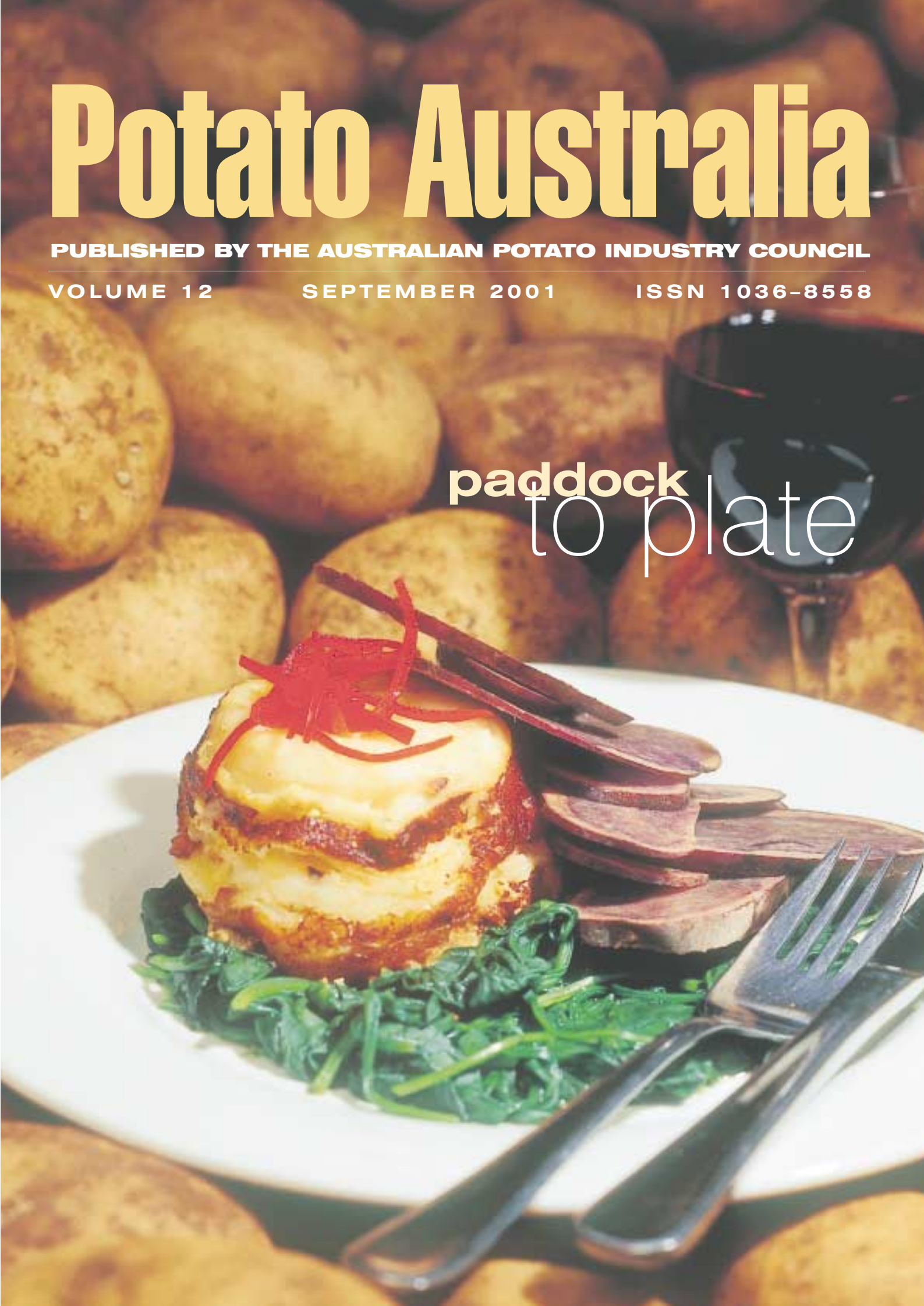
Potato Australia

PUBLISHED BY THE AUSTRALIAN POTATO INDUSTRY COUNCIL

VOLUME 12 SEPTEMBER 2001 ISSN 1036-8558

paddock to plate



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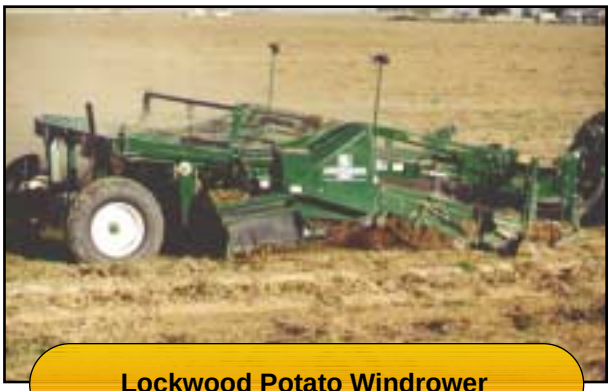

