on the outcomes of levy-funded research since the inception of the R&D program. We will distribute the booklet to all levy payers.

Another important development this year was the formation of the potato Industry Advisory Committee (IAC) and its two sub-committees (Processing and Fresh) which have replaced the Potato R&D Committee. Each sub-committee has its own budget based on levy receipts, which creates a more equitable situation. This means that if the Fresh Sub-committee chooses to spend money on market development it will not affect the Processing Sub-committee. Both sub-committees have met separately to refocus their R&D priorities and to plan a strategy to achieve the desired outcomes.

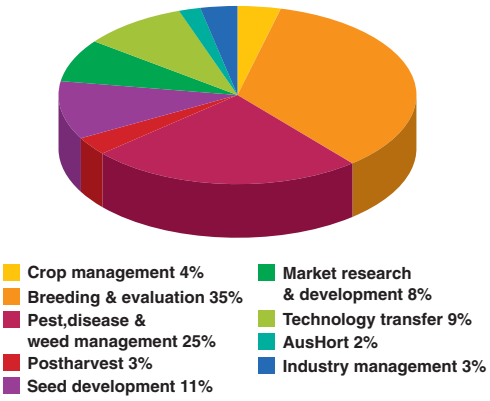
The aim of the Processing Sub-committee is to tackle fewer research areas and put more resources into the highest priority areas. Where necessary, teams will be formed to provide the breadth of expertise required to do the job. (See the article - *New direction for research - IAC Processing Sub-Committee*, p17).

The priority for the Fresh Sub-committee is market development. The unfortunate fact for the fresh market industry is that it is facing increasing competition from pasta and rice and is losing ground in its share of carbohydrate food purchase, which has declined in Australia dramatically from 49% in 1984 to 23% in 2002. That is, from 39kgs per person in 1979 to 27kgs per person in 2002.

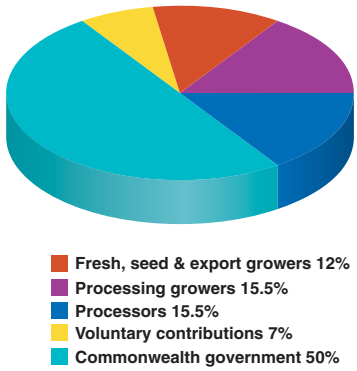
At the time of writing, the Fresh Sub-committee was establishing a steering group to examine the alternatives to halt the slide in rate of consumption of potatoes. This process will require coordination and cooperation not only from growers, but also from the whole fresh market chain.

How the levy money was spent in 2002/2003

Please note this chart represents spending in the past financial year. This differs from last years' chart that provided estimates of spending for the coming year.



Source of funds for projects in 2003/2004



The IAC will continue to meet as one entity to consider issues of common interest.

The majority of IAC funds will be allocated to the soil health, TSWV, and PVS, X & Y (Processing) and market development (Fresh) priorities, however, funds will also be set aside for the breeding program, communications, a reserve fund for emergencies or unforeseen needs, and to develop an emergency response plan for the new strain of late blight – see the article by Tony Pitt and Trevor Wicks on p8.

The Breeding and Evaluation program has undergone a number of changes. The second article in a series on the changes can be found on p12. Roger Kirkham, recently retired as the potato breeder for DPI Victoria, and Tony Slater was appointed to the position. Roger made a major contribution to the program; we thank him for his efforts and wish him the very best for the future. Breeding is a long-term investment and Roger and his team have provided a solid foundation for the industry.

In this issue we have included a financial report of the R&D levy income and expenditure (see p19). Note that some of this available funding has already been allocated.

The annual potato levy payers meeting will be held on November 17 in Sydney (see ad on p23). This meeting gives levy payers the opportunity to receive information and put questions to the managers on the way their levy is spent and the R&D program. This will be a productive and informative session.

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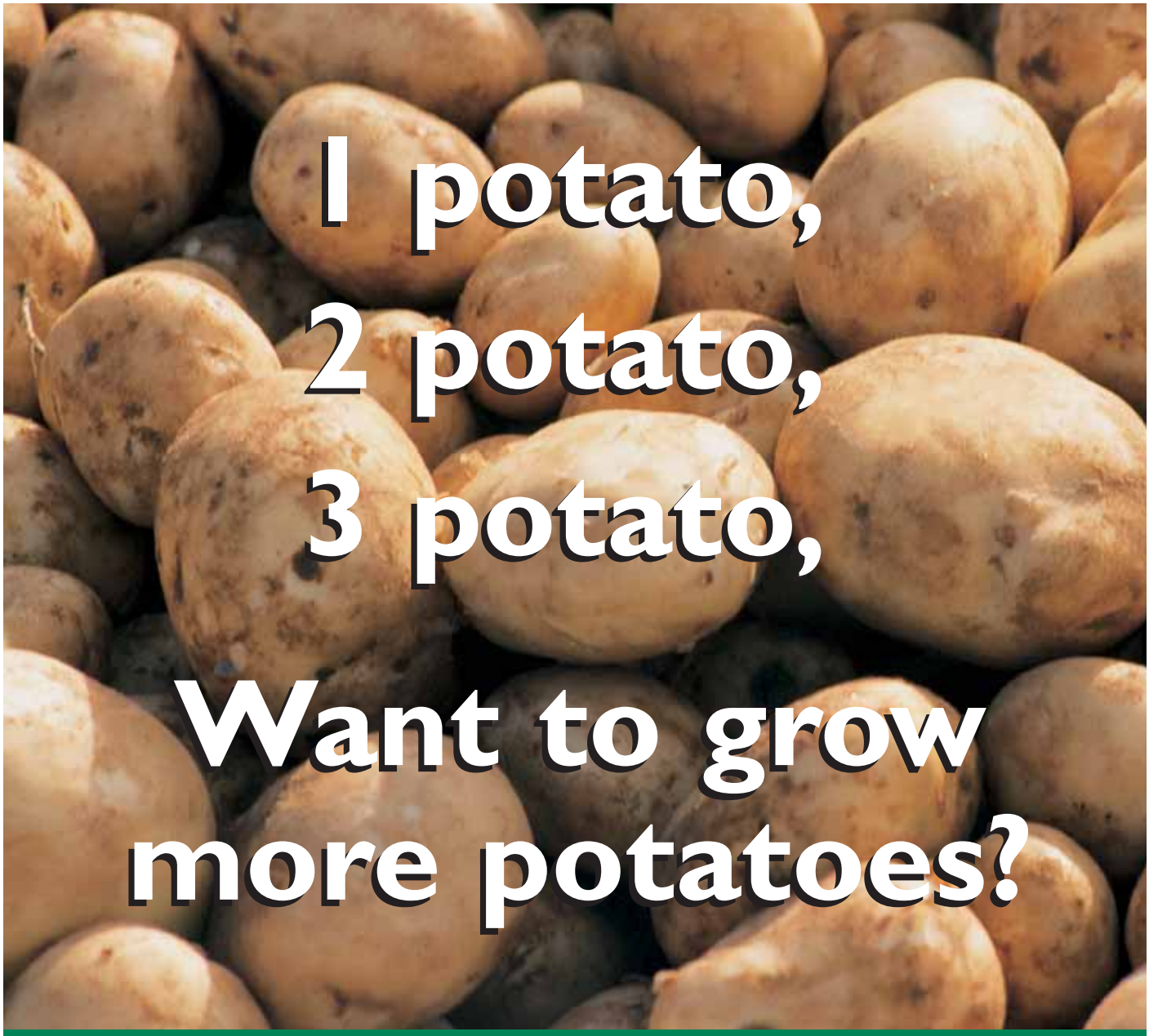

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Late blight devastates PNG Potato Industry

An outbreak of a highly virulent strain of late blight in Papua New Guinea has devastated their potato industry.

Defoliation has been so rapid that crops only three weeks old are showing 50% loss of leaf cover and will fail to produce tubers of marketable size. The disease is apparently spreading via air currents and has moved across the entire 500 km length of the highland valleys in less than 12 months. This strain of late blight attacks stems and petioles of plants as well as leaflets, causing plants to wither and collapse quickly. Prior to 2002/03, PNG was thought to be free of late blight.

Although tests are still in progress, it seems the PNG's strain of late blight differs from the existing strain prevalent in Australia. Australia is one of the few countries with the original and somewhat degraded strain of *Phytophthora infestans* dominant prior to 1990. The most notable feature of the PNG epidemic is the lesion development on stems and petioles. The Australian strain only seems to attack leaves. In PNG the fungus is attacking the plants at a very early stage of growth, which suggests there is no inherent juvenile resistance to the disease. It also appears there is a rapid explosion in disease pressure once the disease commences within a crop. US studies suggest the new strains can travel several hundreds of kilometres on air currents and can complete the life cycle from spore to fungal lesion to sporulation, in just 72 hours.

Rapid spread

The first confirmation of late blight in PNG potatoes was in Enga Province, in January 2003. Prior to this, the disease was unknown within the country. Initially, there was some uncertainty as to the reason for rapid haulm death and defoliation of the crops in Enga Province. However, pathology services soon confirmed the presence of the causal organism, *Phytophthora infestans*. The disease spread quickly from West to East across the highlands, with the first reported cases in the Western highlands province in late February 2003. By the end of April 2003, the disease had spread to the Eastern highlands province. Anecdotal evidence suggests the disease may have been present in Upper Sepik prior to 2003. Reports from farmers in the Telefomin and Oksapmin valleys of the Star Mountains indicate potato crops mysteriously died in mid 2002. It seems the disease may have been present in the Upper Sepik for at least 12 months and took time to find a path across the physical barrier of the Strickland Gorge, which separates the Star Mountains from the major highland provinces.

This PNG crop, devastated by late blight, is only three weeks old and yet is almost fully defoliated

Difficult management

Containment and management of the disease in PNG will be difficult. Copper based sprays every five days from just after emergence and for the life of the crop will control PNG late blight, but missing even one or two sprays in this program can provide an opportunity for the fungus to take hold and destroy the crop. Applications of Ridomil, which provide excellent control of late blight in Australia, are not an option in PNG, as the strain appears resistant to metalaxyl, Ridomil's active ingredient. Most PNG potato farmers have not had to spray in the past, and are confronted with one of the most difficult diseases to manage with chemical. The environment works against the farmer, with conditions suitable for infection year round. A major research and extension program is underway, looking at other possible chemicals, cultivar resistance, spraying methods and cultural control, but the answers are long term. In the meantime, the road ahead for the PNG potato industry is going to be a tough one.

Serious implications for Australia

The implications for Australia are significant. Australia is the only continent in the world that is not affected by one or more of the new highly virulent strains of late blight. We already have the A1 mating type and if we accidentally import the A2 mating type we could be confronted with a constantly changing and adapting fungus. **Although not yet confirmed, it appears highly probable this outbreak in PNG is due to one of the new, highly virulent A2 mating types.**

Late blight fungus attacking stems and petioles as well as foliage (the Australian strain only attacks foliage and is less destructive than the new, highly destructive strain that has hit PNG)

Realistically, it is more a matter of when the new and improved strains of late blight come to Australia, rather than if. What we can learn from PNG is that when it does occur, it will potentially move very quickly and the devastation could be severe. A prudent approach may be to develop a contingency plan to contain any outbreak. This would include isolation and quarantine with restricted seed movement from infected areas, and importing cultivars with some level of field resistance.

The authors would like to express their sorrow for the PNG farmers. These high altitude farmers are extremely resource poor by our standards, and they depend on potatoes to provide income for their basic needs. It is cruel fate that such a destructive disease should affect those who initially had so little and are so vulnerable to such devastation.

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Choosing the best irrigation system

Choosing the best irrigation system is not that simple. However, following some basic principles that take into account input costs, crop performance and a range of external factors, can make a crucial difference to the bottom line.

Take home messages

There is no 'best' choice, no 'one size fits all' solution to selecting an irrigation system. Individual producer's input costs, crop water use and yield, anticipated price range, and access to water supplies and potential markets affects the economic performance of an irrigation system. Do the sums, either on your own, or with some professional advice, and sort out the answers for your farm.

There are a couple of general principles however:

1. High technology, high yielding, expensive, agronomically water efficient irrigation systems such as drip, are favoured by:
   - high produce prices
   - high water prices
   - water trading and/or a regulated water system
   - water scarcity
   - good market opportunities.
2. Poor crop performance has a greater impact on farm profitability than any advantages from different irrigation systems.

A simple choice

Outsiders often consider that if producers know how much irrigation systems cost to run, how efficient they are and what sort of yields they can deliver, comparing and choosing the best system should be straightforward. Wrong!

Farmers are people too

Firstly, producers are individuals and apart from economics, are also influenced by management (for example ease of operation, linkages with other practices such as fertigation, system reliability), or even lifestyle issues (for example who enjoys staying up all night to shift pipes or irrigators?).

Even if we select an irrigation system based on economic performance, profitability is highly affected by external factors, such as availability of water or market opportunities.

External influences drive economics

The following hypothetical examples demonstrate some principles and processes influencing selection of irrigation systems. Simple economic analysis identifies how sensitive profitability in potato production is to a range of input, crop performance and external factors.

Mick and Sarah's farm

In our example, Mick and Sarah have just taken over 35 hectares of cultivation in the Fassifern Valley in southern Queensland. Their water allocation of 120 ML is sufficient for their spring potato crop and they can sell everything they grow. With sufficient travelling irrigators to water 35 hectares they estimate they'll use about 3.4 ML/ha of irrigation to produce 28 t/ha of marketable potatoes.

Sarah has done some research and suggests that by investing an additional $1400/ha in drip irrigation they might be able to increase yields to 34 t/ha and at the same time drop irrigation needs to 3.1 ML/ha.

Experimentalist, Angelina Gilbert, checking potatoes from a drip irrigated block before harvesting.

Which irrigation system is best?

The sprinkler system produces 8.2 tonnes of potatoes per ML of irrigation. The drip irrigation has better agronomic water use efficiency at 11 t/ML. Does that mean Mick and Sarah should invest in a drip operation? This depends on the potato price. In this analysis, I calculated the gross profit (revenue minus variable costs) using a standard Queensland potato gross margin, and change the yields, water use and irrigation investment according to the systems described above.

In this scenario, our producers grew potatoes on all 35 ha. At a market price of $350/t, the overhead sprinkler system generates a gross profit of $68,000. At that potato price, the drip system (gross profit $56,000) was not as profitable as the overhead irrigators, even though the drip produced nearly 210 t more potatoes over the 35 ha.

However, as the potato price increases, the higher yielding drip system becomes more profitable, and eventually more so than the sprinkler system, as shown in Figure 1. Looking at the graph, it is evident that the drip is more profitable than the sprinklers at a potato price of about $420/t; the breakeven price.

The 'best' system therefore is determined by produce prices, as well as the obvious factors like irrigation efficiency and yields. But wait, there's more…

Water restriction

The drought has reduced Mick and Sarah's water allocation to 90 ML/ha. Now they can only grow 26 ha under the overhead sprinklers, compared to 29 ha under the drip. The lower yields and restricted planting area with the less water efficient sprinkler system means total potato production is down to 741 tonnes, compared to 987 tonnes under drip. With potatoes worth $350/t, the sprinkler system is still more profitable ($51,000) than the drip ($46,000), however the breakeven price is now only $375/t – any prices greater than that the drip is more profitable. For example, if the drought has resulted in a shortage of potatoes and they are selling at $700/t, the drip system generates $71,000 extra profit than the sprinkler system in the same scenario.

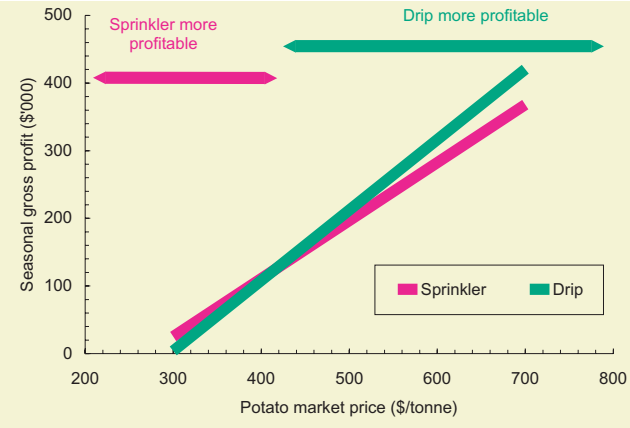
Restricted market

What if the drought has broken and our producers have plenty of water and land, but because of increased volumes of potatoes being grown in the area, can only rely on selling 900 tonnes? In such a circumstance, if the yields, water use and costs of drip irrigation stay the same, they are always around $25,000 better off using sprinklers rather than the drip system, irrespective of the price of potatoes.

A real scenario

The previous examples were hypothetical.

At Gatton Research Station in 2002, a sprinkler irrigated potato block and a drip irrigated potato block were grown side by side. Because of the impact of ongoing drought on bore levels, and several periods of extensive windy weather, the Research Station manager had difficulty keeping irrigation up to the sprinkler block. It received 3 ML/ha of irrigation, but only yielded 20 t/ha. Since the weather and low pump flow rates did not greatly impact the irrigation using the drip, it was possible to supply 3.3 ML/ha of irrigation and achieve 34 t/ha of potatoes.



Greater yields from investment in drip systems pay off at higher potato prices.

In this result, the poor yields of the sprinkler block meant it was always less profitable than the drip block, irrespective of what assumptions were made about potato prices, or whether water or market availability were restricting factors.

Using the actual potato price at the time of harvest ($580/t), one hectare of our drip irrigated potatoes generated $8,400 profit, compared to $4,900 from the sprinkler-irrigated block.

Conclusions

The 'best' irrigation system can only be determined by understanding input costs, crop water use and yield, product price range, and access to water supplies and potential markets. In economic comparisons, substantial investments in irrigation are most worthwhile if they generate high yields, water and produce prices are high, water is scarce and there are good markets for the additional produce. Profitability is very sensitive to poor crop yields under any irrigation system.

The Rural Water Use Efficiency Initiative of the Queensland Government has generously supported our irrigation research and extension program.

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Breeding, evaluation and commercialisation – how it will work

Changes to the national breeding and evaluation program have come into effect. This is the second article in a series that talks about the changes to the program and what it means to industry.

The first article appeared in the June edition of *Eyes on Potatoes*. This article starts to look at the changes in more detail and then focuses on how the evaluation and commercialisation process will work for processing. December *Eyes on Potatoes* will outline the process for fresh potatoes.

The program is split into two:

- Breeding
- Evaluation and commercialisation

Breeding

The breeding program remains largely unaltered. The Department of Primary Industries Victoria (VIC DPI) carries out the breeding at Toolangi on behalf of the Australian potato industry. It is funded by VIC DPI and the levy system through Horticulture Australia. Breeding is deemed to include all generations up to and including Generation 3 (G3).

Evaluation and commercialisation

The big changes occur in the evaluation and commercialisation stages of the program.

One of the main reasons for reviewing the breeding and evaluation program was the need to strengthen it and make it more market driven. The need for this change was reinforced by the review of the levy system that clearly indicated the program's potential to provide significant benefits for the industry, but only if there was strong market leadership. This will involve companies or groups taking responsibility for the direction and outcomes of the program.

Companies or industry groups will now carry out the evaluation and commercialisation of new varieties. The work may be done by the company or industry group who has licensed the variety or by sub-contracted specialists, such as the breeding group at VIC DPI, evaluators in the State Departments or private agronomists. There are many possible options for putting together the necessary expertise.

To fund this stage, companies and groups will be able to apply for Voluntary Contribution funding from Horticulture Australia.

The arrangements for processing and fresh variety development differ so they will be discussed separately. The following arrangements have been agreed, but may change as time progresses. Any changes will need to be agreed to by the relevant committee overseeing the program - Potato Processors Commercialisation Committee or the National Evaluation & Commercialisation Committee for the Fresh Potato Breeding Program (FNECC).

Processing

Potato processing in Australia is dominated by four large processors – Arnotts, Frito-Lay (Smiths), McCains and Simplot. The processors wanted the opportunity for exclusive rights to varieties and several of the companies also had the capability to carry out their own evaluation. The process agreed reflects the needs of the large processors who contribute most of the levy but also recognises there are a number of smaller processors who may wish to participate.

Existing breeding material from the old program

There are potential commercial varieties within the program at G3 or post G3 developed under the old arrangements so these will be treated differently to new lines coming through the system.

In June/July the companies made a decision as to which lines they wanted to take for evaluation. The companies then entered into a non-exclusive license with VIC DPI to evaluate the chosen lines for two years. If both major French fry companies or both major crisping companies are interested in the same line, seed material is shared equally. If only one company is interested in a line it gets all the seed.

After evaluation, the companies will submit proposals to VIC DPI/Horticulture Australia for commercialisation. These will be accepted or rejected. If only one company is interested in a license then the licence granted will be exclusive. If two companies are interested then a non-exclusive license is granted.

Varieties for which licenses are granted must be "reasonably " progressed to commercialisation otherwise the license can be revoked. There will be performance criteria to be met and reasons will need to be given for dropping varieties.

New crosses and lines

Under the new system, companies will work with the breeder and approve any new crosses based on their needs. The germplasm for the new lines will be kept separated for each company. Until and including G3 the breeder will continue to select out the best lines from the crosses based on the companies needs. The companies will then evaluate the lines after G3.

During the evaluation phase promising varieties will either be chosen for commercial use by the company or become an 'orphan'. Any orphans become the property of VIC DPI/Horticulture Australia and can be commercialised by VIC DPI independently of the companies and without further reference to them.

For those varieties selected for commercial use the companies will enter into a commercialisation agreement with VIC DPI that involves the payment of a royalty that will be used to support the operation of the breeding program.

The costs of the program up to and including G3 will be paid for through the levy system as part of the breeding program and the costs of evaluation after G3 will be funded through Voluntary Contribution projects.

Allocation of crosses

The total number of crosses paid for by the levy is 20,000. The split between French fries, crisping and fresh is based on the levy contribution. If the French fry industry contributed 80% of the total levies then there would be 16,000 lines used for French fries.

If companies felt that the eventual program they would have was too small, they could top it up with a Voluntary Contribution project to get the size program they need.

A small proportion of the French fry and Crisping lines would be reserved for the small processors.

Smaller processors

Small processors will also have the opportunity to participate under the new system. The term small processors also include groups growing processing potatoes for export.

Existing lines from the old program

Small processors can participate as if they were a major processor on the understanding that they must fund the evaluation and evaluate the lines to the agreed protocols. They also have the opportunity of obtaining Voluntary Contribution funding from Horticulture Australia.

New crosses and lines

Small processors would be able to establish their own breeding program on the basis that they fund the evaluation. Again, they could obtain Voluntary Contribution funding support.

Small processors would not be able to access lines rejected by the company programs.

Management of the program

The management of the evaluation and commercialisation of new varieties will be carried out by individual processors under the guidance of the Potato Processors Commercialisation Committee.

The committee has been involved in setting up the initial arrangements and handling any issues with the move from the old to the new program. Once these tasks are completed the main activities of the committee will be to focus on:

- New technologies
- Levy arrangements
- Budget issues such as the share of the crosses available to each company

The committee comprises:

- Horticulture Australia Program Manager (Chair)
- Horticulture Australia Commercialisation Manager
- Representative from each of the major processors
- Grower representative associated with each of the major processors
- Department of Primary Industries, Victoria representatives

For small processors who want to investigate participating in the program contact Russell Sully, Victorian Department of Primary Industries, on (03) 9210 2222 or email Russell.Sully@dpi.vic.gov.au.

JONATHAN ECCLES
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Breeding process

The levy program will fund the production of 20,000 seedling lines for screening and evaluation each year. From a gene bank of introduced and improved varieties and breeders' lines maintained at Toolangi, the most promising parental combinations are used to produce this hybrid seedling population.

The process starts in the glasshouse. Pollen from one plant, for example a particular variety that may have resistance to target spot, is transferred to the stigma (female flower part) of another plant, say an established variety such as *Sebago*. The aim in this instance would be to produce offspring that have the characteristics of *Sebago* with some target spot resistance. This is simple in theory but much more difficult in practice as often neither the resistance nor the desired characteristics of *Sebago* are carried through to the next generation.

Botanical seed (sometimes referred to as true seed) derived from the various crossings is planted out in the glasshouse and from each seedling one tuber is harvested for field planting at Toolangi as a single plant plot. This is the first field generation (G1) where each plant is unique, each representing a potentially new variety.

Based on foliage and tuber characteristics only, approximately 10% of G1 are selected at harvest for further multiplication the following year. This is the second field generation (G2) where each individual seedling tuber plant from G1 is now a plot of up to 40 plants. Again at harvest approximately 10% of this G2 population is selected for further multiplication based again on foliage and tuber characteristics but also on cooking quality and reaction to disease. This multiplication is the third field generation (G3) where selected lines from G2 are grown in replicated trials and seed plots at Toolangi.

The best G3 lines will be offered to relevant organisations for further evaluation and eventual licensing and commercialisation.

Horticulture Australia

Your Levy @ Work

Horticulture Australia Potato R&D Levy Projects for 2003- 2004

Project title	Chief investigator	Phone	Page
Review of the Potato R&D Program	Jeff Peterson Agricultural Supply Chain Services	02 9489 7949	18
Crop management			
Coordination of the National Cadmium Minimisation Strategy	Dr Daryl Stevens, CSIRO Soil and Water	08 8303 6700	30
Factors affecting specific gravity loss in crisping potato crops in Koo Wee Rup, Victoria	Dr Ghassan Al Soboh Victorian Department of Primary Industries # *(Russell Sully)*	03 9210 9222	28
Potato tuber quality management in relation to environmental and nutritional stress	Stephen Harper Queensland Horticultural Institute	07 5466 2222	26
Sustainable agronomy packages for export potatoes	Dr Ian McPharlin Department of Agriculture WA	08 9368 3671	29
Sustainable use of reclaimed effluent water for horticultural irrigation on the Northern Adelaide Plains, SA	Dr Daryl Stevens CSIRO Land and Water	08 8303 6700	31
Breeding and evaluation			
Breeding Australia's potato germplasm: the resource for varietal development	Dr Roger Kirkham## Victorian Department of Primary Industries	03 9651 7205	32
Breeding potatoes for improved quality and efficiency	Tony Slater Victorian Department of Primary Industries	03 9210 9222	25
Development of genetically engineered virus resistant fresh market potatoes	Brendan Rodoni Victorian Department of Primary Industries	03 9210 9222	35
Evaluation and development of new potato genotypes - South Australia	Dr Chris Williams SA Research & Development Institute	08 8303 9323	32
Potato cultivar accession and testing in Tasmania	Leon Hingston Tasmanian Institute of Agricultural Research	03 6421 7645	32
Potato variety evaluation, commercialisation and adoption	Russell Sully Victorian Department of Primary Industries	03 9210 2222	34
Pest, disease and weed management			
Biofumigation - optimising biotoxic Brassica rotations for soil borne pest and disease management	John Matthiessen CSIRO Entomology	08 9333 6641	36
Cleaning and disinfection practices for potato farms	Dr Rudolf de Boer Victorian Department of Primary Industries	03 9210 9222	37
Common scab threshold on tuber seeds for processing potato crops	Dr Hoong Pung, Serve-Ag Research	08 6423 2044	48
Control of black dot in potatoes	Dr Trevor Wicks SA Research & Development Institute	08 8303 9323	46
Developing cost effective UV protection of biological pesticides	Dr Brian Hawkett, University of Sydney	02 9351 6973	38
Enhanced biodegradation of soil-applied pesticides - determination, risk assessment and prevention strategies	John Matthiessen CSIRO Entomology	08 9333 6641	36
Enhanced detection of PCN and bacterial wilt to improve quaratine procedures and market access for the Australian potato industry	Dr Robert Faggian Victorian Department of Primary Industries	03 9210 9222	36
Evaluation and commercialisation of common scab resistant clones of commercial potato varieties	Dr Calum Wilson Tasmanian Institute for Agricultural Research	03 6233 6841	44
Influence of rotation and biofumigation on soil borne diseases of potatoes	Dr Rudolf de Boer Victorian Department of Primary Industries	03 9210 9222	38
Joint R & D program for the grains and horticultural industries for the surveillance of and control of branched broomrape ####	Dr Jim Fortune Grains Research and Development Corporation	02 6272 5525	NR
Management of tomato spotted wilt virus in potatoes	Dr Calum Wilson Tasmanian Institute of Agricultural Research	03 6233 6841	42
Management options for controlling melon thrips in vegetable crops	Bronwyn Walsh Queensland Department of Primary Industries	07 5466 2222	49
Monitoring and developing management strategies for soil insect pests of potatoes	Stewart Learmonth Agriculture Western Australia	08 9777 0000	45
National PCN Management Strategy * ####	Gordon Berg Victorian Department of Primary Industries	03 9210 9222	NR
New chemical treatments for fungal diseases of seed potatoes	Dr Dolf de Boer Victorian Department of Primary Industries	03 9210 9222	39
Prediction and molecular detection of soil borne pathogens of potatoes	Dr Nigel Crump Victorian Department of Primary Industries	03 9210 9222	37
Understanding the implications of pastures on the management of soil-borne diseases of seed potatoes	Dr Dolf de Boer Victorian Department of Primary Industries	03 9210 9222	37

Project title	Chief investigator	Phone	Page
Postharvest			
Evaluating a product for enhancing dormancy and storage qualities of potatoes	Ian Macleod, Serve-Ag	03 6423 2044	**50**
Fresh produce retail service – Potatoes	Gina Cowart Horticulture Australia *(Kerry Porter)*	02 8295 2300	**51**
Managing bacterial breakdown in washed potatoes	Dr Trevor Wicks SA Research and Development Institute	08 8303 9563	**52**
Supply chain handling systems for premium potatoes	Adrian Dahlenburg SA Research and Development Institute *(Kerry Porter)*	08 8303 9416	**51**
Market research & development			
Market research for potato nutrition software	Zing Hai Tan, McGregor Tan Research	08 8338 2340	**25**
"Putting the steam back into the potato market from commodity to product" – A consumer and market study ###	Michael Brownlee Creative Dialogue Pty Ltd	02 9281 9611	**NR**
Seed development			
An agronomic and economic blueprint for a round seed system for Australia's processing potato industry	John Maynard Davey & Maynard Agricultural Consulting	03 6424 9311	**62**
Effects of potato seed characteristics on seed piece breakdown and poor emergence	Dr Hoong Pung, Serve-Ag Research	08 6423 2044	**55**
Maintenance and refreshment of the certified seed public variety in-vitro collection	Keith Blackmore, ViCSPA	03 5962 9043	**59**
Optimising production and storage conditions for seed potato physiological quality **	Dr Philip Brown, University of Tasmania	03 6226 2716	**25**
Seed potato handling and storage – implementing best practice *	Dr Doris Blaesing, Serve-Ag	03 6427 0800	**60**
Technology transfer			
Building strategic alliances with young Australian and New Zealand vegetable and potato industry representatives	Brian Newman ##### AUSVEG *(David Ellement)*	03 5790 5247	**66**
Communicating R&D outcomes to the potato industry through 'Potato Australia' and Eyes on Potatoes	Cathy Sage SageWords	03 9328 5310	**NRE**
Coordinating technology transfer in the Australian potato industry *	Leigh Walters, SA Farmers Federation	08 8232 5555	**70**
Implementing the Potato Industry's communication plan	Leigh Walters, SA Farmers Federation	08 8232 5555	**70**
International R&D workshop and industry extension meetings on common scab disease	Dr Calum Wilson Tasmanian Institute for Agricultural Research	03 6233 6841	**65**
Making past industry information from R&D more accessible *	Leigh Walters, SA Farmers Federation	08 8232 5555	**70**
The Workboot Series – The story of potatoes in Australia ***	Kim Field, Kondinin Group	08 9478 8326	**NR**

n New projects that have been approved and will commence once contracts have been finalised or have commenced this year.
- Projects ending in late 2002 and 2003
- Ongoing Projects

NR No report in Potato Australia.
NRE No report is reproduced as outcome is sent out to everyone.
* Deadline for completion extended.
** Delayed start.
*** No report as project has just started. See Potato Australia 2002 for project summary.
AUSHORT project reports will be published in December Eyes on Potatoes.

\# Ghassan no longer with Victorian Department of Primary Industries.
Roger Kirkham has retired.
Project report published in December 2002 Eyes on Potatoes.
Project report to be published in December Eyes on Potatoes.
Brian Newman no longer with AUSVEG.

In some cases projects that are supported for funding do not commence. Any new projects listed last year that are not listed this year did not go ahead. Projects that are listed as ending this year that were not listed last year are short term projects that are approved after the production of Potato Australia.
(Names in brackets and italicised indicate name of author, where different from Chief Investigator)

Horticulture Australia

VOLUNTARY CONTRIBUTIONS

Horticulture Australia Potato R&D VC Projects for 2003-2004

VC or Voluntary Contribution projects are not funded by the Potato Levy. Instead of levy money being matched "dollar for dollar" by Horticulture Australia, a contribution from a non-government organisation is matched. The money may come from a company or farmer group. This money is paid to Horticulture Australia, matched and then paid back to the Chief Investigator responsible for the project as progress payments. Except for the difference in the source of funds, VC projects are managed like levy projects. Although the funding comes from a private group the work maybe done by a government department. Decisions on whether to fund a VC project are made by Horticulture Australia and do not involve the Potato Industry Advisory Committee (formerly the Potato R&D Committee).

Project title	Chief investigator	Phone	Page
Crop management			
Crop management tools for the French fry industry in the south east of South Australia	Robert Peake, PIRSA Rural Solutions	08 8724 2921	**28**
Breeding and evaluation			
Evaluation of internationally bred potatoes	Michael Hughes Queensland Horticulture Institute	07 4091 8704	**34**
Potato varietal evaluation for Western Australia's fresh and export markets	Peter Dawson Department of Agriculture WA	08 9892 8461	**32**
Pest, disease and weed management			
Disease management of potatoes on Kangaroo Island	Dr Trevor Wicks SA Research & Development Institute	08 8303 9563	**39**
Pilot commercial crop monitoring for pests and diseases in WA seed potato crops	Stewart Learmonth Department of Agriculture WA	08 9777 0000	**40**
National facilitation of adoption of methyl bromide alternatives	Dr Ian Porter Victorian Department of Primary Industries *(Alan Shanks)*	03 9210 9222	**40**
The monitoring of potato crops for insect movement on a district scale	Tony Pitt, Ag-Challenge	03 5623 4788	**39**
Postharvest			
Development of a universal grading system for ware potatoes in Western Australia	Deborah Pitter Business Today *(Helen Stevenson)*	08 9228 9255	**50**
Market research & development			
Development of an industry plan for potato growers in South Australia	Gerard King, Kingsgrove Consulting	08 8268 1066	**53**
Scoping project to identify new horticultural opportunities for Manjimup and the South West region of Western Australia	David Doolan Department of Agriculture WA	08 9777 0000	**53**
Seed development			
A partnership to build crisping potato capacity of West Java and Australian seed potato sales	Peter Dawson Department of Agriculture WA	08 9892 8461	**54**
Crop management service development for seed potato production in Tasmania	Mark Heap, Simplot Australia	03 8387 5124	**55**
Development and delivery of an induction program for new certified seed growers	Keith Blackmore, ViCSPA	03 59 629043	**54**
Identifying variability across seed potato blocks using precision farming technology	Garry Kadwell Crookwell Potato Association	02 4832 1800	**55**
Nitrogen dynamics in commercial seed potato crops and its effect on seed yield, quality, storage and subsequent commercial crop performance	Dr Doris Blaesing Serve-Ag Pty Ltd	03 6427 0800	**56**
Potato seed certification workshop	Keith Blackmore Victorian Certified Seed Potato Association	03 5962 9043	**58**
Scoping study for a seed potato industry in South Australia	Robert Peake, Rural Solutions SA	08 8389 8800	**57**
Strategy for management of viruses from certified seed potato stocks	Dr Frank Hay, University of Tasmania	03 6430 4907	**57**
Study tour for Kangaroo Island seed potato growers	Peter McGill KI Seed Potato Grower Group *(John Fennell)*	08 8559 2255	**58**
Thailand plant quarantine visit to Australia for seed potato specification revamp	Stephen Monaghan, Monaghan Packers	03 52331207	**61**
Virus testing of early generation certified seed potato crops in Western Australia	Mark Holland Department of Agriculture WA	08 9368 3721	**57**
Ballarat potato drip irrigation study tour	Dean Jones VIC Department of Primary Industries	03 5333 6740	**64**
Communication of management strategies for potato virus diseases in Western Australian potato crops	Stewart Learmonth Department of Agriculture WA	08 9777 0000	**65**
Processing potato study tour to North America, July 2002	Roger Tyshing, Tasmanian Farmers & Graziers Association *(Greg Bullock & Stephen Welsh)*	03 6331 6377	**68**
Seed potatoes Victoria workshop to be held in Portland	Tony Pitt, Seed Potatoes Victoria	03 56223025	**64**
Study Tour to the UK and Netherlands to investigate value adding opportunities for potatoes, September 2003	John Fennell PIRSA	08 8389 8840	**64**

New projects that have been approved and will commence once contracts have been finalised or have commenced this year.

Projects ending in late 2002 and 2003

Ongoing projects

(Names in brackets and italicised indicate name of author, where different from Chief Investigator)

New direction for research

- IAC Processing Sub-Committee

As mentioned in June *Eyes on Potatoes*, the Processing sub-committee of the Potato Industry Advisory Committee (Potato IAC) decided to focus investment on fewer high priority research areas.

At a June meeting, the sub-committee set research priorities for the next five years. This was important, as the aim was to develop a five year research investment plan focusing on high priority issues for the processing industry. Ensuring the priorities were right was essential if the program was to be successful.

The priority areas for research are:

- Soil borne diseases and soil health
- Potato Viruses X, Y & S
- Tomato Spotted Wilt Virus

The meeting also provided the opportunity to develop an approach for gaining input from research groups. One of the past weaknesses has been that the committee has relied heavily on applications, with little or no direct interaction with researchers.

Rather than relying on applications, the committee will be inviting researchers to a discussion session about the priorities. This will allow the committee to be able to question the researchers and better ascertain what can be achieved. It will also provide the researchers with the opportunity to better understand what is required and respond accordingly.

Through greater interaction at the planning phase, we hope to develop higher return projects more focused towards meeting industry needs. In the past this approach has not been possible as the number of researchers that would need to be brought together, due to the wide range of issues being addressed, was too great to justify the expense.

The sessions with researchers will have occurred in late August. The committee will use the outcomes of the meetings to produce a draft research investment plan. This will be refined through further interaction with research and other groups as required. It is important that this task is done properly as the industry is making a significant investment to address the priority areas.

After the investment plan is finalised, work will be commissioned. The committee will be seeking to form program teams, where necessary, in order to have the breadth of skills required to be able to tackle the priority areas. Each team will have a coordinator responsible for the outcomes.

Farmers have been frustrated by the lack of progress in understanding how to effectively and reliably manage soil borne diseases. Viruses are again becoming a problem. Addressing these problems will result in greater returns for growers and processors, and improve our competitiveness in a global market.

JOHN GALLAGHER
Chairman
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Review of the Levy R&D program

The review of the Levy Research and Development (R&D) program clearly shows the benefits of well targeted research, with returns far exceeding the investment made.

For the programs examined, the review highlighted big wins and potential benefits that will only be realised with changes and improved investment decisions.

The review emphasised the importance of strategic decision making, as some research was based on flawed assumptions prior to its commencement. Unfortunately, no matter how good the work, if its *raison d'etre* is flawed, the outcome is unlikely to provide a commercial benefit.

The review

The Australian potato industry has invested more than $15 million in R&D since levy funding arrangements started in 1991.

In 2002, a review was commissioned to analyse the success of this investment.

The review investigated 11 program areas and estimated the benefits to accrue over 20 years.

Not all projects were suitable for this form of economic analysis and, in some instances, it was necessary to look at the benefits based on assessments by industry participants.

Focus of the review

The study focused on return on investment to those paying the levy. Unlike many studies, this one **did not** look at benefits to consumers, regional communities, downstream industries such as chemical, agricultural machinery manufacturers, and retailers or other horticultural industries that sometimes contribute to R&D funding.

Where economic analyses were applied, the R&D costs included only the contributions of industry and matching government funds. In-kind or financial contributions were not considered.

Outcomes

We have summarised the outcomes and provided our conclusions, below. For more detail and a full understanding of the basis for our conclusions, we recommend reading the Final Report, available from Horticulture Australia.

Cadmium

These projects produced the scientific evidence for a necessary change in regulatory standards for potatoes, allowing the industry to continue more or less unaltered. The analysis was strongly positive, indicating the research represented a useful investment, although further work is required to manage possible future problems with cadmium in potatoes. This project produced a useful environmental outcome due to the widespread adoption of low-cadmium fertilisers.

The benefit cost analysis showed the value of the research; it is unusual to record such a strongly positive value within so few years after completion of research.

Economic value of the cadmium research program

Period	Benefit (NPV)
1992-2000	$1,290,000
1992-2020	$5,768,000

Genetic improvement

The program includes breeding and evaluation of crisping, french fry and fresh market potatoes, as well as gene technology for virus resistance in a limited varietal range.

Neither of the processing breeding (and evaluation) components of the program has produced varieties that have been widely adopted by industry and the analyses indicated a negative return on these investments.

Analyses of an emerging scenario in which the companies individually contract with the breeder (within the current funding arrangements) indicate the availability of potentially large benefits, which will vary with the extent to which beneficial varietal attributes can be identified and achieved, and newer competitive varieties adopted by the companies. This approach should provide a basis for commercial competitive advantage that is presently unavailable.

The fresh market breeding program has released some attractive varieties, though again, the rate of adoption has been poor. The reviewers believe that

without appropriate commercial arrangements (including varietal ownership and strong chain leadership) this part of the program is unlikely to result in a positive return on the investment.

The outcomes of the gene technology program are likely to be limited to one variety (in the timeframes of this analysis), but may include a valuable addition to the industry's pest and disease management objectives. The reviewers were conscious community concerns about GMOs in fresh produce, and corporate rejection of GMO technology, might delay, if not prevent, the adoption of GM varieties.

Subject to the ability to use GM fresh market potatoes by around 2006, the project is assessed as being moderately beneficial to the industry, and to the environment.

Economic value of the crisping breeding initiative

Period	Benefit (NPV)
Growers	
1991-2000	-$193,500
1991-2020	$1,429,000
Processors	
1991-2000	-$193,500
1991-2020	$1,356,600

Note: The 2020 projection is based on strong marketing chain leadership being exercised by the processing companies.

Note:

1. A significant amount of money, compared to the other research projects, has been expended with no measurable economic outcome to date. However, significant potential payoff to this research exists, depending on the rate of adoption of the new varieties (which will depend on strong marketing chain leadership by the processing companies).
2. This is a partial analysis; it ignores a number of potentially significant additional benefits, such as freight and storage costs, that would arise from higher dry matters, and reduced waste disposal from factories. In addition, increasing the dry matter content of potatoes reduces demand and freight bills. Growers would benefit from higher-yielding potatoes through reduced input and overhead costs.

...continued from page 6

Financial Report (k. Unaudited)

Potato Investment Summary 2002/03

Year Ended 30 June 2003	**R&D 2002/2003 $**
a. Levy funds available 1 July 2002	1,644,337
INCOME	
b. Levies Received	1,072,030
c. Commonwealth Government Contributions	1,394,936
d. Other Income	85,844
Total Income	**2,552,810**
PROGRAM INVESTMENT	
e. Levy Programs	2,598,635
f. Service Delivery Programs by Horticulture Australia	194,895
g. Potato industry contribution to AusHort R&D program	51,155
h. Levy Collection Costs	40,422
Total Investment	**2,885,107**
j. Funds available 30 June 2003	**1,312,040**

Explanation of terms
a. Surplus carried forward (unmatched)
b. Potato levy collected over 2002/03 period
c. Commonwealth contribution to match the levy
d. Interest earned on the levy
e. Total of the 2002/03 expenditure for the potato program
f. Horticulture Australia management fee (matched amount)
g. Funds to across horticulture industry projects
h. Levy Revenue Collection Service (AFFA) costs
i. Funds available for new and continuing projects
j. At the time of printing, the finances were being audited.

Net Present Value

When costs and benefits accrue through time a method is needed to value them at a common point in time to allow for valid comparisons. Net Present Value (NPV) is an economic tool that allows for this.

NPV can be thought of as a measure of "profitability" though time. It is the amount the project has or will return, in excess of "break even". The greater the NPV, the more desirable the project is economically. The NPVs in this article are calculated as at the year 2000. The discount rate is 8%(recommended by Department of Finance 1991).

Review of the Levy R&D program (continued)

Economic value of the French fry breeding initiative

Period	Benefit (NPV)
Growers	
1992-2000	-$159,200
1992-2020	$10,713,500
Processors	
1992-2000	-$290,500
1992-2020	$3,406,200

Note: The 2020 projection is based on strong marketing chain leadership being exercised by the processing companies.

Integrated pest management (IPM)

IPM for foliar insect pests (including tuber moth) has been highly successful, economically and environmentally. Adoption, which was facilitated by a series of funded projects, was enhanced by the activities of processors and R&D levy-funded regional development activities. Investment in this research has already produced high positive returns to the industry and will continue to do so.

Work in Western Australia has added significantly to the knowledge of soil borne insects, but attempts to develop biological control methods have so far been unsuccessful. Biofumigation using brassica rotations was not successful in potatoes, but has become a valued part of the disease management program in some vegetable crops. It was not possible to value this research outcome within the terms of reference for this review. Research into the vectors of virus diseases in WA has also contributed to an ability to reduce disease infection rates through the identification and choice of low risk areas, but again it was not possible to value the outcome of this research.

Economic value of the IPM research

Period	Benefit (NPV)
Crisping	
1991-2000	$3,116,600
1991-2020	$10,458,200
French Fry	
1991-2000	$9,614,500
1991-2020	$40,778,500
Fresh	
1991-2000	$2,800,600
1991-2020	$11,686,500
Seed	
1991-2000	$691,100
1991-2020	$3,642,800

Potato cyst nematode (PCN)

PCN, a recent arrival in Australia, has potential to cause the industry considerable economic, social, and environmental harm. The R&D responses were rapid, well planned and effective, and produced a pest management strategy that will allow the industry to continue, with minimal disruption.

While there are a number of ways in which the economic value of the R&D program could be assessed, the reviewers based their analysis on a worst case scenario in which growers in high risk areas would need to fumigate their land, as in parts of Europe.

The economic analysis indicated a highly positive net present value for the research. Alternative strategies, which relied on genetic resistance in Australian and imported varieties and avoidance of infested areas, were not considered.