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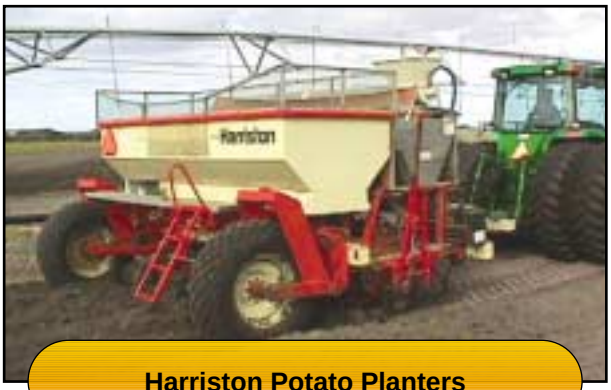

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Cover: This gourmet plate was devised at the Blue Door Restaurant in Kensington, Victoria, using Desiree potatoes (designed as a scalloped stack) and deep-fried Purple Congos cascading from the stack onto the plate. The brushed organic potatoes surrounding the plate were kindly supplied by Kensington Fruit and Veg and the photo was taken by local photographer, Janusz Molinski.

The editor also lives in Kensington!

A note on Purple Congos - they have a dark purple, mealy flesh, which stays purple when cooked. Ideal for salads or contrasting mash. Deep fry or boil.

Designed and printed by Sprinta PRINT

Warning: Any mention of products does not imply endorsement nor infer registration. Contact your local Department of Agriculture office for advice on registration status.

We thank Horticulture Australia for its financial contribution towards the production and distribution of *Potato Australia*.

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Potato Australia

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Feedback - *we need your ideas!*

Eyes on Potatoes and *Potato Australia* are your industry publications so we need to know what you think of them and how they can be improved. If you have any ideas for articles, comments on the format or any suggestions on how the publications can be made better please let us know. We welcome any feedback.

You can contact your nearest newsletter advisory group representative, detailed above

Or comments can be sent directly to:

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APIC report

MILTON RODDA
Chairman
Australian Potato Industry Council

Constant change is an issue we are all required to deal with on a daily basis. In the potato industry and APIC, this process of change requires that we remain flexible and open to new ideas and situations and that we embrace and benefit from such changes as they occur.

Formation of Horticulture Australia

Without doubt the major issue of change for your council in the past year has been the establishment under legislation of the company, Horticulture Australia. The company combines the R&D function of the former Horticultural Research and Development Corporation with the marketing function of the Australian Horticultural Corporation.

The Horticulture Australia Board came into existence in November 2000 and I was able to attend an industry briefing session in Sydney in February this year. I came away confident this transition had occurred with minimum disruption to your Council and your industry and that we should benefit from streamlining the administration within these two functional areas. Your council has since combined with AUSVEG by endorsing an AUSVEG proposal detailing industry expectations of Horticulture Australia for the management of the Vegetables and Potato R & D program for the next three years. This will provide direction for the Horticulture Australia Board during this initial period of transition.

National Seed Certification Standards

National Seed Certification Standards became reality in November last year after a great deal of work by many. We now have a means of describing and certifying potato seed into one single framework regardless of its state of origin. We are now able, for the first time, to market a product nationally or internationally certified to a national standard. This standard will be constantly monitored and where necessary altered to reflect changing expectations by a committee representing all State schemes and chaired by the chairman of APIC. Changes will need to be endorsed by APIC before they are sent to Horticulture Australia acting as custodians of the standard. Horticulture Australia will need to be satisfied that any proposed changes to the standard only occur after proper industry consultation. It is pleasing to note this standard has been well received by industry and its adoption is already underway.

The R & D committee of APIC, the group charged with screening all research applications funded from your levy monies and matched by Government, continue to ensure this money is spent in the most appropriate manner for the industry. This is no easy task as issues confronting industry are many and varied and all of us are prone to consider those issues that affect us most closely as those most important and in need of support. This committee has completed a review of its strategic plan and has mapped a clear path forward for industry. Part of this plan includes closer relations with New Zealand on joint projects using shared resources and benefiting both bodies. I take this opportunity to thank the R & D Committee for their continuing hard work and success with this and other issues.

A note on Chips!

Chips, a world scanning service of potato research articles, will be included as an insert in this and future editions of Potato Australia and Eyes on Potatoes. This circular is currently provided to New Zealand growers and, for a small contribution which assists both industries, is now available to Australian growers.

Future of the National Potato Breeding Program

Of concern to your council is the ongoing issue of the future of the National Potato Breeding Program and the need to progress the potato cyst nematode (PCN) issue. Both of these issues have remained unresolved for a considerable time. It is unlikely that the breeding and evaluation program will be able to be funded to the extent it has been in the past and to this end the R & D Committee has commissioned a business plan for the evaluation and commercialisation phases to reduce the burden on levy payers. With regard to the PCN issue, a levy-funded project was approved titled National PCN Management Strategy. This project was slow to start but is now underway.

It is to be hoped that both issues can be concluded rapidly.

With the support of industry your Council will continue to work on your behalf to better our industry and I take this opportunity to wish you well and to invite your participation either directly, or indirectly through your industry groups

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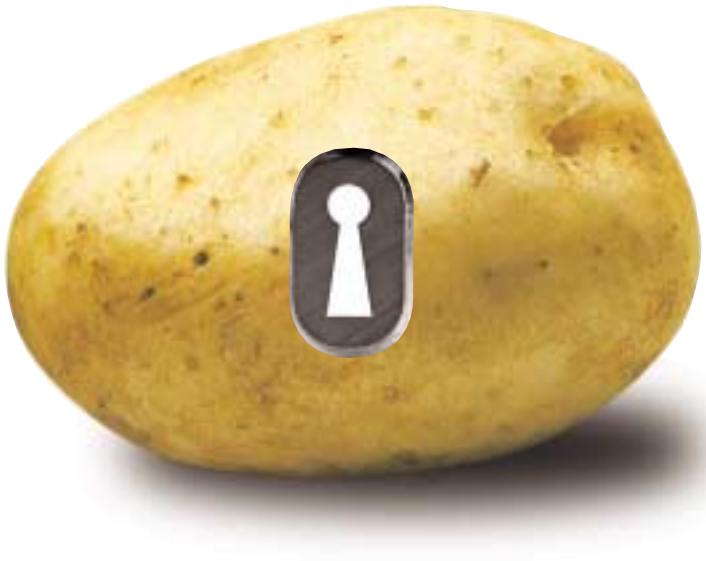

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Horticulture Australia

Marketing and research go hand in hand

What is the point in being able to produce more if we cannot sell it!

If research in the future, particularly production research, is to be valued by industry, then the size of the market for potatoes needs to grow through new buyers, increased consumption and new products that add value to the potato.

Without new opportunities to sell more potato products, competition will become fiercer and the market easily oversupplied, putting downward pressure on prices.

Growth in the traditional processing sector, chips and crisps, remains strong, but the situation in other sectors is more uncertain.

In the fresh sector, industry and researchers need to create new market opportunities and not solely rely on the way things were done in the past.

Potato researchers in Australia have been very successful in addressing production problems. While these problems are undoubtedly important, work also needs to focus on opening up new opportunities in the marketplace. This needs to be a shared responsibility of industry and research groups.

It is easy to rely on established products or uses but that does not always result in new opportunities for growth.

Other countries are not relying on traditional uses but are putting a priority on searching for new ways to sell more potatoes.

Our industry people experienced this when they attended the World Congress last year in the Netherlands and travelled through Europe. They were exposed to a large range of products currently not seen in Australia.

So it's over to us – the ball's in our court!