The results of the economic analysis have not been included in this article as they need to be considered in conjunction with a number of assumptions, otherwise they could be easily misinterpreted.

Tuber borne diseases (rhizoctonia and common scab)

Research into these diseases has represented a significant draw on the R&D investment funds. They are difficult research subjects and progress has been slow but positive. A full-scale economic analysis was not undertaken on the outcome of this research.

However, on current indications, research in Tasmania may result in a positive economic outcome. This work has already produced plantlets of two French fry varieties which were selected, in vitro, for resistance to common scab. Other research has provided some important research tools, expanded the knowledge of the organism and its relationship with its environment, screened and selected chemical control measures, identified

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the (limited) potential for biofumigation (using brassicas) and developed codes of practice to limit disease spread within the industry.

Current research, which builds on the results of previous studies, is exploring the potential for integrated disease management through crop rotations. This research requires long term industry and funding commitment and is unlikely to produce spectacular breakthroughs, but deserves ongoing funding support within a comprehensive industry R&D plan.

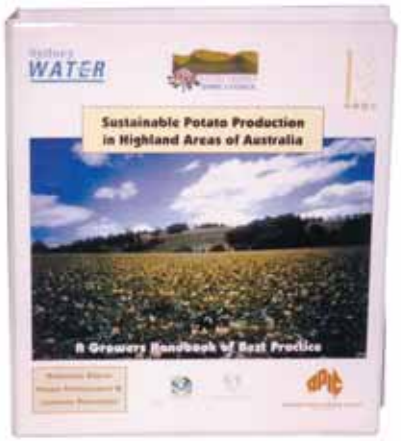
Resource management and protection

This relates to the industry's objectives for environmental sustainability and includes a number of projects assessed separately for economic benefit (eg, cadmium, IPM etc), as well as some not previously considered (soil and water management).

The outcomes were difficult to assess in the absence of clear industry objectives for soil, water, chemical and community sustainability. While each project has contributed to achieving sustainable production, the reviewers recommended future progress, and an ability to claim sustainability credentials, would depend on industry's willingness to develop and implement a focused, outcome-oriented sustainable production systems R&D strategy.

Quality assurance/HACCP

The Australian potato industry ranks high in the adoption of food safety practices, largely due to a single levy funded project. While not subjected to economic analysis due to data limitations, this research area was clearly and strongly beneficial, through its impact on grower (and industry) knowledge and acceptance of QA and HACCP principles and practices, and through its impact on the more pragmatic and user-friendly Freshcare program. It is assessed as a highly effective R&D investment.



Regional industry development project – Southern and Northern Highlands

Like other regional industry development projects, this one focused on important economic and environmental outcomes. The project was small but highly effective when viewed from either an economic or an environmental perspective, and represented a valuable industry investment.

Economic value of the Regional Development (Southern and Northern Highlands) research

Period	Benefit (NPV)
1994-2000	$286,800
1994-2025	$1,743,300

Regional industry development project – Atherton Tablelands

The major industry outcome was an increased awareness and adoption of IPM by non-contracted growers, and possibly a heightened knowledge and awareness of improved production practices by participating growers. The benefits were not quantified or recorded, so no economic analysis was possible. The project is assessed, qualitatively, as marginally beneficial.

Industry development – Crisping Group

These involved the dedicated efforts of an Industry Development Ifficer to the crisping potato industry in southern Australia. Over a limited time, the project resulted in improvemed yields, reductions in input costs and increases in processing efficiency. It also produced some significant, though unmeasured, environmental outcomes. Its success was largely due to partnership between the researcher, crisping growers and processors. Because of this, a third of the benefits are accredited to the project, and two thirds to the processors. The benefits due to the levy investment were significant, and the project assessed as highly effective.

Economic value of the regional crisping industry development project

Period	Benefit (NPV)
Growers	
1992-2000	$6,198,900
1992-2020	$8,844,700
Processors	
1992-2000	$8,109,400
1992-2020	$11,681,300

Export market development

Two projects were considered under this category, and within a qualitative framework. The first analysed the potential for Australian potato exports into Asia, and provided an important, if disappointing, assessment of market opportunity. This result has tempered attitudes to R&D and export activity in the industry. This project represented a sound R&D investment.

The second project, falsely predicated on a large potential for the industry in Asia, produced new shipping technologies that have, so far, not been adopted, and that failed to drive market expansion. Because of the inaccuracy of the assumptions that underpinned the project, it is judged to have been a poor R&D investment.

Australian Potato Industry Council

AUSVEG PPAA Horticulture Australia

Attention Potato R&D Levy payers

Notice of Annual R&D Levy Payers Meeting

3.30pm Monday 17th November 2003

Stamford Hotel

Corner O'Riordan and Robey Streets, Sydney Airport, NSW

The purpose of the meeting

To provide a forum for Potato R&D levy payers where levy issues can be discussed and for presentations to be made on:

- Potato Industry Advisory Committee annual report on the Potato R&D Program -

Enquiries: Tony Imeson
Australian Potato Industry Council
☎ (03) 9689 3233

Relative effectiveness of R&D investments

An exact ranking of projects on the basis of their economic value to the industry, or on their return on investment was not possible, so the projects were grouped into:

Highly effective investments

- Integrated pest management
- Cadmium
- Potato cyst nematode
- Industry development (crisping)
- Quality assurance
- Aspects of the resource management (sustainable production systems) program

Ineffective investments

- Export market development
- Breeding (of public varieties)

Potentially effective investments

- Breeding for French fry and crisp processing, subject to the adoption of processor-led, individual chain programs leading to unique proprietary varieties and effective competitive advantage for each of the processors.
- Breeding for fresh market potatoes, subject to the development of similar partnership arrangements to those that are currently being agreed with the processors.
- Tuber borne diseases (*rhizoctonia* and common scab).
- Resource management (subject to identification of industry objectives and development of R&D strategic plan).
- Industry development (Atherton)

Who benefits from the R&D investment

Under the current arrangements, growers and processors contribute levies. It is suggested the major economic benefits of R&D tend to migrate "up the chain": processors and wholesalers/retailers (and consumers) eventually benefit most through reducing grower prices, more or less in accordance with their ability to reduce production costs and to stay in business as prices decline.

While it probably doesn't matter who pays the levy, the distribution of benefits of research depend on the industry's underlying economic structure. When many small growers sell to one or a few large buyers (in a marketing environment with less than perfect competition) the benefits of research tend to move towards the wholesalers, retailers, processors and consumers, who are able to exercise some market power.

Conclusion

The R&D program has been an effective investment for the potato industry. With better selection of programs and projects the economic returns on the investment could be enhanced even further. This will require careful consideration of all costs to the point of industry adoption and realistic estimates of industry benefits.

Success, as highlighted with the breeding and evaluation program, must include effective drivers to adoption. Producing good technology is not good enough to ensure its adoption, there must be people championing the cause.

There also needs to be a willingness to consider innovative approaches, to ensure industry achieves the research's potential. This will take a focused and analytical approach to industry and R&D planning.

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The full review report – Review of potato research & development program PT02033 – is available from Horticulture Australia.
See page 65 for details.

R&D is a winner

The Levy program review is good news for the Australian potato industry.

It clearly highlighted the benefits of R&D to industry - if we do the job properly. It has also identified considerable untapped potential in programs, such as breeding and evaluation.

It is also interesting to note the returns from only a few successful projects would effectively pay for the entire R&D program since its inception. The returns from the remaining projects then become the icing on the cake. If only all personal investments performed so well!

Not all projects were successful but that was to be expected. Research is a risky business. The important thing is that the overall result is positive.

The above summary article cannot do the R&D program justice, due to space limitations. A booklet on the outcomes of the R&D program has been compiled and will be mailed to you shortly. The booklet provides an easy to ready summary of the outcomes from the entire R&D program. It is worth reading, especially as we often quickly forget our R&D achievements.

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New levy projects approved by Horticulture Australia

Breeding and evaluation

Breeding potatoes for improved quality and efficiency

This project will develop new improved varieties that will meet market requirements and the needs of the Australian fresh and processing industries.

Through active involvement of the processing company and fresh potato growers and supply chain stakeholders in the setting of project priorities and actively evaluating progress, the industry expects to achieve increased cost efficiencies, while minimising inputs such as water, fertiliser and pest and disease control agents. There will be a stronger market and industry feedback mechanism into the program to increase its effectiveness and accountability.

The program will benefit consumers through better quality potatoes, the community through reduced negative impact on the environment, and growers and processors through improved agronomic, processing, storage and handling attributes that overall increase efficiency.

Duration: 3 years

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Market research and development

Market research for potato nutrition software

CropTest Potato Crop Nutrient Evaluation System is a computer program and manual providing nutrition information and tools to improve nutrient management of potato crops.

CropTest summarises knowledge of crop nutrition in potatoes and includes information from Australian and overseas research. In effect, it is the industry's encyclopedia of nutrition.

The package was released in 1998 and funded through the levy system. Due to incompatibilities with Microsoft Windows XP operating system, the package has been withdrawn from sale. As the package needed upgrading, several options were presented to the Potato IAC:

- fix the incompatibilities and release a new version.
- do the above and also update the information –considered fairly easy, as not many changes were required.
- take advantage of the opportunity and seek input from industry as to whether they wanted the package changed and, if so, what improvements needed to be made.

The IAC opted for the last option, as the main concern was ensuring industry gained maximum return from their initial investment. If the package can be improved and made more attractive, this is the ideal time for changes to be considered.

Horticulture Australia has engaged McGregor Tan Research on behalf of the industry to carry out market research on the product. The outcomes from the research will determine the next steps for CropTest.

Duration: 1.5 months

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Seed development

Optimising production and storage conditions for seed potato physiological quality

The physical appearance of a seed tuber has little to do with its quality, so selecting and purchasing seed that will perform well is a difficult process for potato growers.

While certification schemes provide assurance that disease levels in the seed are low, variations in physiological age or physiological condition of seed between certified seed lots may result in big differences in crop performance and yield.

This project aims to identify the major contributors to seed physiological quality in seed crops. The relative contributions of seed crop growing environment, haulm kill treatments and harvest timing, storage environment and post storage treatments to crop performance and yield are being determined.

The research will help to identify the conditions and treatments most likely to contribute to high physiological quality and to reduced physiological quality.

Duration: 3 years

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Managing environmental and nutritional stress for better quality tubers

This 2002 study evaluated and determined factors affecting incidence of brown fleck (BF) in *Sebago* potatoes.

Your Levy @ Work

Researchers looked at the role of calcium and boron nutrition, soil and air temperature and canopy management in reducing BF in *Sebago* potatoes.

Nutrition

Calcium and boron nutrition do not appear to play an important role in incidence of BF, which is contrary to common belief.

Soil and air temperature

A combination of high soil, day and night temperature favoured BF development.

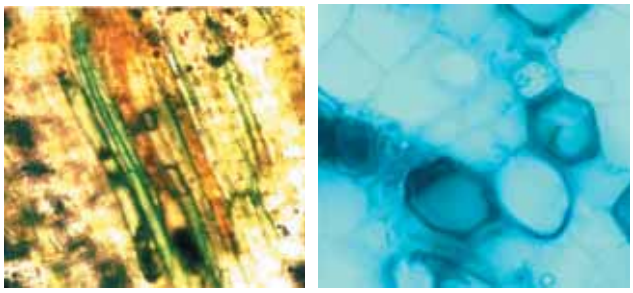
Increasing the day/night air temperature from 18(day)/13(night)°C to 23/18°C significantly increased BF in tubers. This demonstrates that air temperature in foliage is a key factor in inducing BF. Previous studies had demonstrated that an even higher air temperature regime dramatically increased BF incidence.

An increase in soil temperature from 18°C to 23°C to 28°C also progressively increased BF incidence. Previous evidence has suggested soil temperature is not as critical as foliage temperature in inducing BF. However, the current (more detailed) study showed high soil and air temperature both induce brown fleck.

Canopy Management

A large plant canopy appears more likely to induce BF than a smaller canopy. This holds with field observations that BF incidence is generally highest when yield potential is high and a vigorous plant canopy is present. A preliminary conclusion is the amount of foliage and its respiration are major factors in causing BF.

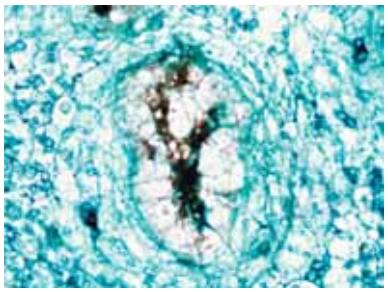
Removing foliage before the tops die off shows promise for reducing BF incidence. One important trade off with top removal is the associated yield loss. The study showed this loss could be as high as 25% if all tops were removed. Research in 2003 will further review the potential for top removal as a tool to reduce BF incidence.



Brown fleck affected potato tuber phloem conducting cells

Brown fleck under the microscope

Preliminary microscopic cell studies show that BF appears to be associated with phloem cells in actively growing tissue at the crown end of the tuber. More detailed microscopic analysis will be conducted in the coming season.



Brown fleck affected vascular tissue and surrounding unhealthy tissue

Brown fleck appears to occur when one or several of these conducting cells die and become blocked. The blockage is likely to prevent sugar distribution to new starch storage cells, surrounding the blocked phloem cells. This causes glassiness around the browned phloem cells.

Ultimately these surrounding cells are likely to die, effectively through starvation, resulting in enlargement of the brown lesion called brown spot.

Project started: January 2000
Duration: 4.25 years

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Paul's seed potatoes off to a clean start with the help of MAXIM

While there is still a lot we need to know about mysterious soil-borne fungi like *Rhizoctonia solani* (Black Scurf) and *Helminthosporium solani* (Silver Scurf), there are a number of steps potato growers can take to minimise the risk. Avoiding short rotations and planting clean seed are absolutely essential. If there is any risk seed carries even low levels of Black Scurf, a registered seed treatment should be applied.

Ensuring sprouts emerge quickly after planting will help minimise risk, as will making sure seed is warmed before planting (above 15ºC) and sprouted. Planting in the top 5 cm will help the crop emerge quicker and cold, wet soils should be avoided.

Paul Myers, a certified seed grower from Warragul in Victoria says they aim to broaden their rotation even further to one year in seven. He grows fresh market varieties of certified seed for Smiths and McCains and also a variety called Spunta for export.

"I guess the longer rotation is seen as a benefit by our customers and I think it does help lower the risk of soil-borne diseases like *Rhizoctonia*," he said.

Warragul certified seed grower, Paul Myers (left), with Syngenta Territory Manager, Andrew Meurant, who is based in Melbourne. Paul says he's been converted to MAXIM because of ease of handling and excellent results.

"We also look to incorporate break crops like maize in summer and Annual Ryegrass in winter, even oats as a break crop. Soil-borne diseases can be potentially such a huge issue with potatoes if your not careful.

"For seed treatment we've converted over to MAXIM® which is applied to the seed in the shed.

"We bring the seed home from the coolstore, then we run it over the grader and separate the round seed out. At the same time we treat the whole lot with MAXIM.

"MAXIM's easy to use and doesn't have any dust or smell issues.

"We were putting it on at the planter for a while, but it was just another hassle that we didn't need out in the paddock.

"It's so much simpler to put on in the shed.

"We use MAXIM primarily for *Rhizoctonia* but we've also seen good activity on Silver Scurf. All our seed is treated, regardless of variety."

Easy MAXIM application with small misters

Matthew Cheminant, Agronomist with Castec Rural Supplies in Naracoorte South Australia, says use of MAXIM fungicide for potato seed treatment has rocketed over the past 12 months. The high adoption by growers in his area has in part been due to MAXIM's excellent activity on Black and Silver Scurf, but also due to a new and easy way of applying it to seed potatoes.

"I've been promoting a small mister for easier MAXIM application," he explains. "The mister and MAXIM have worked beautifully together.

"MAXIM mixes easily and it's a good product to be applied through these misters which achieve excellent seed coverage.

"This has been a very affordable application technique.

"Growers simply connect a small pump to a clean 20 L drum and pump the diluted MAXIM spray over the seed on the cutting table. Because the water rate is so low they usually get at least two bins out of each 20 L.

"It's easy to calibrate and they usually fit an in-line tap.

"Most growers down here have installed one mister but a couple of the bigger machines need two.

"The main thing to consider is coverage and making sure the water rates are not too high. If the potatoes become too wet they can experience seed piece breakdown.

"I really like the ease of use and operator safety with this technique."

For further information on MAXIM please contact the Syngenta Technical Product Advice Line:
Freecall 1800 067 108
Freefax 1800 805 871
or visit our website at www.syngenta.com.au

From Naracoorte in South Australia, Castec Rural Supplies' Matthew Cheminant with Alli James-Martin from Syngenta. The insert (top left) shows the small mister Matthew is promoting for easy MAXIM application to seed potatoes across the cutting table.

Specific gravity loss in crisping potatoes in Koo Wee Rup, Victoria

Researchers investigated reasons for a gradual decline in specific gravity (SG) of potatoes grown at Koo Wee Rup to identify possible solutions.

The main factors contributing to the decline were:

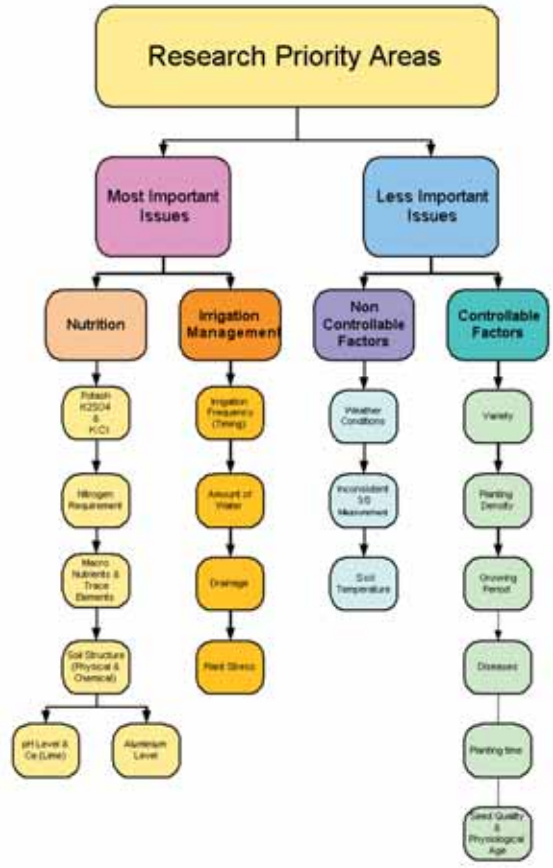
- dry winters and high temperatures during the growing season
- low soil pH (4.7), which caused insoluble aluminium to increase and some nutrients (phosphorus, potassium, magnesium and sulphur) to become bound to the soil and unavailable to the plants.

The study also found:

- most growers have changed their fertiliser practices, but soil structure and nutrients requirements were not fully understood
- most growers irrigated crops using observation; the amount of water and times between irrigations during growing stages were not fully understood
- although planting time influenced SG it was difficult to optimise due to delivery contract requirements.

The trend to lower SG has resulted in losses to growers and processors, due to greater yield losses and higher processing costs.

Further research is needed to develop a better understanding of the influence of planting time, soil fertility, fertiliser mixtures, applications rates and irrigation management on SG, and help growers address this problem.



Based on work carried out by Ghassan Al Soboh with support from Stephanie Andreata.

Project started: June 2002
Duration: 3 months

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Crop management tools for the French fry industry in the south east of South Australia

This project will to review the previous three seasons of paddock history and spray diary data for French fry growers in southeast South Australia. This data is being analysed and compared with Best Practice Benchmarks. The next steps in the project are to interview the growers, discuss their historical records, and review the Best Practice Benchmarks relevant to their business. From these combined sources, we will develop draft concepts for crop monitoring tools, in order to field test them for the coming season.

Project started: December 2001
Duration: 2.5 years

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Maximising returns in export markets

For our export markets to expand and flourish, major growth in the Australian potato industry and new varieties are needed.

Agronomy programs used for growing established varieties may not be appropriate for growing new varieties. In addition, programs need to be environmentally sustainable to satisfy the demands of local and export markets.

Early results have revealed differences between requirements of industry standards (such as *Atlantic*) and new varieties. This information is important for grower to maximise returns in export markets.

This project combines information derived from formal experiments on research stations with the monitoring of new crop varieties on *Pioneer Growers'* properties.

Export markets: established and emerging

Markets exist for Australian fresh, processing and seed potatoes in Brunei, China (including Hong Kong), Indonesia, Malaysia, Mauritius, Middle East, Singapore, Sri Lanka and Thailand. A new market for seed may also develop in Vietnam. About 30,000 ha of potatoes are planted annually in Vietnam, using 45,000t of seed.

In some of these markets, varieties already established in Australia are in high demand. In other cases, Australian farmers have grown varieties specifically for the export market with no guaranteed local market. For example, *Granola* for seed in Indonesia and *Eben*, and *KT3*, *TK 51.6* and *PO3* for seed in Vietnam.

Taking a risk

Growing export varieties with a probable local market option is obviously less risky than growing them with no local market option. However, taking that risk represents the Australian potato industry's determination to expand through exports. Export markets have expressed interest in varieties bred and grown in Australia for processing and seed. For example, *Dawmor* has performed well in East Java and it is in demand for seed and crisp processing in Indonesia. Similar interest has been generated for another processing variety bred in Australia, *Bliss*.

Getting the agronomy right

The purpose of this project is to develop sustainable agronomy packages for existing and new export varieties for seed as well as for processing and fresh markets.

Nitrogen management is critical because:

- leaching from sandy soils can cause contamination of human drinking water. This has emerged as one of the most important environmental issues facing potato growers in recent years.

Harvesting experiments examining the agronomy of export varieties at Manjimup Horticultural Research Centre, WA

- it is of major importance in the cooking quality of crisping potatoes and in influencing the size of tubers destined for markets requiring small (40-50g) round seed.

The nitrogen fertiliser requirements for any variety / market is likely to be higher on an infertile sand than on a more fertile loam, where legumes are part of the crop rotation. Similarly, the nitrogen fertiliser requirements of potatoes for the small round seed market is likely to be lower than if larger tubers are required for cut seed or processing.

Early results show the nitrogen fertiliser requirements of *Atlantic* and *Granola* for the small round seed market are different. Added to these variations, are the variations in nitrogen fertiliser needs for different varieties. With export markets having very specific quality requirements, farmers cannot assume agronomy programs that worked for an established variety will be appropriate for new varieties.

Similar differences in fertiliser management may emerge between *Atlantic* and the Australian bred varieties *Bliss* and *Dawmor*. These differences are being examined on research stations and grower properties in this project.

Pioneer Growers

The use of *Pioneer Growers* in the project has allowed, for the first time, monitoring of the agronomy of new varieties grown on properties for a new commercial market. The information derived from this first crop will be used in conjunction with data from more formal experiments to develop the agronomy packages.

The willing cooperation of growers in this project is gratefully acknowledged.

Project started: July 2002
Duration: 3.5 years

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National Cadmium Minimisation Strategy

The National Cadmium Minimisation Strategy committee structure has changed, with Daryl Stevens accepting the position as Coordinator and Mike McLaughlin stepping down as Coordinator and taking on the role of SA state representative. Lindsay Cook has stepped down as Chair and George Rayment from QLD Department of Primary Industries elected in his place.