JONATHAN ECCLES
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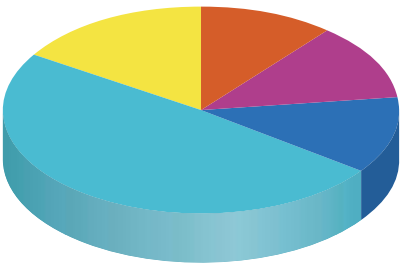
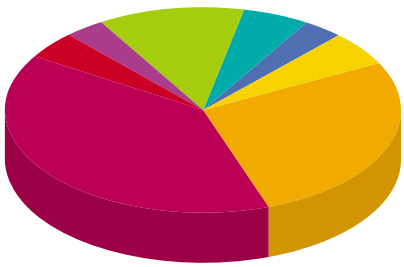
Source of Funds for Projects in 2001



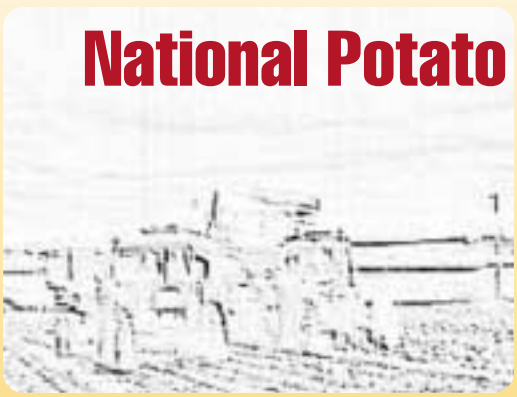
- Fresh, Seed & Export Growers 11%
- Processing Growers 12%
- Processors 12%
- Voluntary Contributions 15%
- Commonwealth Government 50%

How is the Levy Money Spent 2001/2002



- Crop Management 6%
- NaPIES 27%
- Pest,disease & weed management 40%
- Post harvest 4%
- Seed development 3%
- Technology Transfer 12%
- AusHort 5%
- Industry Management 3%

(Projects being funded are listed on pg 10 & 11)



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SUMI/IMC 6903 June 00

Potato R&D Projects for 2001 - 2002

Project title	Chief investigator	Phone	Page
Crop management			
Coordination of the National Cadmium Minimisation Strategy	Dr Mike McLaughlin CSIRO Soil and Water	08 8303 8433	16
Effect of calcium nutrition on decay of summer sown seed potatoes	Dr Greg Howell NSW Agriculture	02 6951 2510	17
Potato tuber quality management in relation to environmental and nutritional stress	Stephen Harper Qld Horticulture Institute	07 5466 2222	18
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	19
National Potato Improvement & Evaluation Scheme			
Breeding Australia's potato germplasm: the resource for varietal development	Dr Roger Kirkham Agriculture Victoria	03 9651 7205	20
Breeding crisp potato varieties - Stage 2	Dr Roger Kirkham Agriculture Victoria	03 9651 7205	20
Breeding French fry potato varieties - Stage 2	Dr Roger Kirkham Agriculture Victoria	03 9651 7205	20
Breeding fresh market potato varieties - Stage 2	Dr Roger Kirkham Agriculture Victoria	03 9651 7205	20
Development of fresh and export markets by varietal improvement (VC only)	Peter Dawson Agriculture WA	08 9892 8461	20
Development of genetically engineered virus resistant fresh market potatoes	James Hutchinson Agriculture Victoria	03 9210 9222	EOP
Evaluation and development of new potato genotypes - SA	Dr Chris Williams SA R & D Institute	08 8303 9323	20
Potato cultivar accession and testing in Tasmania	Leon Hingston Tas Institute of Ag Research	03 6421 7645	20
Potato cultivar evaluation in Victoria and New South Wales	Dr Roger Kirkham Agriculture Victoria	03 9651 7205	20
Potato variety evaluation, commercialisation and adoption	Russell Sully Agriculture Victoria	03 9210 9385	12
Technology transfer of new potato cultivars	Dr Roger Kirkham Agriculture Victoria	03 9651 7205	22
Pest, disease and weed management			
Biofumigation - optimising biotoxic Brassica rotations for soil borne pest and disease management	John Matthiessen CSIRO Entomology	08 9333 6641	24
Cleaning and disinfection practices for potato farms	Dr Rudolf de Boer Agriculture Victoria	03 9210 9222	25
Control of black dot in potatoes	Dr Trevor Wicks SA R & D Institute	08 8303 9323	12
Control of pink rot in field and storage	Dr Trevor Wicks SA R & Dt Institute	08 8303 9323	26
Developing cost effective UV protection of biological pesticides	Dr Brian Hawkett University of Sydney	02 9351 6973	12
Development of extreme resistance (immunity) to common scab disease within current commercial potato cultivars	Dr Calum Wilson Tas Institute of Ag Research	03 6226 2638	28
Enhanced biodegradation of soil-applied pesticides - determination, risk assessment and prevention strategies	John Matthiessen CSIRO Entomology	08 9333 6641	29
Enhanced detection of PCN and bacterial wilt to improve quaratine procedures and market access for the Australian potato industry	Dr Ian Porter Agriculture Victoria	03 9210 9222	12
Enhanced metalaxyl breakdown and its implication in Australian horticulture	Dr Hoong Pung Serve-Ag Pty Ltd	03 6423 2044	34
Evaluation and commercialisation of common scab resistant clones of commercial potato varieties	Dr Calum Wilson Tas Institute of Ag Research	03 6226 2638	13
Influence of rotation and biofumigation on soil borne diseases of potatoes	Dr Dolf deBoer Agriculture Victoria	03 9210 9222	30
Management of tomato spotted wilt virus in potatoes	Dr Calum Wilson Tas Institute of Ag Research	03 6226 2638	34
Monitoring and developing management strategies for soil insect pests of potatoes	Stewart Learmonth Agriculture WA	08 9777 0000	13
National PCN Management Strategy	Gordon Berg Agriculture Victoria	03 9210 9222	24
New chemical treatments for fungal diseases of seed potatoes	Dr Dolf de Boer Agriculture Victoria	03 9210 9222	35
Prediction and molecular detection of soil borne pathogens: the way forward for the Australian potato industry	Dr Ian Porter Agriculture Victoria	03 9210 9222	13
Understanding the implications of pastures on the management of soil borne diseases of potatoes	Dr Dolf de Boer Agriculture Victoria	03 9210 9222	14