The committee recently finalised an information brochure on cadmium and vegetable production, to be posted in the next two months to growers that contribute to the Horticultural Australia vegetable levy. The brochure is part of the VEGE notes series instigated by Horticulture Australia.

If you wish to receive a brochure and do not contribute to the vegetable levy, please visit the website http://www.cadmium-management.org.au or contact Sandra Wildman on (08) 8303 8759.

Other major committee projects are:

- Monitoring national and international changes in maximum limits for cadmium in foods and providing an advisory role to Australian regulators and associated industries.
- Developing consistent standards across Australia for cadmium in fertilisers and labelling of fertilisers, and assisting the fertiliser industry in reducing cadmium concentrations in fertilisers, long term.
- Maintenance of a website for communication regarding potential cadmium issues related to agriculture in Australia - <http://www.cadmium-management.org.au>
- Collation of an Australian database on cadmium concentrations recorded in Australian agricultural products. This database is used confidentially to identify regional issues related to violations of maximum limits for cadmium concentrations in produce. This allows identification of potential cadmium hotspots and development of management strategies to ensure produce quality is not compromised due to high cadmium concentrations.

This project is jointly funded by the Fertilizer Industry Federation of Australia, Grains Research and Development Corporation and Horticulture Australia. It was established as a result of continuing concerns over accumulation of cadmium in agriculture.

Project started: July 2000
Duration: 5 years

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Your Levy @ Work

Recycled water for horticultural irrigation on the Northern Adelaide Plains

The final stage of this project is to publish a textbook, *Using reclaimed water in Horticulture, an Australian Perspective* (Working title).

Nearly all chapters have been reviewed and are being edited for submission to CSIRO Publishing.

Another outcome has been the appointment of a coordinator for Reclaimed Water Development in Horticulture, Jim Kelly (08) 8303 6709.

Horticulture Australia used voluntary contributions from several interested water industries and unmatched funds from various state government regulatory agencies to fund Mr Kelly's appointment.

The first stage of the project involves establishing a management committee, which will also manage to manage a Land & Water Australia initiative, *Use of Reclaimed Effluent Water in Australian Horticulture: Stage 1 – A National Scoping Study*, helping to which will help integrate the two projects.

Mr Kelly's project will coordinate the development of reclaimed urban wastewater in Australian horticulture. The project aims to provide information and facilitate the transfer of knowledge within the reclaimed water industry (nationally), to ensure the development of a consumer accepted and environmentally / agriculturally sustainable reclaimed water industry.

On a small scale, the benefits include a consolidation of resources for developing and delivering water reclamation and reuse schemes. On the larger scale, the benefits will be a sustainable and renewable water resource and an irrigation practice considered acceptable and environmentally friendly by everyone those along the entire supply chain.

Project started: January 1998
Duration 4.75 years

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Your Levy @ Work

New potato varieties

Australia's only potato breeding program is operated by the Victorian Department of Primary Industries at Toolangi.

To date, evaluation trials have been run by state Departments of Agriculture (for independent assessment of new entries) and conducted mainly on growers' properties. Industry is currently revising the operation and funding of the evaluation portion of the program.As of 1 st July 2003 a new system for evaluation has commenced (see page 33 for details).

Australian bred varieties such as *Coliban, Snow Gem, Wilwash, Lustre, Shine, Ruby Lou, Otway Red* (fresh markets) and *Riverina Russet, Dawmor, Sonic, Wontscab, Tarago, Catani* (for processing) have come from this program.

As well, most of the current, overseas bred varieties used commercercially were first introduced and tested through the scheme. These include varieties for fresh use such as *Crystal, Nadine, Desiree, Pontiac, Nicola* and *Kipfler*. Processing varieties from the program include *Atlantic, Russet Burbank, Ranger Russet, Nooksack, Shepody, Trent,* and *Denali*.

Recent releases

Commercial crops of new releases such as *Lustre, Ruby Lou, Dawmor* and *Riverina Russet* were grown during the 2002-03 season. Most were selected as 'low input varieties' with improved disease resistances requiring less chemical protection. The more vigorous plants also allows for reduced inputs of irrigation, fertilisers and herbicides.

Ruby Lou – a new red skin fresh market variety

Ruby Lou has become a major red skinned variety for washed packouts in South Australia and Western Australia. Plants have a vigorous growth and are resistant to target spot and common scab. Crops grown for harvest in winter have an improved tuber shape, smoother skin and darker red skin colour than *Desiree*.

Roger Kirkham and Chris Williams at a field day on Mark Pye and Clinton Zerella's 'Temuka Farms', SA, where the new variety Lustre was released

Harvesting new French fry processing varieties in a trial on Andrew Widdison's farm at Kalangadoo, SA

Inspecting a trial plot of Fergifry at Kalagadoo, SA, were (from left): Paul Frost (Safries-McCain), Roger Kirkham, (VicDPI), Don Ferguson (Grower), Graeme Henman (Safries-McCain) and Chris Williams (SARDI)

Dawmor - a new crisper for export

Dawmor continues to be grown in spring planted crops in the Manjimup/Pemberton region of Western Australia for fresh crisp potato export market. In this region it has the potential, compared with *Atlantic,* to set many more tubers and produce higher yields with acceptable dry matter but less internal disorders.

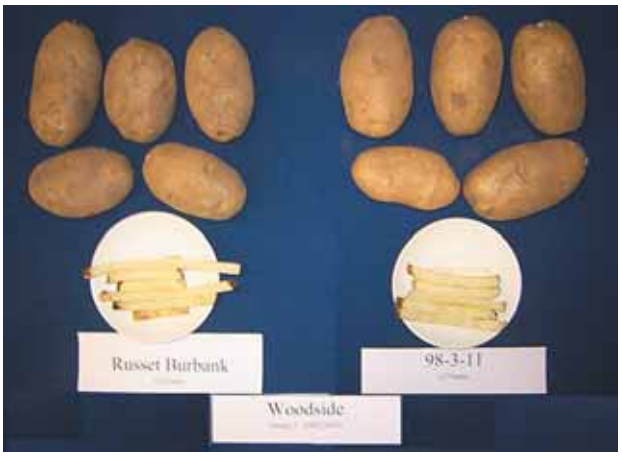
Lustre - a new fresh market variety

Lustre was released in 2002 from a cross of *Crystal* with *Coliban*. Its tubers have a short dormancy and the plants have early tuber bulking and high yield potential. Crops of *Lustre* when managed for washed use produce tubers with white, bright, smooth skins suitable for packouts. In 2002 trials in the South Australian Mallee, Australian bred entries: *Lustre,* 93-37-3, 95-95-13 and 95-97-9 in a February sown trial produced increased yields (34, 34, 53 and 44 t/ha, respectively) and equal or brighter skin colour compared to the industry standard variety, *Coliban* (25 t/ha). Further trials on these new lines will be harvested at Peebinga in winter 2003.

Riverina Russet - a new direct delivery, early French fry variety

This new variety is becoming increasingly used (on sandy soils along the Murray River and adjacent areas) for direct delivery during the mid and late summer supply period to French fry processing factories. In the past this has been a difficult period of supply as the main early variety *Shepody* can suffer plant growth and tuber quality problems as temperatures increase from mid summer.

(From left) Brian Dickson (Western Potatoes) and potato growers Jeff and Bob White, Mandogalup, WA, comparing White Star (left), Maris Piper (centre) and Delaware tubers.



A promising stage 2 French fry variety at Forthside, Tasmania, in April 2003

New lines in trials

A number of new lines have been outstanding in variety trials and small commercial tests during the past season.

White Star – a fresh market variety

In 2002, in bulk tests at two sites in Western Australia, *White Star* produced yields of 37t/ha from a May planting (similar yields to *Delaware*). *White Star's* benefits over *Delaware* at this time of year are its larger, more even shaped attractive tubers and greater resistance to powdery scab. In two supermarket surveys (by Western Potatoes), customers rated *White Star* highly for both appearance and taste. These benefits mean that *White Star* may help growers to increase their profits in this difficult production period.

Fergifry – a direct delivery French fry variety

This line has vigorous plants that are resistant to target spot disease and have a long growing period. Plants produce tubers early and have high yields of long shaped tubers. *Fergifry* is best suited for 'out of season' production areas and is being tested in large commercial trials for direct delivery harvest in late summer and also in winter (from ground stored crops).

Tasmanian French fry varieties

Lines have been identified from Australia and overseas breeding programs that show superior characteristics to the processing standard, *Russet Burbank*. The development of these selections into commercial use continues with the local processing companies. This project has been successful with the commercial adoption of *Ranger Russet* (20% of Simplot Australia's tonnage), grown primarily in the north-east of Tasmania (for direct processing and storage) on marginal soils that are not traditional potato growing areas. A further 10 cultivars from this program are currently the subject of large-scale commercial evaluation in Tasmania.

New evaluation process

The Victorian Department of Primary Industries will continue to operate Australia's only potato breeding program to 3rd generation stage.

Two new subcommittees of the Potato Industry Advisory Committee will be responsible for evaluation and commercialisation of varieties. These are the Fresh National Evaluation & Commercialisation Committee (FNECC) and the Potato Processors Commercialisation Committee (PPCC).

Acknowledgments:

We thank all the growers, processors and packers who have helped with variety testing over the past decade or more. This work has been funded by the Potato Levy, Commonwealth and State Governments, South Australia Potato Trust Fund Committee, Western Australia Potato Grower's Association and other grower groups.

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Your Levy @ Work

Potato variety evaluation, commercialisation and adoption:

Interim project stage 2

The purpose of this project was to evaluate the suitability of potato varieties from the breeding program for crisping, French fry and fresh markets.

We evaluated shape, size, growth habit, marketable yield, specific gravity, disease tolerance and cooking performance.

Trials were conducted in a range of environments and soil types typical of the diverse regions used for commercial potato production across Australia, including Toolangi, Koo Wee Rup, Ballarat, Berrigan and SA Mallee loam and sandy soils.

We examined a number of harvest times to reflect the year round supply of fresh potatoes for processing and fresh markets. This determines the ability of potential new varieties to handle heat stress and ground storage without a drop in yield or quality.

A number of potential new varieties will now be available for assessment by industry stakeholders on their commercial potential.

The work was carried out by Roger Kirkham and Graeme Wilson at the Department of Primary Industries Research Station at Toolangi, VIC.

Project started: July 2001
Duration: 2 years

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Evaluation of internationally bred potatoes

This project evaluated the suitability of 17 internationally commercial potato varieties for production in Australia's tropical (Atherton Tableland) and sub-tropical (Lockyer Valley & Darling Downs) growing regions.

We compared the international varieties with Australian commercial varieties being grown in these regions. The range of trial sites enabled testing under environments varying from harsh and dry through to ideal.

The proprietary variety, *Valor*, showed outstanding producing ability over a wide range of growing conditions. Under harsh, dry conditions *Valor* yielded 62.4 t/ha (47.7 t/ha tubers in the120-350g range), while under ideal growing conditions, yields rose to 85.9 t/ha (61.4 t/ha tubers in 120-350b range). These yields were significantly higher than *Sebago's* 32.3 t/ha and 58.1 t/ha respectively. *Valor's* role would be as a fresh market brushed potato as its skin texture can vary from sooth to slightly russetted. It has no processing ability.

Argos was another proprietary variety with potential for the fresh market. Its total yields ranged from 39.6 t/ha (harsh conditions) to 85.5 t/ha (ideal conditions). It is similar to *Valor* in that it would be best suited to the fresh-brushed market. It also has no processing ability.

Harmony has potential as a fresh washed potato, with smooth bright skin and potential for high yields. Its seed has a long dormancy Further testing of this variety is needed.

Of the redskin varieties tested, *Redgem* was a consistent performer although it was not significantly better than the standard varieties *Red la Soda* and *Pontiac*.

Kestrel showed ability as a dual purpose variety, continually achieving higher specific gravity measurements and outyielding *Sebago*, although not significantly. The main problem with *Kestrel* was its slightly longer and flatter shape than *Sebago*, and its purple eyes and eyebrow. At field days, concerns were raised that "consumers would not find *Kestrel's* appearance acceptable".

This project has shown some internationally commercial lines are capable of significantly out yielding a number of current Australian commercial lines.

Funded by Horticulture Australia on behalf of the potato industries, Elders Pty Ltd and the Queensland Government.

Project started: July 2001
Duration: 2 years

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Development of genetically engineered virus resistant fresh market potatoes

This project is developing potato cultivars with resistance to Potato Leaf Roll Virus (PLRV) and Potato Virus Y.

Improved lines with PLRV and Potato Virus Y resistance have been produced and tested in the glasshouse, with promising results. Transgenic lines of Sebago exposed to PLRV in the glasshouse have indicated these lines could result in up to 50% yield improvement.

A new method for identifying transgenic plants resistant to powdery scab and common scab has been developed. This will be useful in assessing resistance to these diseases.

This project is under review. In March, research scientists met with industry to talk about the future direction of the work (see June 2003 *Eyes on Potatoes*). Given ongoing public debate about genetic engineering technology, the meeting highlighted the importance of providing consumer benefits in any new transgenic lines.

This technology offers enormous opportunities for the potato industry, but may take several years before any varieties reach the marketplace.

Project started: July 2001
Duration: 3 years

Your Levy @ Work

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Better PCN and bacterial wilt detection to improve market access

Diagnostic tests being developed using new DNA fingerprinting technology are expected to increase the speed and reliability of detecting bacterial wilt or brown rot (caused by the bacteria *Ralstonia solanacearum*) and potato cyst nematode (PCN) *Globodera rostochiensis*.

The tests will allow quick and reliable detection of the bacteria and nematodes in plant material, potato tubers, soil and water where suspected outbreaks of disease occur. They will also determine whether produce or soil is disease free.

The accuracy and reliability of a DNA test for bacterial wilt is being compared with older, more cumbersome methods by testing soil and watercourses in a district with a history of bacterial wilt in Australia. New Zealand scientists are developing the tools to detect PCN.

PCN and bacterial wilt are two of the world's most destructive potato diseases. Both are subject to quarantine restrictions in Australia and New Zealand and outbreaks of either disease can severely limit trade across state and international boundaries, resulting in millions of dollars of lost income.

Project started: July 2001
Duration: 3 years

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Enhanced biodegradation of metham sodium - soil recovers slowly

Research has shown that prevention is the best approach to enhanced biodegradation of soil applied pesticides.

Enhanced biodegradation of metham sodium can limit its value for controlling soil borne pests and diseases. It is a problem that has no cure.

Research has shown that the use of this pesticide must cease for the soil to regain its microbial balance. Results from this project show that this can take years.

Severely affected soil last treated with metham sodium in March 1999, was tested every six months for the four years of this project. It was only at the last sampling that the soil showed any appreciable recovery, but it was still well short of untreated soil.

At this stage, it is still unclear how complete the apparent recovery has been. We suspect another application of metham sodium to the soil may quickly return it to the worst enhanced biodegradation level, rather than gradually reintroducing the problem.

With the end of the project, this is a question that will remain unanswered. However, the results reinforce the message that prevention is the best way to tackle the problem of enhanced biodegradation of soil applied pesticides.

This research is supported through Horticulture Australia by the vegetable and potato levies, the Australian Processing Tomato Research Council and Queensland Fruit & Vegetable Growers, and the Commonwealth Government.

Project started: February 1999
Duration: 4.5 years

JOHN MATTHIESSEN
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Biofumigation –impact on soil pathogens

Earlier research in this project showed pulverising and watering greatly improved the release and transport into the soil of fumigant-like chemicals from Brassica plants.

Testing the effects of these biofumigation treatments and different brassicas is often frustrated by the highly variable distribution of pests and diseases in soil.

To evaluate the impact of biofumigation treatments, the researchers used a WA Department of Agriculture site developed to have a heavy and uniform infestation of *Pythium sulcatum,* the cause of cavity spot disease in carrots.

Assessment of seedlings soon after germination showed significant reduction of *Pythium* infection in the roots in the plots previously sown to brassicas, compared with bare soil and carrots. The carrots are now being harvested and assessed.

This research is supported through Horticulture Australia by the Vegetable and Potato levies, and the Commonwealth Government.

Project started: July 2000
Duration: 3 years

JOHN MATTHIESSEN
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The role of pasture in managing soil borne diseases of potatoes

Pastures are an important part of the potato farming enterprise in many districts around Australia. This project is investigating the effectiveness of pasture as a 'break' for the diseases affecting potato crops.

We have always suspected pasture acts as a reservoir for some potato pathogens that cause disease. When we sampled field trial plots in the Central Highlands region of Victoria (near Ballarat), we found the *Rhizoctonia* fungus, which causes rhizoctonia stem canker and black scurf, favoured the roots of white clover and fodder *Brassica* over perennial ryegrass roots, wheat and barley. The fungus colonised more clover and *Brassica* plants than grass and cereal plants. The fungus also formed sclerotia (much like those that form on the potato skin) on the roots of clover and *Brassica,* but not on the roots of the grass and cereals.

The tough, thick walled sclerotia allow the fungus to survive in soil when a suitable host is not present. This means clover and *Brassica* may help perpetuate the fungus in a potato cropping system, whereas grasses and cereals may reduce the population.

This year we will compare the effects of no break (potatoes each year) with a gap of one or two seasons of grass or clover on populations of *Rhizoctonia* and other pathogens (powdery and common scab) in the rotation. Disease severity will be compared in the following crop.

Project started: July 2001
Duration: 3 years

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Sound hygiene and disinfection practices for potato farms

This project developed hygiene protocols*, including cleaning and disinfection, to help growers minimise the risk of contaminating healthy seed stocks.

It found the potato shed is a significant source of contamination and disease in seed potato stocks. Tests showed that dust in potato sheds was heavily contaminated with common potato pathogens that cause disease. The dust sampled from the shed floor was often more concentrated with pathogens than field soil. Even the air in the shed was laden with pathogen spores.

Several commercially available sanitisers were tested for their effectiveness in disinfecting various surface materials contaminated with the pathogens. However, researchers found disinfectants are best used after an effective cleaning program (dust extraction, vacuuming, pressure washing).

Implementing a shed hygiene program can result in tangible improvements in the health of seed and ware potatoes. Extra benefits include a cleaner and safer working environment and a clean image that can only be good for business.

*** The hygiene protocols are currently being produced as easy to use information tools that will be promoted and made available to industry.**

Project started: July 1998
Duration: 4 years

Your Levy @ Work

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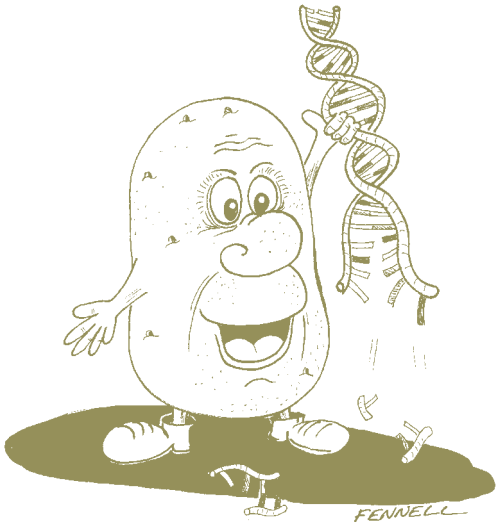
DNA fingerprinting tracks down soil borne disease

Forensic type DNA fingerprinting is being used to develop rapid and reliable soil tests for common potato pathogens. Ultimately one test will be able to detect several potato pathogens in soil. The soil counts (or amount of disease detected by the test) will be linked to disease thresholds or disease prediction systems that help growers make more informed management decisions.

The fingerprinting technology will greatly speed up soil borne disease research and provide a new window on the world of plant disease organisms in the soil. The tests developed so far can detect *Rhizoctonia solani* AG3, *Streptomyces scabies* (common scab), *Spongospora subterranea* (powdery scab), *Verticillium dahliae* (verticillium wilt) and *Helminthosporium solani* (silver scurf) in soil. We are developing the tests to reliably measure quantities of these pathogens in soil.



Project started: January 2001
Duration: 3 years

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Your Levy @ Work

Developing cost effective UV protection of biological pesticides

Potentially good biological pesticides are made ineffective by their susceptibility to the sun's rays. Providing effective protection for these pesticides will lead to more becoming available and those presently in use becoming more effective, enabling more effective incorporation of these pesticides into Integrated Pest Management (IPM) systems.

This project is developing titanium dioxide as a sunscreen to protect sun sensitive biological (soft) pesticides in IPM programs. The result will be that soft pesticides which do not kill beneficial insects (predators and parasites) will be more effective, and use of hard (broad spectrum *anticholinesterase*) chemical pesticides minimised.

Inorganic pigments such as titanium dioxide and zinc oxide have been used as sunscreens for many years. However, this sort of technology has not yet been successfully exploited to protect sun sensitive biological pesticides.

Titanium dioxide as UV protection

The potential for titanium dioxide as a UV protection agent had been shown in an earlier Grape and Wine Research and Development Corporation funded project. However, further ideas and developments were needed to create a viable system for field application. This project is exploring and developing these ideas.

Our formulating objective is to develop a tank mix additive capable of protecting biological and chemical pesticides from UV degradation. If successful, this would allow broader use of biological pesticides and lower application rates for chemical pesticides. Both aims will enhance IPM strategies.

An appropriate grade of titanium dioxide has been selected and formulated to yield a trial preparation showing good promise. In laboratory trials, with 2nd instar diamondback moth larvae on cabbage leaves, 0.1% of the formulation in spray water protected the biological control *Bacillus thuringiensis* (Bt) against UV degradation. The larvae also continued to feed on the Bt control agent.

Field trials of the formulation are planned.

If this project is successful, growers can expect improved performance from soft pesticide options and reduced application rates for UV-susceptible hard chemical pesticides.

This project is funded by the vegetable and potato industries and the Commonwealth Government.

Project started: December 2001
Duration: 2 years

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Influence of rotation and biofumigation on soil borne diseases of potatoes

A key finding of this first major study of the influence of crop rotation on potato disease and yield in Australia is the shorter the rotation the greater the disease risk in potatoes.

The length of rotation had a greater bearing on disease levels than crop species grown in rotation with potatoes. Minimum breaks of 2-3 years between potato crops are recommended.

However, our research also showed that managing species in the rotation is key to controlling *Rhizoctonia* (see Potato Australia Vol 13, 2002). This fungus (*R. solani* AG3) can survive the period between potato crops by colonising roots of fodder species such as clover and brassica (e.g. fodder and oilseed rape, Indian mustard).

A separate investigation of biofumigation did not highlight any significant effects of ploughing in fodder brassica crops before potatoes, even though laboratory studies had shown the volatile chemicals released from ground-up brassica leaves inhibited growth of several fungal pathogens.

Project started: July 1996
Duration: 5 years

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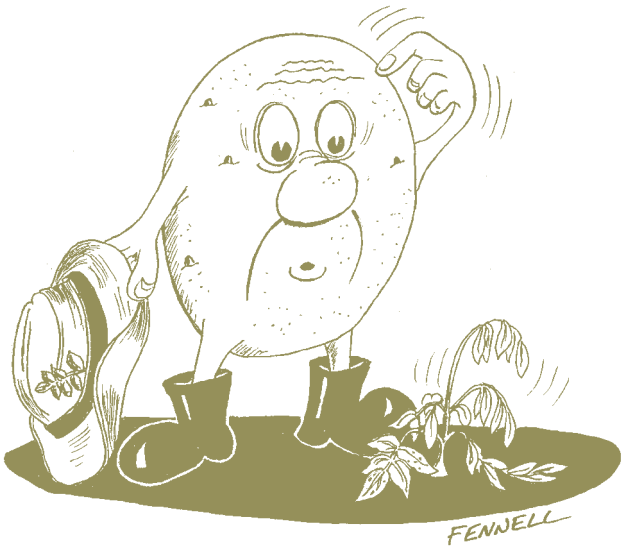
New chemical treatments for fungal diseases of seed potatoes



The results of this project will help seed potato growers make more informed decisions about the use of chemical seed treatments on their farms.

A series of field trials over four seasons compared the effects of several fungicide and disinfectant treatments of seed pieces on the carryover of seed borne diseases in 'old' ground (history of potato crops) and 'new' ground (potatoes not grown before) (see *Potato Australia Vol 13 2002*).

A number of disinfectant chemicals were identified as potential replacements for formaldehyde, a harmful chemical used as a post harvest seed treatment. Several fungicides were used as soil treatments to take into account soil borne disease in the seed treatment trials. One fungicide treatment significantly reduced the incidence of progeny tubers with black scurf compared with the untreated control and another significantly reduced the incidence of tubers with powdery scab. Neither is registered as a soil treatment at present.

Project started: July 1997
Duration: 4 years

Your Levy @ Work

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Disease management of potatoes on Kangaroo Island

Kangaroo Island growers are developing a potato seed industry.

Most have not grown potatoes before and have minimal knowledge of possible diseases and disease management.

To address this lack of knowledge and develop a data bank on disease incidence, we tested soil and plant material on the island.

The resulting information is critical for the growers, as most of the seed will enter the fresh market, where quality is paramount.

The outcome will be a data record system for each grower and a process to record and update individual record systems.

Project started: August 2002
Duration: 1 year

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VOLUNTARY CONTRIBUTIONS

The monitoring of potato crops for insect movement on a district scale

This project aims to improve seed potato crop management through pest monitoring and providing relevant information on seasonal conditions throughout the active growing period for seed crops.

The project is based in Gippsland, Victoria. Professionally gathered data on insect populations in potato crops, observations on foliage diseases and other pertinent data are distributed by facsimile or email to seed producers throughout Gippsland. The information is updated weekly.

An important outcome will be reduced incidence of potato leaf roll virus and other pests, and more effective pest and disease control programs.

Project started: December 2002
Duration: 6 months

VOLUNTARY CONTRIBUTIONS

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National facilitation of adoption of methyl bromide alternatives

In 1992, many horticultural industries worldwide faced their biggest threat of the modern era when methyl bromide (MB) was listed a Class One Ozone Depleting chemical and scheduled for phase-out in 2005 under the Montreal Protocol.

In Australia, MB underpins horticultural industries worth $1.5 billion and is our major barrier against the pest and disease outbreaks that could destroy the viability of industries and threaten endemic flora.

Since then, programs funded through the National MB Research Levy have enabled industries to reduce MB use by 70% in Australia and satisfy international restrictions under the *Montreal Protocol* without any productivity loss.

The Department of Primary Industries Research and Development Division at Knoxfield has conducted key research programs in the strawberry, flower and protected cropping industries and established a national communication and grower trial program to facilitate adoption of alternatives to methyl bromide.

The national communication and grower trial program has played a key role in keeping growers informed about policy issues and research outcomes relevant to the MB phase out.

Key outcomes include:

- development of a network of regional researchers and industry representatives to conduct grower trials and extension activities in MB-using industries
- production and distribution of the National Methyl Bromide Update. A bi-annual newsletter informing growers about research and policy issues relating to the MB phase out
- conducting 25 grower trials from 1998 to 2003 evaluating short-, medium- and long-term chemical and non-chemical alternatives to MB in major MB-using industries
- increasing grower confidence in short term strategies (eg. low-rate MB formulations) to meet MB phase-out obligations under the *Montreal Protocol*
- encouraging many of the major horticultural industries to commence the adoption of MB alternatives by supporting commercial scale-up trials
- production of the first nation-wide audit of MB used for QPS purposes and identified potential alternatives to MB for individual export and import markets.

DPI's research has been partly responsible for the global reductions in MB in the atmosphere and solely responsible for a 25% drop in MB concentrations observed in the air above Melbourne. It has also placed industries in an excellent position to phase out MB completely by 2005.

Project started: November 2001
Duration: 3 years

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Pest and disease crop monitoring for WA seed potato crops

Growers in Western Australia are working with researchers to monitor crops for aphids and thrips.

This study aims to minimise the chance of Western Australian seed potatoes becoming infected with potato leafroll virus and tomato spotted wilt virus. Crop monitoring is the key, with an emphasis on aphids and thrips that spread the viruses.

Last year, researchers monitored crops weekly, with advice sent to growers on pest abundance and recommendations for corrective action. Due to budget constraints, monitoring was reduced this season and growers undertook their own monitoring one week in four.

Growers gave positive feedback about the monitoring. It provided them with useful information on the presence of aphids and thrips. If spraying was necessary, the monitoring assessed its effectiveness.

This season saw little pressure from aphids, and thrip numbers were very low. Spray recommendations were mainly for aphids. There was one recommendation for a thrip spray because infestation occurred near crop emergence.

A review will determine whether monitoring will continue next season.

Principal Investigator: Mark Holland, AGWEST PLANT LABS, Department of Agriculture, WA.

Project started: July 2002
Duration: 1 year

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Tomato spotted wilt virus – what is driving the epidemics?

There are many factors involved in a tomato spotted wilt virus (TSWV) epidemic, but there are also a number of ways to help control this serious disease. This project looks at progress in developing control options.

Tomato spotted wilt is an important virus disease affecting more than 1000 different plants. It seriously affects potato crops in some parts of Australia. The disease is sporadic and infrequent, but losses can be considerable when epidemics occur.

Symptoms of the disease in potato vary according to cultivars and may be mistaken for early (*Alternaria)* blight disease, which is caused by a fungal infection. This can then lead to an underestimation of the disease and lead to inappropriate control responses.

On shoots, brown spots or rings may appear, which can lead to early death of the leaves. Brown streaks may also be evident on stems.

In tubers, scattered dark brown necrotic patches may be present internally, which render them unsuitable for processing or consumption. In moderately resistant cultivars or those that transfer the virus poorly to tubers (like *Russet Burbank*), only occasional internal spots and flecks may appear.

How it is spread

Tomato spotted wilt virus (TSWV) is transmitted to potato and other plants by thrips - tiny slender sap sucking insects only a few millimeters in length. Thrips acquire the virus during the immature stage of their development as they feed on potato plants and other hosts. These immature stages (larvae) are capable of transmitting the virus and continue to do so as adults. The virus may also be introduced to a crop through planting of infected seed.

Importance of understanding the causes of epidemics

Observations in the field, prior research and other historical information, all suggest a steady increase in the frequency and intensity of TSWV epidemics since the first report of the disease in Australian potato crops in 1935.

Over the past two seasons (2001-02 and 2002-03) epidemics of TSWV in southern Australian potato crops have been monitored with funding from Horticulture Australia. The monitoring aims to assess the risk factors associated with epidemics and develop an early warning system for potato growers. This will enable growers to make better decisions regarding cropping and disease control strategies.

The cause of sporadic epidemics

As with many other crops there is more than one factor responsible for the observed epidemics of TSWV in Australian potato crops. Information gathered so far suggests a complex relationship between virus sources, thrips that spread the disease, potato crops, weather and management practices.

For the past two seasons, research has been conducted on potatoes in Tasmania, Victoria, South Australia, and New South Wales (during the last season), to determine the role played by factors such as potato seed health, weeds as virus sources, thrips activity, virus levels, patterns of infection in crops over time, weather data and potato plant resistance to TSWV infection and movement of virus in the plant.

Thrips species that transmit TSWV in potatoes

While several thrips species are found in potato crops, only onion thrips (*Thrips tabaci)* and tomato thrips (*Frankliniella shultzei)* are known to spread TSWV and therefore responsible for the observed TSWV epidemics in potatoes. Although western flower thrips is important in the spread of TSWV in other crops within regions where surveys have been conducted during the past two seasons, the species is yet to be observed on traps within and adjacent to potato crops, and does not play a role in driving the epidemics.

This is significant given the ability of this species to transmit virus in other crops. The ability of onion and tomato thrips to acquire and transmit TSWV in potatoes requires investigation but preliminary evidence suggests tomato thrips may have a greater capacity for virus spread in potatoes, particularly from infected potato sources.

Thrips populations are affected by weather such as rainfall, temperature and relative humidity. Peak thrips populations have been recorded in potato crops in early summer but total number of thrips trapped is a poor indicator of disease risk.

Where is the virus coming from

There are two infection patterns of TSWV in potatoes in Australia. One involves primary transmission which occurs as thrips acquire the virus from a source external to the crop, become adults and then fly into potato crops. The second is, where the virus is introduced to the crop in infected seed (which is often found in seasons following prior epidemics).

External sources may be any number of weeds, or alternate crops. Some weeds growing within and adjacent

The variety Bismark (third row from left) showing high levels of resistance to thrips feeding damage and TSWV infection in a variety trial (2001-2002), University of Tasmania Farm (Cambridge, Tasmania).

to potato crops which have been found to be infected with TSWV include Marshmallow *(Malva parviflora)*, Cape weed (*Actotheca calendula),* Hare's foot clover *(Trifolium arvense)* Blackberry nightshade *(Solanum nigrum),* Treeflower nightshade *(Solanum triflorum),* Fat Hen (*Chenopodium album),* Clammy goosefoot *(Chenopodium pumilio),* Wild melon/Bitter melon *(Citrullus lanatus),* Wire weed *(Polygonum aviculare),* Prickly sowthistle *(Sonchus asper) and* Salvation Jane/Paterson's Curse *(Echium plantagineum/ E. lycopsis).*

Where external sources provide the majority of infections the disease is characteristically clustered on the edges of the crop. This scenario may render chemical control largely ineffective, as the thrips only require a short period of time to transmit the virus once they land on the crop. Furthermore, only small numbers of thrips are required to effectively transmit the virus. Subsequent spread from infected potato to potato may be limited.

Alternately, if infection has mainly been through planting of infected potato seed, the disease will appear as random infections spread throughout the crop.

Do potato varieties respond similarly to TSWV infection

Data gathered on more than 20 potato varieties from glasshouse and field experiments during the last two seasons has supported the conclusion that potato varieties differ in their reaction to virus infections and thrips feeding preferences. Preliminary field data has provided indications that at the resistant end of the scale, varieties *Bismark*, *Russet Burbank* and *Coliban* exhibit good resistance to TSWV.

The resistance to TSWV by *Bismark* in field trials is due to resistance to thrips feeding and damage, and consequently lack of virus transmission and not to the virus itself. This resistance to vector thrips could be useful in breeding programs and is a subject of further study.

The variety, *Royal Blue*, was highly susceptible to thrips feeding damage. At the susceptible end of the scale are varieties such as *Atlantic, Shepody* and *Victoria*, which were susceptible both in the field and glasshouse, allowing the virus to move through to the tubers more easily. Data analysis to confirm these results is currently in progress.

Role of weather in epidemics

Besides promoting the survival of the first larval stages of thrips, during which they acquire the virus, weather patterns within regions surveyed influence the availability of host weeds, a prerequisite for thrips breeding and subsequent infections.

What then can be done to control TSWV epidemics in potatoes

1. ***Use of resistant potato cultivars.*** The use of potato varieties with high levels of resistance to TSWV presents the best management option. However cultivar choice is often dictated by end use requirements and market preferences. No virus immune varieties exist but cultivars with good resistance to virus infection and to expression of tuber symptoms exist.
2. ***Use of certified potato seed***. Potato seed health is also crucial in minimising TSWV epidemics. Planting infected seed is an obvious source of disease and evidence suggests in years following major outbreaks significant levels of virus within seed can be an issue.
3. ***Use of insecticides***. There is currently little useful information on the benefits or otherwise of using insecticides for thrips control in minimising TSWV spread in potatoes. Because many of the virus sources are external to the crop, virus carrying thrips can migrate into a sprayed crop bringing the virus with them. However, materials that inhibit thrips feeding or deter thrips may be useful. In other crops, foliar applied insecticides with anti-feedant activity and/or granular materials applied at planting have been shown to be useful.
4. ***Monitoring thrips and infected plants within the crop***. For efficient use of foliar insecticides, knowledge of major thrips flights is useful for targeting sprays. Regular paddock inspections and roguing of infected potato plants will also reduce infection levels in the crop.
5. ***Weed control around potatoes.*** As many non-grass weeds can be an important source of the virus, weed control can reduce the virus level in the vicinity of the crop. Studies suggest infected plants close to the crop are much more important than those distant and keeping crop borders weed free can be important.

As TSWV affects many other crops, an investigation and analysis of the whole farming and cropping system within each region could provide a clearer understanding of what triggers TSWV epidemics and therefore allow effective use of an integrated disease management approach.

As shown by the experience in South Africa, a single switch in the rotation of paprika and potato crops, both of which host TSWV, halted the epidemics.

Developing a good understanding – particularly of the role of non-cultivated areas on or near the property as a starting point for epidemics – of TSWV epidemics will be essential.

Project started: February 2001
Duration: 3 years

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Your Levy @ Work

Development of extreme resistance to common scab

Resistance to common scab is being fast tracked using plant tissue culture techniques.

Common scab is a major limiting factor to the profitability of the Australian French fry processing industry and is difficult to control by conventional management tools. This project aims to develop durable resistance to the disease by using plant tissue culture techniques.

Prior studies have shown that all strains of the common scab pathogen (including Australian strains) produce a toxin (*thaxtomin*) which is essential for bringing on the disease. In fact if the purified toxin is applied to tubers it is capable of inducing scab lesions even when the pathogen that causes the disease is absent. Furthermore, recent studies have shown that specifically knocking out toxin production by the pathogen completely eliminates the disease, demonstrating the importance of toxin activity for pathogenic attack. This tells us that a high level of tolerance to the toxin in the host plant will lead to extreme and durable resistance to the disease.

In this project *thaxtomin* has been selectively used to screen for toxin resistant clones in commercial potato cultivars using tissue culture and cell selection techniques.

Regeneration of potato plants from toxin tolerant cell cultures

Mutation and cell selection techniques have successfully isolated toxin tolerant clonal cell lines of various cultivars including *Russet Burbank*, *Desiree*, and the New Zealand control cultivar, *Iwa*. A large number of potato plants have been regenerated from the cell lines, some of which show greater tolerance to the toxin than their parent control clones.

Effect of foliar auxin treatments on common scab disease on Russet Burbank grown in soil inoculated with Streptomyces scabies

Preliminary results from recent glasshouse trials indicate that some toxin tolerant clones showed promising expressions of resistance to common scab disease. These results will need to be confirmed in further glasshouse and field trials. Selection of other important cultivars including *Shepody*, *Atlantic*, *Pontiac* and *Coliban* are currently under way.

The first field assessment of toxin tolerant clones will be undertaken this season. This will provide field disease assessments and an indication of the agronomic performance of selected clones. The trial will be planted with minitubers derived from tissue cultured plants.

Other work within the project involves evaluating the mechanisms of disease resistance and alternative disease management strategies.

An alternative management tool for disease control?

In previous studies, foliar applications of the plant hormone, *auxin* and *auxin analogues* to potatoes have been shown to significantly reduce common scab incidence. To confirm these findings a glasshouse trial was carried out on *Russet Burbank*. Two auxin materials (CNB and 2,4-D) were applied as sprays. 2,4-D treatments were shown to significantly reduce scab surface coverage. CNB had little effect on disease. In contrast, little or no disease was evident for potatoes treated with 2,4-D. Although not statistically significant from the control, scab severity was also reduced with 2,4-D treatments.

Auxin treatments at high rates are toxic to plants and can reduce yield. In this pot trial no significant effect of the treatment on yield was found but tests in the field are required to check.

Screening for thaxtomin tolerance among regenerants. Leaves removed from plants are placed onto media containing the toxin. Arrows indicate lines with apparent elevated tolerance

Project started: October 2001

Duration: 3 years

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Developing management strategies for soil insect pests

Pre-crop sampling and soil pest management guidelines are tools that will soon be available to help growers reduce the risk of soil insect pest impact on tuber quality and yield.

This project is developing monitoring guidelines and new management strategies for the known major soil insect pests. For less well known and understood pests, the aim is to identify and understand their biology to uncover effective controls that can be used as required.

Progress to date

The second season of pre-crop soil sampling for African black beetle, whitefringed weevil and redheaded pasture cockchafer, and baiting for potato wireworm has delivered encouraging results. Researchers have successfully predicted the absence of pest problems or the need to treat or avoid paddocks where soil pests have been identified as a risk. They also ran light traps as a warning tool for "fly-ins" of African black beetle adults in autumn 2003. In all cases, damage has been low.

To encourage widespread adoption of pre-crop soil sampling, a pest identification guide and means for growers to get the soil pest information they require will be provided. This may be as a training option for growers or through a fee for service where trained scouts sample soils.

The less well known soil pests are being sampled in crops where they have been found. The sporadic nature of these pests has made gathering information difficult, but a cockchafer in far north Queensland associated with sugar cane cropping has been identified. In Robertson, NSW researchers have collected specimens of a cockchafer grub that caused isolated but severe tuber damage. Identification is underway. A similar insect has been collected at Dorrigo, NSW.

In the coming final year of the project, researchers will consolidate pre-crop sampling and put finishing touches on guidelines to avoid risk. They will also assess alternative control methods, such as rotary hoeing, that show promise in reducing red-headed pasture cockchafer numbers.

Potato grower, Nev Beaumont (front right), and project team researchers checking for soil insects in a NSW pasture paddock to be sown to potatoes.

Project started: July 2001
Duration: 3 years

Your Levy @ Work

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Your Levy @ Work

Black dot...

an underrated disease of potatoes in Australia

The main aim of the project is to develop management strategies to help washed potato growers and seed growers control black dot disease.

For many years, growers and researchers have considered black dot to be a secondary disease of low importance. However increasing demands on quality in both the fresh and processing industries have shown black dot to be an economically important disease due to external skin blemishes, internal tissue discolouration of stem ends and yield reductions.

Survival and spread

Studies show that black dot is primarily seed borne and can survive on the outside or inside of tubers. It also develops on stem and root tissue and other plant hosts which eventually results in it becoming soil borne.

Surveys of certified seed used in South Australia have shown some seed lots with up to 80% of tubers infected with black dot. Planting infected seed can result in up to 100% of the daughter tubers being infected as well as many of the neighbouring plants within the same hill.

Development in the field

Black dot can be detected in plant sap after seven weeks and visually on roots at ten weeks and tubers at twelve weeks after planting.

Development in storage

Black dot does not increase in cold storage (4°C for five months), whereas silver scurf does.

Weed hosts

Weeds were collected from potato fields and those fields cropped to potatoes in the past two years. Eight of the 28 plant species were infected with black dot.

Presence of black dot on 28 weed species collected from potato growing regions in South Australia 2001-02

Name	***Presence of black dot***
Wild oats (*Avena fatua)*	No
Barley grass (*Hordeum leporinum*)	No
Annual ryegrass (*Lolium rigidium*)	No
Capeweed (*Arctotheca calendula*)	No
Skeleton weed (*Chondrilla juncea*)	**Yes**
Stinkwort (*Dittrichia graveolens*)	No
Heliotrope (*Heliotropium europaeum*)	**Yes**
Wild turnip (*Brassica tournefortii*)	No
Sand rocket (*Diplotaxis tenuifolia*)	No
Wild radish (*Raphanus raphanistrum*)	No
Wild turnip (*Rapistrum rugosum*)	No
Wild mustard (*Sinapsis arvenis*)	No
Mallee catchfly (*Silene apetala*)	No
Fat hen (*Chenopodium album*)	**Yes**
Bastard melon (*Citrullus lanatus*)	No
Caltrop (*Tribulus terrestris*)	No
Paddy melon (*Cucumis myriocarpus*)	No
Wild tomato (*Citrullus colocynthis*)	**Yes**
Shepherds purse (*Capsella bursa-pastoris*)	Yes
Horehound (*Marrubium vulgare*)	No
Primrose (*Oenthera glazioviana*)	No
Three cornered jack (*Emex australis*)	No
Wire weed (*Polygonum aviculare*)	**Yes**
Flaxleaf fleabane (*Conyza bonariensis*)	No
Onion Weed (*Asphodelus fistulosus*)	No
Quena (*Solanum esuriale*)	**Yes**
Black nightshade (*Solanum nigrum*)	**Yes**
Soft roly poly (*Salsola kali*)	No

Cultivar susceptibility

A recent trial in the Mallee region of South Australia evaluated 14 commercial potato cultivars for resistance to black dot.

Incidence and severity of black dot on 14 potato cultivars

(Values with the same colour in a column are NOT significantly different.)

Variety	% of infected tubers	Avg. disease severity	Use
Riverina Russet	30	1.8	Fry
Shepody	30	2.2	Fry
Russet Burbank	32	2.0	Fry
Sonic	34	2.5	Crisp
Atlantic	36	2.1	Crisp
Winter Gem	45	2.1	Fresh
Dawmor	55	2.5	Crisp
Ida Rose	59	2.8	Fresh
Shine	59	2.6	Fresh
Ruby Lou	68	3.6	Fresh
Fontenot	69	3.2	Fresh
Desiree	76	3.7	Fresh
Coliban	76	3.3	Fresh
Nadine	79	3.1	Fresh

Severity rating scale 0 to 4

0 - no diseases, **1** - <2%, **2 -** 3 to 10%, **3 –** 11 to 30%,

4 >30% of tuber surface affected

Note: These results are based from one trial only.

No cultivars were free of black dot and *Coliban*, the most widely used cultivar for washed potatoes, was one of the most susceptible.

Example of how to interpret the table

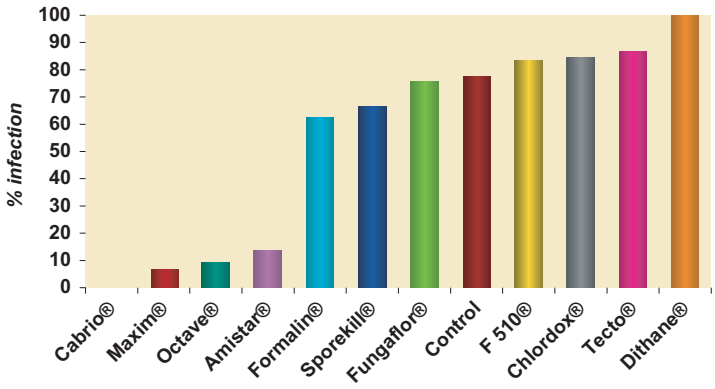
The percentage of infected tubers is significantly different between *Atlantic* and *Winter Gem* but not between *Atlantic* and *Sonic*. For average disease severity there is no significant difference between *Nadine* and any other variety in the column.

Fungicide Evaluation

Glasshouse trials

Eleven fungicides were evaluated as seed treatments for the control of black dot. Maxim® (*Fludioxonil*), Octave® (*Prochloraz*), Cabrio® (*Pyraclorostrobin*) and Amistar® (*Azoxystrobin*) all reduced the level of black dot on daughter tubers.

Percentage of daughter tubers infected by black dot in the glasshouse fungicide evaluation trial



Yield differences were not detected between treatments.

At the completion of this trial, soil from each pot was retained for a year and then planted with clean minitubers. The progeny tubers were infected, showing that black dot remains in the soil for at least a year. In pots where seed had previously been treated with Amistar® and Cabrio® but not Maxim®, the level of black dot infection continued to remain low.