Postharvest

Increasing the opportunities for the use of organic wastes in the Tasmanian vegetable industry*	John McPhee Tas DPIWE	03 6421 7674	23
Managing bacterial breakdown in washed potatoes	Dr Trevor Wicks SA R & D Institute	08 8303 9563	37
Potato export market development	Russell Sully Agriculture Victoria	03 9210 9222	38

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	30
Development and implementation of National Seed Potato Certification Standards	Russell Sully Agriculture Victoria	03 9210 9222	40
Improving seed potato production	Dr Phillip Brown University of Tas	03 6226 2716	42

Technology transfer

Business plan for a national internet site for the potato and vegetable industries	Leigh Walters SA Farmers Federation	08 8232 5555	45
Coordinating technology transfer in the Australian potato industry *	Leigh Walters SA Farmers Federation	08 8232 5555	23
Implementing the Potato Industry's communication plan	Leigh Walters SA Farmers Federation	08 8232 5555	46
Making past industry information from R&D more accessible	Leigh Walters SA Farmers Federation	08 8232 5555	48
National Potato Industry Business and Marketing Conference	Jan McIntyre Conference Management Committee	08 8723 2624	8
Communicating R&D outcomes to the potato industry through Potato Australia and Eyes on Potatoes	Cathy Sage SageWords	03 9328 5310	#

AusHort (Projects funded by all horticultural levy paying industries)

Addressing quality management and food safety issues in horticulture	Richard Bennett Horticulture Australia	03 5831 3919	50
Advancing horticulture's response to the Existing Chemical Review Program	Kevin Bodnaruk AKC Consultancy	02 9499 3833	50
Gene technology newsletter	Evonne Lovric Horticulture Australia	02 9418 2200	50,58
Horticultural audit of production and sustainability, phase two – best practices study	Andrew Grant Andersen	03 9286 8786	14
How can horticulture best capture, store and make available relevant information on environmental management	Vicki Lane Queensland Horticulture Institute	07 3821 3784	14
Horticulture Emergency Plan	Libby Abraham Horticulture Australia	02 8295 2300	50
Implementation of the Freshcare on farm food safety program	Margaret Milgate Freshcare Limited	07 3247 7212	50
Improved labelling of pesticides to encourage optimum use in horticultural crops	Adrian Jones ChemCert	03 5682 2384	51
Key genes for horticultural markets	Dr Anna Koltunow CSIRO Plant Industry	08 8303 8610	14
Scoping study for value adding technologies for Australian horticulture	Ian Gould Food Science Australia	03 9731 3220	14
Statistical scoping study for the Australian horticultural industries	Martin Kneebone Retailworks Pty Ltd	03 9852 8733	14
Understanding the implications of Codex issues to horticulture	Kevin Bodnaruk AKC Consultancy	02 9499 3833	51
Worker exposure of endosulfan in the horticultural industries	Assoc Prof Lyn Frager University of Sydney	02 6752 8210	14