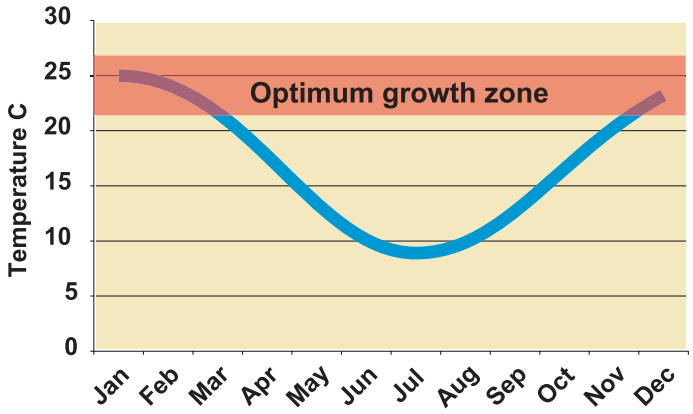
Field Trials

Eleven fungicides were evaluated as either tuber seed treatments or soil furrow treatments at planting in soil treated with and without soil fumigants Metham Sodium and Telone® (*1-3 Dichloropropene*) at four sites. Trends across all sites showed that the fungicides Maxim®, Amistar®, Cabrio® and Octave® were effective at reducing black dot.

Metham Sodium and Telone® alone reduced the incidence of black dot on tubers by 30-55% and increased average yields by 24% at two sites but decreased yields by 7% at two others. Soil fumigation was less effective when both seed and soil infection levels were high.

Black dot…an underrated disease of potatoes in Australia (continued)

Optimum temperature range for growth of the fungus black dot based on the average soil temperature at 20cm depth for five years at Loxton



Effects of temperature on the growth rate of black dot

Laboratory studies were carried out to determine the temperatures most suitable for the growth of the black dot fungus. The fungus grew at temperatures between 12 and 32°C, but was most active between 22 and 26°C.

By comparing this information with the soil temperatures in a particular region, growers may be able to adjust their planting/harvesting times to reduce the risk of infection.

Summary

- Black dot is now recognised as a major potato disease
- Black dot causes premature dying of plants and both external and internal tuber blemishes
- Black dot is present on many certified seed lots and can be introduced to the soil on seed tubers
- Black dot survives on the outside and inside of tubers
- Planting diseased seed can result in up to 100% infection on daughter tubers
- Black dot can survive for 12 months or more in soil
- Black dot survives on several weeds
- Seasonal infection levels are influenced by soil temperature
- Black dot does not increase in cold storage
- Susceptibility to black dot varies between potato cultivars, but none are resistant
- Some fungicides, such as Maxim® and Amistar® offer control
- Fumigants such as Metham Sodium and Telone® are not always effective.

For further information on symptoms, disease cycle and control measures please refer to Potato Australia 2002.

Project started: September 2001
Duration: 3.5 years

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Common scab threshold on tuber seeds for processing potato crops

Increasing numbers of seed crops do not achieve certification, due to the relatively low threshold levels for common scab.

Your Levy @ Work

Changes to the certification system (i.e. using disease severity rather than disease incidence) could result in major savings in seed production. However, the lack of follow-on studies of common scab thresholds and resulting disease levels in the field make it impossible to define how and what changes could be made by the processing industry.

This project aims to establish an achievable and meaningful common scab threshold level that reflects field performance, regional conditions and market acceptability.

Six trials were conducted in 2002/2003 in Victoria and Tasmania to examine common scab transmission from infected seed tubers, and to determine an achievable and meaningful common scab threshold level that reflects field performance.

We found common scab transmission was related to the actual common scab incidence on seed tubers. However, the certification process does not allow for this level of precision, and the certified levels were not reflected in the final results. This would appear to be due to variability in detection and sampling size. We also found common scab transmission to be related to the percentage of seed tubers with five or more lesions.

Formaldehyde and mancozeb seed treatments reduced common scab transmission from infected seed tubers, as well as reducing the disease severity. Generally, mancozeb applied as an in-furrow application was as effective as when applied as a seed treatment. Mancozeb seed treatment also negated the relationship between infected tuber seed levels and common scab transmission.

Project started: September 2002
Duration: 3 years, 2 months

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Your Levy @ Work

Avoid melon thrips yield loss

DPI's Carolyn Lee assesses thrip damage at harvest

Scientists from the Queensland Department of Primary Industries (DPI) have recorded up to 30% or $2400/ha yield loss in autumn potato crops from *Thrips palmi* (melon thrips) damage.

These losses can be avoided with an investment in crop monitoring and effective melon thrips management of about $300/ha.

Melon thrips can be managed. Effective strategies include:

- monitor the underside of middle leaves for thrips, particularly nymphs, from crop emergence
- if more than four thrips per leaflet occur at tuber initiation, action may be required
- minimise application of chemicals for other pests by monitoring and targeting sprays.

Interim findings

It is important to identify the level of melon thrips present. In two commercial potato crops monitored, one property recorded the highest level of 10 melon thrips per leaf while the other, also with a history of melon thrips infestation, reached only 4.5 melon thrips per leaf. The first property experienced a 30% loss in premium grade yield, the other no significant yield loss.

Another consideration is the thrips species present. Thrips identifications over the year have shown the load of different thrips species varies throughout the year. It is important to correctly identify thrips to choose appropriate pesticides.

The study concluded that for an autumn *Sebago* crop in the Lockyer Valley :

- under one thrips per leaflet can be tolerated without yield loss
- up to four thrips per leaflet, for a short period can also be tolerated
- critical time for managing melon thrips could be early in the season
- management practices used against other potato pests may contribute to melon thrips problem.

Another pesticide efficacy trial is planned for autumn in the Lockyer Valley. Tests will also confirm a threshold recommendation for autumn potatoes and imidacloprid sprays will be compared to other grower practices for control.

Project work will finish in January 2004 with expected outcomes to include advice to growers on sustainable management of this destructive pest.

The project is a collaborative effort by Horticulture Australia Limited, Queensland Fruit & Vegetable Growers Heavy Produce Committee, DPI Qld and Sumitomo Chemicals.

Project started: November 2001

Duration: 2.25 years

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Evaluating a product for enhancing dormancy and storage qualities of potatoes

DMN is used in the US to stop sprouting and improve storage quality. This product is now being assessed in Australia as an alternative to CIPC.

The University of Tasmania and Serve Ag Research are collecting information about the potato dormancy enhancer DMN, which is used commercially in the USA to stop sprouting and improve storage qualities of potatoes. DMN works by promoting dormancy within the tuber, so its mode of action is quite different to the current product CIPC, which works by stopping sprouting. Because DMN does not kill sprouts, it is suitable for controlled storage of seed potatoes.

To date, the project has focused on quantifying the levels of DMN that occur naturally in potatoes. Chemists at the University of Tasmania have developed techniques to better measure low levels of DMN, which will allow greater understanding of the role of natural levels. A small demonstration trial is being run in collaboration with Simplot, to provide observations on how effective DMN is in stopping sprouting under commercial storage conditions.

Project started: January 2002
Duration: 2 years

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Your Levy @ Work

Development of a universal grading system for potatoes in Western Australia

Western Potatoes coordinated a supply chain working group comprising members of the chain from grower to retailer, to establish an integrated working plan for the Western Australian potato industry.

Attendees at the workshop series unanimously agreed that further progress in addressing issues was limited by the different grading systems in each sector of the supply chain.

In addition, the different terminology used by each sector leads to confusion and misunderstanding and limits the ability of growers to receive meaningful feedback from consumers.

The aim of this project is to develop a uniform grading system for potatoes in Western Australia based on retailer specifications. As the industry for domestic ware potatoes is regulated in Western Australia, a uniform grading system is considered a priority to enable the industry to work together to better meet consumer demand.

The project will be carried out in three stages with involvement from representatives of each sector of the supply chain.

Project started: April 2003
Duration: 1 year

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VC VOLUNTARY CONTRIBUTIONS

Supply chain handling systems for premium potatoes

This project aims to develop integrated post harvest handling procedures and improved packaging options to increase consumer confidence in the appeal of fresh market potatoes.

The first stage of the project involved two separate surveys to help identify areas of concern. One survey looked at the quality of potatoes in retail outlets and the other gathered information from potato-packing operations regarding general procedures and problems. The following are preliminary results.

Fresh produce retail service – potatoes

The quality of fresh potatoes and the handling practices of retail staff at 600 major supermarket chains and independent outlets were assessed in November 2002 and February 2003. It was revealed that the majority of stores in most states check the quality of potatoes on arrival but less than 10% check the temperature. The exception was South Australia where 23.4% of stores checked temperature

The survey found that the majority of stores hold fresh potatoes in the general storage area rather than a cool room. South Australia was again an exception where 73% of stores keep the product in a cool room. In this case best practice would be to put stock straight on display, but for short-term storage a well ventilated area between 4∞C and store temperature is generally sufficient. The potatoes were also assessed for mechanical damage and breakdown.

Fresh Market Potato Packers' Survey

Representatives from 30 potato-packing operations participated in the survey, helping to identify several concerns common across this section of the industry. These concerns include poor starting quality, use of plastic packaging materials, cold chain issues, inadequate stock rotation, rough handling and disease. Issues such as better starting quality and handling, cold chain education and consumer education were the main responses on how to deliver an improved quality of potatoes.

Respondents said that research should be directed into cold chain, packaging, disease and starting quality issues. Although some of these issues are outside the scope of this project, the results of this survey can be used to direct future research and development efforts.

Project started: October 2002
Duration: 2.5 years

Your Levy @ Work

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Retired horticulturist, Bruce Beattie, is cataloguing Tasmania's potato history

Add your bit to Tasmania's spud history

Retired horticulturist, Bruce Beattie, a pioneer of potato minituber production techniques in Tasmania, is leading a project to catalogue Tasmania's potato history.

He's on the lookout for interesting information and yarns to add to a multimedia CD and web page production of oral histories, film and photos to be launched in December to coincide with Forthside Research Station's 40th anniversary.

The project also ties in with bicentennial celebrations due to begin next year, as Lt John Bowen brought potatoes with him in 1803.

Bruce is coordinating the project while doing a PhD on the effect of seed potato production on the subsequent commercial crop.

He has been collecting information about Tasmania's potato history for the past 15 years. He recollects that little change has occurred in the growing area for potatoes. For example, in the 1890s, a similar amount of land, about 9000 hectares, was used to grow potatoes as there is today.

Some of the events his history will record cover the first incidence of Irish Blight in 1910, the 1920s decline in productivity due to virus, and the subsequent introduction of the certified seed scheme. Other key events include the World War Two effort, when more than 350,000 tonnes of potatoes were grown on a massive 35,000 hectares of land to support soldiers in the Pacific.

Anyone with information for this project, please contact the Department of Primary Industries, Water and Environment. The information will be passed on to Bruce.

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Bruce Beattie is compiling a history of Forthside Research Station in celebration of its 40th anniversary

Managing bacterial breakdown in washed potatoes

Investigations were undertaken at commercial washing plants to determine the source and development of bacterial soft rot.

Your Levy @ Work

Four washing plants in South Australia were monitored for levels of *Erwinia* in tuber wash water and tuber soft rot. Studies were also undertaken at the Plant Research Centre to develop and evaluate methods to control bacterial soft rot in washed tubers.

The main findings were:

- Three species of *Erwinia* bacterium were shown to cause rotting of tubers in the field and storage: *E. carotovora* subsp. *carotovora* (75% of isolates), *E. carotovora* subsp. *atroseptica* (21% of isolates) and *E.chrysanthemi* (1.8% of isolates).
- The average incidence of tubers contaminated with *Erwinia* in the field was 26% (range 0 – 78%) and with an average severity of 0.7 (range 0 – 3.5).
- *Erwinia* were found throughout the washing plants. In general 57% of all water samples had levels within the range of $1,000^3$ to $10,000^4$ *Erwinia* colony-forming units per millilitre (cfu/ml).
- Most of the washing plants reused wash water, with surplus water collected from the washing plant into a series of settling ponds and re-used in the main washing areas of the washing plant. *Erwinia* were detected in all untreated recycled pond water and 86% of the pond water samples had *Erwinia* levels at $1,000^3$ cfu/ml or higher.
- In the washing plant most tubers were first infected when they were immersed in water in the initial washing tank and tumbler region. Average initial wash soft rot incidence and severity levels were 64% and 1.9, respectively whereas the soft rot incidence and severity in the tumbler were 88.6% and 2.9, respectively.
- Levels of *Erwinia* in the initial washing tank and tumbler water increased rapidly from 0 to $1,000^3$ cfu/ml within 15 minutes of washing time.
- Maintaining a low population of *Erwinia* in the wash water (less than 100^2 cfu/ml) reduced tuber soft rot. Regular renewal of wash water with water free of *Erwinia* will maintain low levels of *Erwinia.*
- Sanitising agents such as Oxine“, Nylate“, Klorman“, Liquid Pool Chlorine, Sporekill“, Proxitane“ reduced *Erwinia* in water. However, rates 10 to 250 times greater were needed to achieve the same level of control in wash water, which was high in soil and organic matter. Most importantly before any of these treatments are applied to recycled pond water, the quality of the water must be improved by removing the majority of the soil and organic matter.
- Ultra violet irradiation controlled *Erwinia* in recycled pond water. As with the sanitisers, quality of water must be improved before application.
- Exposing infected tubers for 60 seconds microwave on a high setting at 850Watt controlled soft rot.
- Air drying infected tubers with hot air at 45 - 50∞C for 60 seconds or an air knife also controlled soft rot but was not as successful as microwave irradiation.
- Maintaining tubers in a dry condition before packaging helped minimise soft rot.

Conclusions

- The main contributor to soft rot infection was infected wash water
- The level of rot on tubers entering the washing plant did not have a significant effect on the development of soft rot in the washing process
- Using clean water reduced soft rot
- Once infection had occurred in the washing process, only microwave, ultraviolet irradiation, heated air drying or drying with air knives reduced soft rot before packing.

Project started: July 1998
Duration: 4.5 years

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Industry development plan for SA growers

In late 2002, the Potato Growers of South Australia (PG of SA) commissioned a research project to develop an industry strategy aimed a number of key areas affecting the industry:

- Variety selection and evaluation
- Best practice management
- Promotional campaign with retailers
- Supply chain study

The plan aimed to establish a state-based industry development fund to help address the key areas.

The project involved:

- Desk research (industry statistics, data and background information)
- Questionnaire survey
- Regional workshops.

Following the regional workshops, a draft report was compiled and key outcomes sent to growers and packers.

Key outcomes

Industry stakeholders acknowledged the need to arrest declining potato consumption through active promotion, and address other issues affecting growers, such as variety selection and evaluation, and supply chain issues. It was also recognised in order to achieve these changes, resources must be found and adequate funding was critical.

One issue raised in the workshops concerned the low level of supermarket staff knowledge in regard to the correct storage, handling and display of fresh potatoes (including variety knowledge). As a result, workshop attendees agreed on the development of a training program for retailers.

Another area of concern involved the critical nature of variety selection and evaluation to the industry's future.

The next steps

Following the final report, industry representatives will meet with the South Australian Minister for Primary Industries, with a view to establishing the fund by 2004.

Project started: December 2001
Duration: 6 months

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New horticultural opportunities for Manjimup and southwest WA

Researchers undertook a desktop analysis and identified 15 possible opportunities for new horticultural enterprises at Manjimup and the southwest region of Western Australia and presented their results to the New Futures Project steering committee.

They recommended a detailed assessment of the opportunities, which included Navel oranges, Perigord Black Truffles, summer production of processing Iceberg lettuce, plums, walnuts and hazelnuts.). (The report, *New Opportunities for Australian Horticulture*, is available for a fee from the sponsoring Growers' Group).

The steering committee approved a study tour to investigate some of the more promising options and new markets. This is likely to be undertaken this year, with the final report produced in March 2004.

New Futures involved an evaluation of 50 crops to identify opportunities and constraints for development in the Manjimup region. The major constraints identified were lack of market opportunity, lack of supporting infrastructure, lack of obvious competitive advantages for Manjimup and crops with high labour requirements without compensating high returns.

Project started: October 2001
Duration: 18 months

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Seed market in West Java to help Australian potato growers

The West Australian potato industry is looking for new markets for its premium seed potatoes. Large potential markets can be found in neighbouring Asian countries such as China, the world's largest potato producer.

Asian markets are hungry for affordable, high quality seed potatoes, as poor quality seed is a well known and major constraint to increasing the efficiency of potato production.

High quality seed is expensive and new markets cannot be established until suppliers demonstrate the benefits of their seed. The supplier also needs to show commitment to the market in the form of assistance to potential customers. However, market development is expensive and difficult for Australia's relatively small potato exporters.

For markets to develop, suppliers need to become familiar with, and determine the best way to meet, the market's particular requirements.

Western Potatoes, the WA Department of Agriculture and Indonesian potato crisp producer, PT Indofood have developed a partnership to help develop a supply of good quality, affordable seed for Indonesian contract growers. This would allow growers to develop a more reliable supply of locally produced potatoes, as supply of potato crisps in Indonesia is well below demand. The processor has a staff of experienced potato agronomists that will ensure the experiments and demonstration are grown using best management practice.

Growing potatoes in West Java differs from Australian potato growing. The project will help answer questions regarding seed suitability and other concerns such as:

- How does Australian Atlantic seed perform in West Java?
- Which planting times give the best performance?
- Does the seed need to be fresh or cool stored?
- Will Australian suppliers be able to send larger seed for cutting?
- What are some of the major constraints on seed performance and can these be overcome through management changes?

We sent a test shipment of seed to West Java for planting in various experimental and demonstration plots at Pangalengen and Garut. The crops are looking good with little bacterial wilt, and are to be harvested in mid August.

Travel restrictions have affected the project, with the Australian partners being unable to visit the trial sites. However, the experience of our Indonesian partners combined with the help of the Western Australian trade representative in Jakarta, means the project should still be a success.

Project started: September 2002
Duration: 14 months

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VOLUNTARY CONTRIBUTIONS

Development and delivery of an induction program for new certified seed growers

An induction program for new Certified seed growers will provide the new seed growers with an understanding of the history and concepts behind Certified seed production. It will enable the growers and their staff and family members to understand production rules and processes for Certified seed production. The overall aim is to efficiently and effectively assist growers to move into Certified seed production.

The course is expected to:

- provide participants with a thorough understanding of the history of Certified seed production
- enable participants to effectively and efficiently grow Certified seed by following the scheme rules and carrying out the processes involved
- help participants avoid pitfalls of seed growing, and understand the administration processes
- help participants become effective Certified seed growers with high standards of seed management.

Project started: July 2003
Duration: 4 months

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VOLUNTARY CONTRIBUTIONS

Crop management service development for seed potato production in Tasmania

Seed performance is critical to the long term competitiveness of the processing potato industry in Tasmania.

Simplot R&D has examined the performance of the many seed lines produced for processing crop production over the past three years in large replicated trials.

We have been surprised by the difference in seed line performance, with a range in yield between poor and good seed lines of about 30% in each year!

A project involving Simplot Australia Pty Ltd, Tasmanian Potato Seed Growers and Horticulture Australia started in July 2002 to:

- promote new technology for seed potato crop management
- encourage the widespread use of agronomists and consultants
- collect and analyse key data on seed crop production, irrigation, plant nutrition, pests and diseases.

The service was employed for 33 seed potato crops in the 2002/2003 season. Full sets of data for these crops have been entered into a database and a 50-page report has been produced and made available to Tasmanian potato seed growers.

The report includes a generic section outlining the R&D progress made by the analysis of the combined data. This section includes locally derived information on the financial impact of water stress, inadequate plant nutrition, plant population, planting date, and disease. It also contains a section that records and analyses the information collected on the individual seed crop, and contrasts the key data with the overall industry averages.

Tasmanian seed potato growers and cool store operators attended four workshops to explain the service and its findings. The service has strong support and will be expanded for 2003/2004.

Project started: October 2002
Duration: 3 years

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Identifying variability across seed potato blocks using precision farming technology

Soil variation on seed potato production properties can lead to micronutrient deficiencies resulting in variability in plant performance.

This project aims to identify the variability across seed potato blocks in the Southern Tablelands of NSW using precision farming technology, with the aim of improving soil and water management, and identifying the micro-nutrient status of the various soil types and rotations to determine any yield constraints.

Project started: February 2003
Duration: 6 months

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Effects of potato seed characteristics on seed- piece breakdown and poor emergence

Potato seed certification focuses on identification of diseases in the parent crop and visual assessment of tuber diseases, without providing information on potential seed quality and performance.

A high yielding, quality crop starts with high quality seed and seed pieces in good condition at planting. However, currently there is a lack of suitable indicators to define and determine seed quality.

A one- year feasibility study in 2002/2003 investigated measurable tuber seed properties including specific gravity, nutrient elements, skin firmness, wound healing, and susceptibility to dry rot, as indicators of seed quality and performance.

All tests are complete and the data sets being collated for analysis.

Project started: September 2002
Duration: October 2003

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Managing nitrogen for quality and yield in seed potato crops

Seed potato growers will have access later this year to better guidelines on nitrogen management to improve seed crop yield and quality.

A Tasmanian research team is drafting the guidelines following three years of crop monitoring (1999-2002 seasons) to investigate the effect of nitrogen release from crop residues and fertiliser carryover on seed potatoes.

Importance of nitrogen

Nitrogen (N) greatly influences yield and quality in seed potatoes. If users of seed are to gain its full potential, nutritional management of seed potatoes has to focus not only on yield, but also on storage and subsequent crop performance.

Nutrient management includes taking into account the N that becomes available from incorporated plant residues and organic matter during the growing season. N from mineralisation and possible N-fertiliser carryover from the previous season can significantly impact the crop by producing unexpected N excesses or flushes which may affect tuber set and seed performance. N flushes can lead to growth spurts resulting in other nutrient deficiencies as well as higher susceptibility to foliage diseases. On the other hand, N deficiency at any time will be detrimental to yield.

Investigating nitrogen dynamics

The team drew on previous research that revealed alarmingly high soil nitrate levels, especially in ex-pasture soils, during early to mid summer.

They monitored soil and plant N levels in seed potato crops, which were assessed for plant, stem and tuber numbers, yield, tuber size and quality prior to harvest. Crops to be monitored were selected by participating seed producing companies to represent different paddock histories - previous crops with high or low amounts of N release from crop residues.

The test for monitoring available soil N levels, *N-check*, was adopted from Europe, where it is the recommended method for managing N inputs into crops to avoid environmental problems through nitrate leaching into waterways. The test for monitoring N uptake into the plant, *NU-test*, analysed nitrate levels in petiole sap. Different from tissue testing, which provided information on nutrient accumulation, *NU-test* showed current nutrient uptake, and reflected nutrient availability in the root zone and uptake conditions.

Cropping history affects available N

Data collected from seed potato crops with different histories showed that cropping history should be taken into account when determining N fertiliser inputs.

The crop preceding potatoes influenced soil, plant and tuber nitrate levels. The exposure of seed to high soil nitrate levels influenced seed quality after storage as well as performance of the following crop.

Some outcomes

A seed potato crop was grown under a centre pivot. Half the paddock had been pasture, the other half lucerne. The seed potato crop was not top-dressed. The old pasture had little plant material, while the lucerne provided a large amount of easy to mineralise organic material.

Nitrate available to each crop differed. Mineralisation from lucerne caused high soil nitrate levels in January (probably due to a rapid increase in microbial activity, supported by the large amount of fresh material with a favourable Carbon: Nitrogen ratio, which then dropped rapidly). The rapid decrease was partly due to plant uptake, but also to denitrification (loss of N to air) and tie up of nitrate in soil organic matter (humus). In comparison, pasture delivered less than 50% of the N mineralised after lucerne.

However, N uptake over time was similar in both parts of the paddock, indicating that plants do not take up excess amounts, even if available.

The lucerne side of the crop yielded higher than the pasture. This is likely not due to higher N availability: rather the better soil structure and root volume observed on the lucerne side may have led to higher tuber set.

Simplot Australia Pty Ltd, McCain Foods (Aust) Pty Ltd and Harvest Moon Pty Ltd funded this research, with matching funds from Horticulture Australia.

Project started: December 1999
Duration: 3.25 years

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Scoping study for a seed potato industry in South Australia

South Australia is a major producer of fresh washed potatoes in Australia as well as a significant producer of French fries. Certified seed potatoes are sourced mainly from interstate. Seed quality varies and this variation can have an important economic impact on the fresh crop in particular. Current certification procedures are based on visual inspection.

This project is exploring how better communication and processes in the demand chain can supply a more consistent product that attracts a fair market price. It will assess the potential for seed potato production in SA, highlight potential strengths and identify weaknesses that need to be addressed.

Project started: January 2003
Duration: 4 months

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VOLUNTARY CONTRIBUTIONS

Survey to determine the prevalence and incidence of common viruses in potato seed stocks in Tasmania

The National Standard for Certification of Seed Potato relies mainly on the visual detection of viruses in the field during crop inspections

However, field inspections are unlikely to detect viruses such as Potato virus S (PVS) and Potato virus X (PVX), as these viruses do not produce obvious symptoms in the field. The WA seed potato industry has markedly reduced the incidence of these and other viruses in seed stocks by conducting intensive surveys. However, other states have not followed this lead.

PVS is often considered a relatively benign virus, with reported yield losses of 0-15%, and PVX reportedly causes yield losses of up to 20%, yet few studies have been conducted in Australia. PVS and PVX are reported to be spread mechanically, such as during seed cutting, and through contact between infected and healthy plants in the field. Aphids transmit the Andean strain of PVS.

Laboratory testing suggests PVS, PVX and potato leaf roll virus are present in some seed potato stocks in Tasmania. This project will conduct a comprehensive survey of seed potato crops in Tasmania to test for PVS, PVX, potato leaf roll virus and Potato virus Y. Strains of PVS will be characterised to determine whether they are the ordinary or Andean strain.

Project started: October 2002
Duration: 15 months

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VOLUNTARY CONTRIBUTIONS

Virus testing of early generation certified seed potato crops, WA

Maintaining low virus levels in seed potatoes presents a serious challenge under Western Australian conditions.

Virus levels have generally been controlled within the seed schemes but serious outbreaks have occurred and are of concern for the domestic industry and emerging export markets.

WA seed growers are using the results of Mark Holland's virus testing research to identify outbreaks and assess risks in future crops

This project investigated the level of virus contamination of certified and registered second generation sown crops.

Eight thousand plants were tested close to senescence. The results showed the incidence of Potato Leaf Roll Virus at 0.1%, Tomato Spotted Wilt Virus o.o1%, Potato Virus S 0.28% and Potato Virus X at 3.38%. All plants infected with Potato Virus X were found on one property. The results confirmed the high health status of Western Australian second generation certified and registered seed crops.

Seed growers have used the information to identify outbreaks of virus in crops and enabled them to determine virus risks prior to sowing large third generation crops. As a result, they have either applied appropriate control measures or removed seriously infected seed lots from their program.

Project started: February 2003
Duration: 11 months

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VOLUNTARY CONTRIBUTIONS

Seed development

Study tour for Kangaroo Island seed potato growers

Kangaroo Island's Quarantine Status prevents the introduction of serious soil borne diseases and the island is one of the most disease free areas for seed potato production in Australia. It has a sparse history of potato production and climate favourable to the production of healthy early generation seed potatoes.

David Pike from Neerim Junction, near Warragul, talks with Kangaroo Island seed growers

Seed potato production on Kangaroo Island is a relatively new industry. Farmers on the island were keen to improve their skills through networking with other seed growing areas.

Five growers and John Fennell from Primary Industries and Resources, South Australia, undertook a study tour in February. The itinerary was:

Sunday 9 February

Travel from Kangaroo Island to Melbourne by air, minibus to Healesville, evening meeting with Seed Potatoes Victoria

Monday 10 February

Morning at IHD Toolangi to see the tissue culture facility and learn about the potato breeding program. Meeting with ViCSPA. Afternoon with growers at Neerim Junction and Warragul to view crops and shed activities. Evening meeting with growers from Thorpedale.

Tuesday 11 February

Morning at IHD Knoxfield to discuss potato diseases , hygiene and diagnostics. Air travel from Melbourne to Launceston, Tasmania and minibus to Ulverstone. Evening tour of Simplot potato processing factory.

Wednesday 12 February

Visits to potato minituber production facility at Stoney Rise, Devonport, potato cool stores and seed cutting business at Latrobe and Dobmac Agricultural Machinery manufacturer at Ulverstone. Visits to seed growers and crops at Wilmot, Riana and Nietta. Evening meeting with seed potato growers.

Thursday 13 February

Inspection of potato harvesters at Landpower, Ulverstone and visit to Harvest Moon seed potato production at Cressy. Return flights from Launceston via Melbourne and Adelaide to Kangaroo Island.

The group made many useful contacts and gained a better understanding of issues important to running their businesses.

Project started: January 2003
Duration: 4 months

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VOLUNTARY CONTRIBUTIONS

Potato seed certification workshop

ViCSPA conducted training for eight Certification Officers from Tasmania, Victoria, South Australia and Western Australia from January 13 to 17. The training was held at the Victorian Department of Primary Industries' (DPI) Potato Research Station, Toolangi.

Specialist lecturers from Knoxfield provided the latest information on virus diseases and fungal problems. Field trips to Thorpdale, Koo Wee Rup and Gembrook provided practice in field and tuber inspection skills.

The workshop addressed issues including improved knowledge of variety identification, best practices for inspection, plant diseases, the National Standard, tuber quality assessment and new varieties from the NaPIE program.

The participants successfully completed a competency based assessment for rules and process associated with tuber and field inspections, and all practical tuber/field inspection exercises.

Thanks to the DPI at Toolangi and Knoxfield and Bruce Ure, Greg Marsen, Frank Rovers, Keith and Graeme Ingleton and Graeme and Dot Chapman for assistance with the field exercises.

This course will be held biannually and the next training is proposed for December 2004.

Project started: January 2003
Duration: 13 months

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VOLUNTARY CONTRIBUTIONS

Potato varieties
- ensuring our public varieties perform

Commercial growers need vigorous true to type seed to have the best chance of achieving high yields of quality potatoes.

To ensure ongoing access to good seed of public varieties, a collection is maintained by ViCSPA on behalf of the Australian potato industry.

The collection is used for all seed schemes in Australia and is held *in vitro* at the Department of Primary Industry's research centres at Knoxfield and, a duplicate collection, at Toolangi. The Department of Primary Industries Water and Environment, Devonport, also holds some public varieties *in-vitro*.

Each year six to 10 mini tubers from each accredited laboratory are planted in field plots to check the plants produced are true to type. The plots are an aid to identifying off types or mutations that have been known to occur and to identify variety mixes.

As well, an industry committee assists in selecting plants of five varieties for re-testing (re-indexing) for diseases and DNA fingerprinting. The varieties are also checked to ensure they are free from *Bacillus,* which can contaminate cultures. These five varieties are then added to the *in-vitro* collection.

The aim is to "refresh" the whole in-vitro collection every eight to ten years and ensure the best types and vigorous seed of each public variety are available to industry via state certified seed schemes.

Potato in-vitro cultures - the public variety collection is stored at Knoxfield and Toolangi. The collection contains selections made by specialist seed growers in Victoria over many years as well as specialist lines from other states.

Status of variety selections

The following varieties were selected in 2001 and will be ready for release to accredited laboratories, after virus testing. They are *Atlantic* (to be known as *Atlantic Line C*), *Sebago (Line E), Bison (Line C), Bintje (Line B)* and *Coliban (Line C).*

Varieties selected in 2002 will be ready for release as soon as DNA and virus testing is complete. They include *Exton, Kennebec Laine 2, Russett Burbank* (Ruen Strain), *Snowgem* and *Trent*.

Red La Soda, Sequoia, Shepardy, Spunta and *Wontscab* have been sent to Knoxfield for pathogen testing after selection and harvest in 2003.

Selections for 2004 include *Desiree, Crystal, Ranger Russet, Simcoe* and *Pontiac.*

Project started: August 2002
Duration: 3 years

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Verification plots growing at Toolangi in flower and being assessed.

Your Levy @ Work

Seed potato handling and storage – implementing best practice

Researchers are developing a user friendly Best Practice Seed Potato Storage and Handling Manual that has the potential to substantially boost industry profitability.

Your Levy @ Work

Current Australian seed potato handling and storage practices do not always result in optimum quality seed, affecting commercial potato crop performance and yield.

The manual will provide practical guidance on using and/or upgrading existing facilities and implementing good practices, cost efficiently. An industry training program, explaining best handling and storage methods and their incorporation into operation and quality management systems, will facilitate the adoption of practices and technologies outlined in the manual.

The project has involved liaison with local industry groups, storage operators, extension personnel and researchers to ensure the outcomes will meet industry needs. The researchers have sourced information from Holland, Scotland, the US and the UK, and visited seed producers/storage companies in NSW, Victoria, South Australia and Tasmania.

They have revised the working definition of 'seed potato storage' to: ***seed storage management starts at harvest and ends when the seed is planted***. They define the ***storage period*** as starting with vine death and finishing at planting. The 'in-store period' is only part of the storage period. The importance of pre- and post-store factors was highlighted in most publications and stressed by seed growers/storers.

Seed industry stakeholders believe seed producers storing their own seed are able to create the correct storage environment. Seed performance was said to be influenced by supply chain management and communication (seed and ware potato producers), on farm storage (by ware potato producers), seed grading, cutting and disease management.

Potato plant grown from healthy seed

Commercial crop grown from healthy seed

The manual will include vital information on:

- What can go wrong
- Risk management
- Monitoring to identify and prevent problems
- Specifications
- How to improve on priority issues and get as close to specifications as possible under given conditions
- Self assessment of operation
- Physiological age
- Communication within industry
- Disease prevention and control
- Common problems
- References

Project started: March 2002
Duration: 1.25 years

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Thailand delegates visit Australia for seed scheme inspection

Monaghan Packers Pty Ltd has been exporting seed potatoes to Thailand for around 10 years.

The majority of seed exported to Thailand is from the Gippsland and Otway districts, which have predominantly red heavy soil types.

Thailand's phytosanitary requirements have been relaxed enough in the past for us to export seed with low levels of soil adhesion. However, this changed last year with the introduction of stricter requirements for soil adhesion and powdery scab tolerances. If these requirements remain, Gippsland and the Otways would be excluded from further exports.

To continue exporting under new conditions was almost impossible, so we approached Horticulture Australia for assistance to bring a delegation of Thai Department of Agriculture officials to Australia. We wanted them to see first hand how the Victorian seed scheme operated and reassure them our regulations ensured seed quality was of a high enough standard to minimise any risk of disease and pest transmission on tubers.

The delegation comprised the Chief of Plant Quarantine Thailand, Dr Udorn Unahawutti, Senior Agricultural Scientist Ms Preyapan and Thai Agricultural Inspector, Mr Supoj. The Australian Plant Biosecurity and the Australian Quarantine Inspection Service were involved in arranging the program, which consisted of farm visits in the Gippsland areas and meetings at Knoxfield and Toolangi.

The Thai officials agreed in principle that the strict phytosanitary requirements for seed exporting from Australia to Thailand could be reviewed. They were satisfied the Victorian seed scheme had the best systems in place to ensure the highest standard of seed.

The Thai Plant Quarantine is now in the final process of reviewing the phytosanitary requirements. We are hopeful of a favourable decision within the next couple of weeks, which would allow us to continue exporting seed from the traditional growing areas.

Project started: April 2003
Duration: 2 months

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VOLUNTARY CONTRIBUTIONS

Seed Potato Advisory Group update

The Seed Potato Advisory Group (SPAG), using information from the State Certification Authorities has compiled a record of areas (in hectares) submitted for certification in Australia (Victoria, Tasmania, Western Australia, New South Wales and South Australia) during 2002.

Summary of the areas of each variety grown in Certified seed schemes in Australia in 2002/2003

Variety	Area (Ha)	Variety	Area (Ha)
Russet Burbank	719.91	Riverina Russett	9.69
Atlantic	582.29	Bintje	9.16
Coliban	446.26	Wontscab	8.42
PBR Varieties	427.65	Bison	7.88
Sebago	239.28	Bismark	6.11
Ranger Russet	128.82	Catani (86-34-4)	5.70
Desiree	103.93	Up-to-date	3.35
Kennebec	78.52	Nooksack	2.27
Pike	41.09	Red la Soda	1.93
Ruby Lou	40.02	Dawmor	1.37
Granola	38.20	King Edward	1.09
Trent	37.25	Tasman	1.04
Exton	34.00	90-77-4	0.92
Sequoia	27.13	Brownell	0.72
Delaware	24.47	Rideau	0.58
Crystal	21.35	Kipfler	0.51
Lustre (92-19-10)	20.96	Mainchip	0.44
Pontiac	19.23	92-37-1	0.41
Spunta	18.11	Toolangi Delight	0.31
Shine	16.21	Macrusset	0.28
Nicola	14.78	Breaklight	0.10
Sebago (line D)	13.27	Purple Congo	0.06
Pink Eye	13.18	Pink Fir Apple	0.05
Simcoe	12.87	Norland Super Red	0.03
Wilwash	11.95	Wilstore	0.02
Denali	11.26	Red Norland	0.01
Snowgem	10.87	Onka	0.01
		Totals	**3215.32**

Areas of private varieties (that is, those under Plant Breeders Rights) have been combined under the heading PBR varieties. The list does not include registered seed in WA or approved seed in Tasmania, **which do not comply with the national standard for the certification of seed potatoes.**

Proposed change to Standard

Following industry consultation, the SPAG committee submitted the following proposed change to the National Standard for Certification of Seed Potatoes to APIC for its consideration:

"That the tolerance for Foreign varieties for Rating 2 at the second field inspection be increased from nil to 0.01%."

Currently the National Standards require that R2 crops should have a nil tolerance for foreign varieties at the first and second field inspection. The Certification Officers conducting inspections and some growers agreed that the nil tolerance was very severe when an odd foreign plant or self-sown was present.

One proposal was to allow a tolerance of two foreign plants per hectare. However, after consideration it was decided to recommend an allowance of 0.01% that then allows for various sized plots. With a plant population of about 60,000 per hectare (200mm in row spacing and 0.813 row spacing), the tolerance would allow up to six plants per hectare.

APIC has recently approved the change, which will be incorporated into the National Standard next season.

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Your Levy @ Work

Blueprint for a round seed system for Australia's potato processing industry

This project aims to find the best way of producing round seed and determining an equitable payment system for seed growers.

Work in 1999/2000 and 2000/01 showed the strong influence of plant density on round seed yield. However, a comparison between planting whole and cut setts had little effect on either total yield or round seed yield.

Work by Philip Brown, University of Tasmania, showed *Carvone*, a natural sprout suppressant, enhanced the production of round seed. While our 2000/01 trials showed a significant positive effect of *Carvone*, it was less than that found by Dr Brown.

In his work, Dr Brown concluded seed source, mother crop husbandry, harvest and subsequent storage condition had a greater effect than *Carvone* on seed size distribution in the ensuing crop.

To pursue the latter finding, this project was extended. In 2001/02, seed used in previous trials was bulked up in readiness for 2002/03 trials. In cooperation with industry, seed was selected from private seed crops at various locations, times of harvest and storage condition.

Trials using collected material were established in 2002/03. Preliminary indications show no significant effect on round seed production.

A preliminary economic analysis of trial results has been undertaken using Simplot's Tasmanian seed and processing contracts. Superimposing the seed model over the trial data revealed that in all cases on red soils, the highest gross margin was earned at around 65,000 setts per hectare. This density is close to that used by growers in Tasmania. However, these margins did not correspond to the highest yield of round seed.

Higher sett densities were needed in order to maximise the yield of round seed. In 1999/2000 and in 2000/01, the highest yield of round seed was produced at a density of 200,000 setts per hectare (the highest density in the trials in these years). In order for a seed crop planted at 200,000 setts per hectare to produce the same gross margin as one planted at 65,000 setts per hectare, a price premium of 60% was required for the round seed component. This increased the price paid for round seed to around $540 per tonne.

The economic model is being further developed to determine under which circumstances processing growers could afford such a price premium.

Project started: July 1999

Duration: 4 years

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ROWLAND LAURENCE and LEON HINGSTON
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2002/03 trial at Forthside Vegetable Research Station, Forth, Tasmania (Photo: Leon Hingston)

CONTROL FREAK

Rhizoctonia solani is a serious fungal disease that attacks potatoes. It exists as different strains, divided into anastomosis (AG) groups.

RIZOLEX® controls the major strains of ***Rhizoctonia*** that effect potatoes in Australia[1], giving you maximum protection against black scurf.

Do you know which strain of *Rhizoctonia* you have present?

Comparison Study[2]

Strain of ***Rhizoctonia solani***	RIZOLEX	MONCEREN*
AG-3	✓✓✓	✓✓✓
AG-4	✓✓✓	✓
AG-5	✓✓✓	X

✓✓✓ Good control ✓ Limited control X Poor control

RIZOLEX 100D
- Simple to apply
- No wetting of seed piece
- **IT WORKS**

SUMITOMO CHEMICAL

1. Balali et al. Anastomosis group and pathogenicity of isolates of *Rhizoctonia solani* from potato crops in South Australia. Plant Pathology 1995
2. Data on file

Technology transfer

Ballarat potato drip irrigation study tour

A tour to Queensland was organised this year to study drip irrigation.

The cities of Ballarat and Geelong draw their water supplies from the same catchments as the potato irrigators. Both cities are expanding and have experienced water restrictions in recent years.

Central Highlands trials showed water savings of up to 50% could be made through using drip irrigation compared to lateral move and Gun irrigators. Fuel saving of up to 80% over high pressure systems (Rain Guns) has been achieved in the trials.

The high labour demands of current mobile irrigation systems have created occupational health and safety concerns. Issues such as one person operations, fatigue, and night shifts to complete irrigation runs have been identified as safety risks. Drip irrigation can significantly reduce these problems.

The labour demands on potato farmers have also led to succession planning problems with fewer young people wanting to move into farming. The reduced labour demand of drip irrigation could increase the attractiveness of potato farming and ensure skilled people remain in the industry.

The tour was an opportunity to gain a better understanding of drip irrigation and see how other farmers dealt with laying out and reeling in the tape. The group of 14 participants visited farmers at Bundaberg, Atherton and Ravenshoe.

We would like to thank the Queensland growers for their hospitality and openness, also Netafim and David Pedretti as the primary hosts of the tour, and Horticulture Australia.

Project started: July 2003
Duration: 1 month

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VOLUNTARY CONTRIBUTIONS

Seed potatoes Victoria workshop to be held in Portland

A workshop in Portland over two days (August 18-19) by Seed Potatoes Victoria will help enhance technology transfer to the potato industry. The event will provide an opportunity for farmers to have personal contact with professionals in specific areas of potato production, who would not normally be readily accessible.

The workshop will focus on “best practice” and a range of expert speakers from overseas, interstate and locally will be presenting. There will also be machinery exhibits, trade displays and a district tour.

Project started: July 2003
Duration: 1 month

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VOLUNTARY CONTRIBUTIONS

Study Tour to the UK and Netherlands to investigate value adding opportunities for potatoes, September 2003

A study tour to the UK and the Netherlands for potato producers, packers and retailers will include visits to fresh potato packers, seed potato producers, large and small processors, supermarkets and research establishments. It will include two major events:

- British Potato 2003, September 3 and 4, Newark. This biennial event is a showcase for the UK potato industry but there are many European participants. The event covers all aspects of potato production and marketing (machinery, agronomy, varieties, seed, R&D, processing, new products).
- AGF Totaal 2003, September 15 -17, Rotterdam. This biennial event is an international fruit and vegetable trade fair attracting around 30,000 participants.

Project started: September 2003
Duration: 17 days

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VOLUNTARY CONTRIBUTIONS

International R&D workshop and industry extension meetings on common scab disease

A workshop on common scab is planned to link in with the International Conference on the Biology of Actinomycetes (ICBA) to be held in Melbourne in December 2003.

The workshop will provide an opportunity for international experts and conference attendees to compare strategies and devise ideas on future R&D approaches in dealing with this disease. Two industry seminars (in Victoria and Tasmania) are flagged to follow the conference, and key researchers will present to an industry audience.

All active common scab researchers have been contacted by mail and forwarded a copy of the conference brochure inviting them to attend the ICBA workshop. Expressions of interest are also being sought for those willing to participate in the post conference industry workshops. Professor Rosemary Loria (Cornell University) widely regarded as the leading international researcher in this disease has agreed to co-chair the conference workshop and participate in the industry seminars.

Project started: July 2002
Duration: 1 year

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Seeking expressions of interest

Anybody interested in participating in an industry workshop can you please email or fax Calum on (03) 6233 6145 with the following details:

- **Name**
- **Fax or email address**
- **Subject: Tasmanian/Victorian Scab Workshop, Dec 2003 - request for information**

A flier will be sent out to you with the details once arrangements have been finalised.

Latest R&D report

Horticulture Australia has released one Final Report in the last three months:

Cleaning and disinfection practices for potato farms PT98018

The report is available from Horticulture Australia for $22.00 in Australia or $US30.00 outside Australia including postage. To obtain the report send a cheque or money order with a note quoting the project name and number to:

Publications
Horticulture Australia
Level 1
Carrington Street
Sydney NSW 2000
☎ (02) 8295 2300
Fax: (02) 8295 2399
✉ publications@horticulture.com.au

A new video on potato viruses is available

Video - strategies to manage WA potato virus diseases

This project produced a video covering all aspects of managing the two main insect transmitted viruses in Australian potato crops - potato leafroll virus and tomato spotted wilt virus.

The video, completed in May 2003, runs for 38 minutes and covers virus symptoms, source and spread of virus, vector monitoring, vector management and complete virus management.

The video can be purchased in Australia for $22.50 including GST and postage by contacting Roseworthy Information Centre on 1800 356 446.

Project started: June 2001
Duration: 1 year

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Make strategic friends not enemies!

New Zealand tour provides salient advice to new entrants in the global market

A "mindset-expanding" vegetable industry tour to New Zealand for selected young growers aged 25 to 35 set out to challenge the group to recognise possibilities, rather than problems, in globalisation.

Given a fundamental market shift in recent times to internationally-competitive supply chains, organisers AUSVEG encouraged tour participants to use the tour, August 2002, to focus on new ways of winning export markets. The aim was to look at forming strategic partnerships and alliances, rather than the more traditional individualistic approach of treating other growers and even customers as enemies.

Our young growers, the industry's future, will need to be cleverer, more adaptable and more open to change to survive and prosper in an increasingly competitive environment, according to AUSVEG Chairman Mark Badcock.

A vegetable and potato grower participated from each state - Michael Mammone and Mark Peters (Victoria), Eddy Galea and Scott Beaumont (NSW), Phillip Mete and James Hansen (Queensland), Scott Samwell and Leigh Muster (South Australia), Thomas Hingston and Brett Connors (Tasmania) and Shemek Radizikoski and David Anderson (WA).

The group attended the Produce Plus conference in Christchurch and visited 10 vegetable and fruit growing operations in New Zealand's South Island, the South Pacific Seeds' production facility and Plains Produce packhouse, which supplies South Island's major supermarkets.

New technologies

The conference presented sessions on future fresh produce retailing, marketing innovation and new technology. Two technologies featured were Tastemark Australia's Near Infrared Spectroscopy, that includes grading for sweetness in the standard fruit grading process and Reduced Space Symbology, which uses extremely small barcodes to label fruit and vegetables, to help meet increased market demand for quality assurance systems and traceability.

Keynote speaker, New Zealand Vegfed President, Brian Gargiulo, highlighted challenges facing Australia and New Zealand's vegetable industries – and the need to set ambitious goals - observing that European (and others') production and marketing methods had developed more rapidly than New Zealand's. He noted there were fewer producers as well as fewer markets for growers to sell their product, leading to a decrease in the number of businesses in the market place. He said chain stores wanted guaranteed year-round supply.

Retail opportunities

Ronnie De La Cruz from Tanimuri and Antle (a large US shipper of fresh vegetables) said recent market research shows the supermarket's fruit and vegetable section is the main consumer impulse buying area. This provides opportunity for bigger margins and differentiation among retailers, as impulse buyers tend to be less price conscious; they are motivated more by 'emotional' than financial considerations.

He reported growing demand for individually wrapped and sealed produce and more supply chain integration, requiring growers to group together to approach supermarkets with strength and be involved in industry issues from plant breeding to marketing.

Working together for new markets

The field visits highlighted New Zealand growers' efforts to work together to explore and penetrate new export markets. Many growers use high levels of greenhouse and other technology, often imported, to stay ahead of the competition, including Australia.

Plains Produce packhouse, with a number of growers producing for it, has established a good relationship based on trust with the supermarkets it supplies. Priorities are reliability and quality, then price. An example of its customer-focused approach shows in their marketing of potatoes, which sell in bags labelled for use rather than variety, based on samples prepared from each shipment to the packhouse.

Other tour benefits

The tour group was also exposed to modern business practice opportunities like linking enterprises with common objectives for significant benefit, to reduce competition, share R& D and promotional investment, and develop products and logistics that will provide critical mass in the market.

One of the greatest benefits for participants was the opportunity to meet each other and talk shop. The tour gave them a rare chance to step back from the day-to-day demands of running their businesses to consider the issues facing them and ideas to push forward.

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The tour allowed me to peer into another culture and philosophy on farming and agriculture.
I take away with me the importance of innovate or die!
Przemek (Shemek) Radzikowski

Technology transfer

The Communication report

This year I have consolidated all the projects (P1, P2 and P3) I manage into one report, as there were a lot of common issues.

The past 12 months have been probably the most difficult since I started this job. The number of things going on has, at times, been daunting.

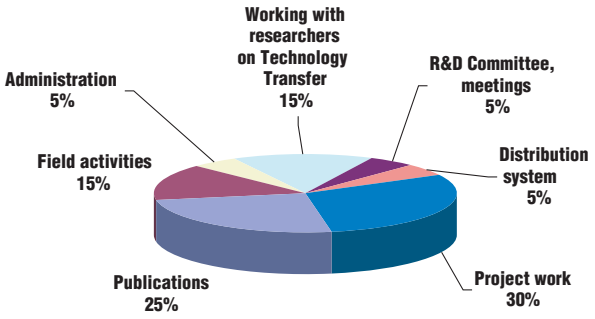
Progress this year has been good in some areas and poor in others. The number of information products close to release is exciting. The challenge is managing the number of jobs ending at once and this has caused a few problems.

Coordinating technology transfer in the Australian potato industry (P1)

The main tasks remaining are the **Information Directory** and the **Evaluation** of the project. The Directory has undergone a complete revamp and will be finalised once I complete my commitment to *Potato Australia*. Given support by the distributors, the Directory will be sent out separately with another booklet probably in October – not long after you receive *Potato Australia*. Once the Directory is out, an evaluation of the work will be done and the project wound up.

Implementing the Communication Plan (P2)

The Communication Plan for the potato industry is ambitious but achievable. It focuses on the main needs of the potato industry. This pie chart shows a breakdown of my tasks.



Field activities

I have had to wind back my commitment to field activities, which include grower meetings, due to the heavy project workload. Unfortunately I have only been able to do one group session in Bordertown, SA, late last year.

Publications

The recent changes to *Eyes on Potatoes* by our designer Andrew at AT&M and Cathy Sage's editorial team are excellent. Full colour gives us many more opportunities. Pink rot no longer looks like green rot!

Readers will have probably noticed changes from the March to the June edition. It was brought to our attention there was some readability issues with the March edition, which we have hopefully resolved.

If readers have any issues with the publications do not hesitate to let Cathy or myself know. We are always keen to receive feedback. You can also send comments back with the Technology Transfer Survey (see below).

Project work

This edition of *Potato Australia* includes an article on the review of the Levy program, which summarises a more detailed report available from Horticulture Australia.

To compliment this, I'm compiling a booklet that will summarise the outcomes of the Levy R&D program since its inception. This will be sent out with the Information Directory. Please take the time to read it. Given the average grower is paying $300 a year, it does not take much to get a good return on your investment. Work it out for yourself how much you pay: multiply the average number of tonnes you produce a year by $0.50. For many, the benefits from one project could cover your investment for the entire period that the levy has been in operation. Do the figures yourself when you receive the booklet on the outcomes from the Levy program. With the fast pace of today's world we tend to forget what we have gained as anything new quickly becomes a normal part of our activities.

Other work has included upgrading the **Potato Internet Starter Pak** and preparing for the last phase of the **National Vegetable Internet** site. A lot of the database programming is complete for the site and the vegetable Industry Development Officers are now in the data collection phase. Most of the data is already collected for the potato industry and entered into databases.

The next stage is site development and for me that mainly means sorting out the developer's brief and finalising the contractual and organisational arrangements.

A new computer program to help growers with disease and hygiene issues has also been developed. The next phase, which has been put on hold until October, is loading in all the information into the program, field testing and marketing. This program is part of a larger information package on hygiene which also includes a series of articles in *Eyes on Potatoes*, a 'Test your knowledge' program and group sessions.

In this edition of *Potato Australia* there is a Technology Transfer Survey. The information will be important in the development of new information products and the completion of existing products. Please take the time to fill it in and fax it back. I have tried to keep it simple so it should not be too onerous. Results will be published in December Eyes on Potatoes.

Distribution system

Our distribution system is the backbone to our communication program. It has been running in its current form since 1997 and, with the introduction of new services, discussions are underway with state distributors about upgrading it.

Computer database systems that drive our distribution system have also been upgraded this year.

Working with researchers

This is ongoing and tends to go from flood to famine, based on need. I would like to spend more time in this area as many research groups do not have communications support. At the moment though it is not possible until I finish up some of the project work.

Potato Archives (P3)

This project had a delayed start and has proved to be a much larger job than originally conceived due to the delays in starting, changes in technology, the additional volume of material as a result of the delays, and implications of new Copyright and Privacy legislation. Most of the information has been converted into digital format but a lot of it needs further interpretation.

Potato Internet Starter Pak

Version 5

If you want a copy of the latest version of the Starter Pak send an email to Leigh Walters (lwalters@saff.com.au) and include in the subject box – **Request for Starter Pak**. Note spelling. In the area where you normally write your message type – **Request**. If you have Windows 2000 or XP, or on a network that does not let through self-executable files, put in **XP** instead of Request.

This job has had to be put on hold while I sort out some of the other tasks. We have had a lot of quality problems and much more scanning from publications than originally anticipated. Once through the interpretation and checking phase the remainder of the work can be fast tracked by contracting out the jobs.

It is unfortunate this job has taken so long but it is essential we do it right as it provides the framework for the archives.

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Processing potato growers' study tour to North America

In July and August 2002 eight Tasmanian growers, two McCains field staff and an agronomist visited Idaho and Washington in the US and the Canadian provinces of New Brunswick and Alberta, to inspect potato production.

The tour was organised as a response to requests for information on four key areas of production following grower discussion groups. The study tour investigated:

- seed handling and cutting
- disease management
- irrigation scheduling
- nutrition management.

Considerable information was gathered from visits to more than 30 farms, storage facilities, researchers and seed producers. While it is not possible to cover all topics here, the most significant findings were:

Virus management

An opportunity exists to use border crops around seed crops to trap aphids and reduce the transfer of viruses, particularly during periods of high infection risk. These border crops should be maintained in a vegetative growth stage for maximum effect. Systemic aphicides should also be considered for use in the seed potato and border crops.

Physiological age of seed

North American growers consider early storage of seed in a controlled environment to be as important as the timing of harvest for maintaining young physiological age of seed. Critical factors in controlled environment storage of seed include specific humidity, temperature and CO^2 levels as well as regular air purging and replacement.

Cutting and curing of seed

Tour participants were introduced to the McCain seed cutting and curing training module. The three most important components of the module were use of a controlled environment conducive to efficient suberisation, using mother tubers of consistent size and controlling storage diseases.

Minimising damage and bruising prior to storage and cutting is a major focal point of US and Canadian seed production operations. Trial work has found yield losses of up to 22% may occur from excessive damage and bruising to cut seed. Damage to seed pieces at planting also creates entry points for *Fusarium*.

Soil moisture and irrigation

Several aspects of soil moisture were examined, including the need to maintain the critical soil moisture range of 70% to 85%, and the use of irrigation to control tuber set and early crop numbers. It was found that where physiological age, nutrition and environmental influences are not limiting factors, the first tubers set and 'held' would provide the greatest yield with appropriate irrigation.

Nutrition management

There are clear benefits to be gained by using lower rates of nitrogen, applied more frequently. No more than 30% of the total crop requirement of nitrogen should be applied at planting. The need for phosphorous to be readily available throughout progressive stages of growth was demonstrated.

Disease control

The management of rhizoctonia was discussed, with a holistic approach to its management identified as the best method of control, including crop rotations, high seed quality and in-furrow spraying. It is hoped that local trials can be undertaken in Tasmania to investigate the effectiveness of a range of fungicides for in-furrow spraying.

The problem of using crops that harbour rhizoctonia such as beans, clover and brassicas in the rotation was also investigated.

The study tour participants would like to thank McCain Foods (Aust) Pty Ltd and Horticulture Australia for organising and helping to fund such an informative and interesting tour.

Funded by participants with assistance from Horticulture Australia.

Project started: July 2002

Duration: 2 months

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Linking crop yields to soil properties

Degraded soil structure is having a significant negative effect on potato yields on red Ferrosol (*Krasnozem*) soils in northern Tasmania. However careful management practices can help overcome the problem.

Scores from a pre-planting visual rating of soil structure have been linked with processing yield of the crop. Based on these results, the cost of degraded soil structure on Ferrosols to the potato industry in Tasmania is estimated at over $3 million a year.

Scorecard benefits

The scorecard uses a brief description and photographs to allow the user to give a paddock a score from 1 to 10. The top score of 10 applies to paddocks with friable porous aggregates, with a good range of aggregate sizes and many fibrous roots. These paddocks have normally come out of a long-term pasture phase. A score of one or two is given to a paddock full of large clods, which bake hard on drying and are 'ankle breaking' when walking across the paddock.

Large clods bake hard on drying and are 'ankle breaking' when the paddock is walked over.

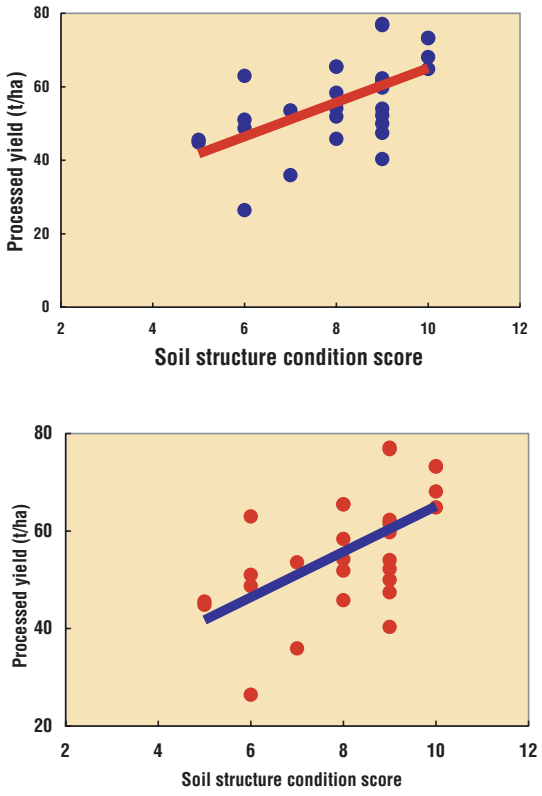
Intermediate scores are given when some smaller clods are present (these are angular, with a smooth surface rather than a porous face, and have a narrow size range of natural soil aggregates). Such soils are often called 'clods and powder'. A soil with a score of six or less is considered to be degraded compared to a soil in good condition.

Effective management practices

The relationship found between structure score and potato yield (see graph) demonstrates that if you can see visible signs of clodiness on heavier textured soils, then this is probably limiting crop yield.

The range of yields for a given soil structure condition score indicates that some farmers are able to overcome degraded soil structure problems through good management of tillage, irrigation, nutrition, weeds and pathogens. Physically degraded soils often take a longer period of good management to recover, so prevention of soil structure degradation is preferable to amelioration.

Relationship between structure score and potato yield



Some suggestions on preventative measures include harvesting potatoes before soils become wet, keeping trucks off paddocks, and not using stock for grazing during wet winter days. If signs of degraded soil structure are apparent, this information can be used to advise on appropriate soil management practices such as timing and depth of tillage, rotations to include a rejuvenating pasture phase, and growing green manure or cover crops.

We sincerely thank the participating farmers and the Natural Heritage Trust for financial support.

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A potential new solution to managing soil borne diseases

Urea, incorporated into soil several weeks before planting, effectively controlled powdery scab on potato roots and tubers in a field trial planted last winter near Torquay in Victoria.

The results were astounding given that two different powdery scab fungicide treatments in the same trial did not significantly reduce scab incidence and severity. However, a note of caution, the urea was applied at a very high rate (one tonne per hectare), which may have adverse effects on production.

Organic waste products

The trials were designed to test the effect of organic waste products on soil borne diseases. In Canada, various organic waste products incorporated in soil prior to planting reduced the incidence and severity of common scab and verticillium wilt (see Potato Australia Vol 12, 2002). The wastes included those with high nitrogen content, such as meat and bone meal, and those containing volatile fatty acids, such as fermented liquid pig manure. Urea (46% N) was used in the trial to mimic the effects of the meat and blood meal.

Powdery scab is particularly difficult to manage and most commercial potato cultivars are susceptible. *Spongospora subterranea*, the organism that causes scab, is widespread throughout many potato production districts. Disease outbreaks are associated with cool (12-15°C), wet (periods of saturation) weather or heavy irrigation during early tuber set. There are no registered fungicide treatments, and those that show promise are expensive. Potato growers are desperate for reliable control measures.

Treatments trialled at Torquay, Victoria (acid sandy loam) included meat and bone meal (MBM), urea and two fungicides (fluazinam and flusulfamide). Several weeks before planting, we broadcast and hoed in MBM and urea over the plots. We then sprayed and rotary hoed the fungicide treatments onto the soil surface just before planting. Neither weeds nor potatoes emerged in the MBM treated plots, indicating the rate of application was too high. The first sign of any effects of treatments on disease was when the young potato plants were dug up and the severity of powdery scab root galls (Figure 1) rated. The results were similar when tubers were assessed for severity of scab at the end of the season. Less than 10% of tubers in the urea treated plots had powdery scab compared with about 60% of the tubers in the untreated controls plots. In contrast, the two fungicide treatments did not significantly reduce scab levels. This may be related to soil type. In our experience, fluazinam treatments have consistently reduced scab levels in trials in the volcanic clay loams in the Central Highlands of Victoria.

Potato growers inspect the field trial at Torquay with the DPI Knoxfield potato team

Above: Tubers from an untreated plot.

Right: Tubers from a plot treated with urea

How they work

MBM contains significant nitrogen (5%-13%). When incorporated into soil, the nitrogen is converted into its various forms, including ammonia (NH_3) and nitrous acid (HNO_2). In high concentrations, both can be toxic to soil organisms and weed seeds. This process depends on soil type, pH and organic matter levels. Other organic waste products (not tested in this trial) work differently. Liquid fermented pig and dairy manures contain volatile fatty acids (eg acetic acid), which are also toxic.

These products have other benefits besides disease control. They are a source of plant nutrients, improve soil organic matter and stimulate populations of beneficial microbes resulting in improved soil and crop health.

What next?

At this stage we do not advocate the use of high rates of urea in potato crops. There is much work to be done to understand the pros and cons of organic amendments. However, the urea treatment has helped demonstrate the principles of using organic manures and waste products for disease control. Another trial is in progress and we are developing a joint research program involving Canadian and Australian scientists. This will help us understand whether organic soil amendments have practical application in Australian agriculture. With this knowledge we can learn to manipulate the soil environment for more effective and affordable disease control.

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Combination cover crop of white lupin and fodder rape

Cover crops with multiple benefits scrutinised

A new project will build on preliminary trials showing a white lupin / fodder rape cover crop mix has the potential to unlock phosphorus (P) and improve the nitrogen (N) status for the following potato crop, biofumigate the soil and reduce erosion, as well as providing stock feed.

White lupins form special roots called proteoid roots that secrete citric acid which frees up some of the fixed P in the soil. If the cover crops also contain fodder rape, the rape significantly reduces incidence of the soil borne fungal disease rhizoctonia, presumably due to the biofumigation effect of the rape. Other benefits are the high biomass of the combination lupin/fodder rape cover crops providing excellent protection for the soil surface against erosion during high intensity rainstorms, the ability of the white lupin to fix N, and the provision of grazing for stock.

Over the next three years a team of scientists from the Australian National University and CSIRO with funding from the Australian Research Council will collaborate with Sydney Catchment Authority staff and growers from the Robertson District Potato Advancement and Landcare Association to further develop these cover crop systems. Their challenge is to effectively tap into the fixed P locked up in the soil and reduce the amount of fumigant applied. Besides reducing fertiliser costs for growers by making some P available to subsequent potato crops, the cover crops will enhance environmental management of the region by minimising runoff and erosion.

Background

Potato production is a major industry on red ferrosol (Krasnozen) soils in many areas of Australia including Robertson, NSW, Ulverstone in northern Tasmania, Toolangi near Melbourne, and the Guyra and Dorrigo regions in northern NSW. However, P fixation is a major problem on these ferrosols due to their high iron oxide content and acidity. To overcome this problem growers have to apply high P fertiliser rates, but recovery of added fertilizer P in potato tubers can be as low as 4%. Over time this results in large amounts of fixed P accumulating in the soil and levels of over 3000ppm are not uncommon.

Another potential problem on these soils is high rates of potato crop infection from the soil-borne fungal disease rhizoctonia. To combat this, large amounts of soil fumigants are used, which are very toxic and can latch onto soil particles. Thus when major erosion occurs, soil particles containing high levels of P and fumigants are transported off site and pollute waterways. In Robertson this issue is particularly critical as the catchment forms part of Sydney's water supply.

Field based strategies

Researchers plan to develop strategies that incorporate a lupin/rape cover crop mix into growers' rotations. Success will depend on whether lupin growth rates match brassica's, and whether both species can regenerate from grazing before being incorporated as green manure.

Field trial on cover crops, Robertson, NSW

Trials based on grower survey

The project will include an initial soil survey and consultation with growers to assess the effects past management practices have had on soil physical and structural properties, and on total and available soil P levels.

A glasshouse study will investigate the effects of a range of cover crops including white lupins and fodder rape, on fixed P release, plant biomass, fungal infection and potato tuber yields on three soils with varying P status.

In 2005/06, field trials at Robertson will look at the differences between potato crop quality / yields grown on two low available soil P sites, one with low P availability after pasture, the other after potatoes. The plots will have different rates of P fertiliser applied ranging from nil to usual growers' rates.

Project results will apply to horticultural production on all red ferrosols in Australia, and other soils that fix P, such as red chromosols.

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WinHort trains women as future leaders

Women in Horticulture's (WinHort's) first national training initiative, Leading the Future, held in Tasmania in May, provided 80 delegates with the opportunity to learn from experts in business management, rural community structures and skills development.

WinHort encourages personal and professional development to enhance women's confidence to take up decision-making positions in horticulture.

Speakers reinforced there are not enough women in high profile roles in paid or voluntary positions. They stressed that horticultural industries need to train and nominate more women for leading industry positions, and provide flexibility and assistance so they can also effectively manage other important aspects of their lives.

Speakers included:

- Dr Jane Wilson, Chair of Horticulture Australia, shared her progression to Company Boards through school and other voluntary committees where she was exposed to public speaking, gaining confidence to become involved in senior Board positions.
- Dr Daniela Stehlik of Central Queensland University spoke on her research to address the social impact on women in rural Australia during drought. Daniela, a leading social scientist, works at the intersections of community resilience, human service practice and social cohesion in rural Australia.
- Shelley Spriggs, Manager of Rural Industries Leadership with AFFA* discussed support and financial assistance for personal development through the Federal Government, part of AFFA's young leader and women in leadership programs (refer to www.affa.gov.au).
- Amabel Fulton, member of the National WinHort Advisory Group shared her enjoyment working with rural women after having mainly worked with men. Amabel's company, Rural Development Services organised the *Leading the future* meeting.
- Dr Alison Sheridan, Senior Lecturer with the New England Business School in the Faculty of Economics, Business and Law addressed issues for women in management. She noted women make up 44% of the paid labour force, but only 23% are managers, clustered in supervisory and junior management positions. This is an area the WinHort program is addressing so that industries can benefit from a wider perspective of ideas and experiences.
- Jan Davis, Chief Executive Officer with the Queensland Fruit and Vegetable Growers, shared humorous stories of her experiences climbing the management ladder in horticulture.

Skill development workshops

Skill development workshops addressed areas of opportunity for women including:

- public speaking
- quarantine and export
- what's involved in being a representative of a farmer organisation
- intellectual property and commercialisation – what you need to know
- Horticulture Australia - opportunities for individual businesses
- managing people
- developing a new horticultural business
- promoting your product and yourself
- occupational health and safety
- creating groups and keeping them going
- getting your message in the media
- involving women in the development of your industry
- developing and maintaining relationships with your marketer

Women interested in hearing more about WinHort can join the national WinHort email group. The group is a forum for women to learn about events, share news and views as well as pose questions and have discussion on issues related to their industry. To get connected, please email Cathy McGowan, the national WinHort coordinator at cmcgowan@albury.net.au, or Libby Abraham on libby.abraham@horticulture.com.au.

Major sponsors of Leading the Future training were Horticulture Australia, Agriculture, Fisheries and Forestry Australia (AFFA), AusIndustry, FarmBi$, local agribusinesses and service providers.

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