■ - New projects that have been approved and will commence once contracts have been finalised or have commenced this year.
■ - Projects ending in 2001
■ - Ongoing Projects
C - Completed. No report

VC only – Voluntary contribution only, no Potato Levy money used.
\# No report is produced as the outcome is sent out to everyone.
* Deadline for completion extended.
\+ Project undertaken while employed with the Queensland Fruit & Vegetable Growers.
EOP-To be part of an industry update in the December edition of Eyes on Potatoes

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*.

New projects approved by Horticulture Australia

National potato improvement and evaluation scheme

Potato variety evaluation, commercialisation and adoption

This project will achieve strong industry/commercial participation through evaluating and commercialising potato varieties for Australian conditions.

It will ensure the effective assignment of ownership rights of new varieties to an organisation that can guarantee a high level of adoption by industry. It will also coordinate the evaluation, release and commercialisation of germplasm developed by the Horticulture Australia project "Breeding Australia's Potato Germplasm: the resource for varietal development".

The project arose from the need to improve adoption and commercialisation of new varieties from the National Potato Improvement Program. The Program has developed and released a number of varieties for all sectors of the potato industry in recent years but adoption and commercialisation has fallen short.

In the past, there has also been little opportunity for commercial organisations to participate in evaluating, developing, marketing and commercialising potatoes released by the program and to capture a return on their investment as ownership rights could not be assigned.

Project duration: 3 years

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Pest, diseases & weed management

Control of black dot in potatoes

Black dot caused by the fungus *Colletotrichum* coccodes is a widespread disease of potatoes in Australia, common in soils of potato growing areas and on seed tubers. In some certified seed, all tubers are infected with black dot.

Previous work on this problem in Australia (HRDC project PT023) showed that premature plant death from black dot reduced yields by 12%. Further losses occur with washed potatoes where infected tubers are rejected because the fungus causes skin blemishes. Yield reductions and losses due to blemished tubers may cost the industry more than $15 million a year.

This project builds on other studies and aims to develop management strategies to control black dot. This will be done by evaluating tuber seed treatments to ensure use of clean seed and soil treatments to ensure that seed tubers are planted into soil that is not infected. Other work will look at the survival of the fungus on weed hosts, and its development on potato roots and tubers. This should indicate which crops are prone to infection and which should be harvested early.

At the completion of the project recommendations will be made on the best management options for black dot which will benefit all sections of the potato industry, in particular the washed potato growers and seed growers. The data generated on chemical efficacy will also be used to gain registration of new chemicals or label extension of existing chemicals for use on potatoes.

Project duration: 3 years

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Developing cost effective UV protection of biological pesticides

This project looks at developing titanium dioxide as a sunscreen to protect sun-sensitive biological pesticides in integrated pest management programs.

It is part of ongoing research to minimise the use of hard (broad-spectrum anticholinesterase) chemical pesticides and replace them with biological pesticides.

Growers using Integrated Pest Management or IPM already incorporate biological pesticides into their programs where these are available and effective enough to reduce hard chemical use.

However, many 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.

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 for the protection of sun sensitive biological pesticides.

The potential for titanium dioxide as a UV protection agent has been demonstrated in an earlier Grape and Wine Research and Development Corporation funded project. However, further ideas and developments are needed to create a viable system for field application. This project will explore these ideas and develop them to a point where industry assistance can be found to develop a product.

Project duration: 2 years

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Enhanced detection of potato cyst nematode and bacterial wilt to improve quarantine procedures and market access for the Australasian potato industry

This project aims to combine research know-how from Australia and New Zealand to develop new ways of predicting and detecting quarantinable soilborne disease using highly sensitive DNA based pathogen detection methods and accurate predictive models.

The chosen pathogens are potato cyst nematode (PCN) in Australia and bacterial wilt in New Zealand. Prediction and early detection will help growers significantly reduce crop losses.

PCN and bacterial wilt are two of the most devastating soilborne pathogens worldwide, with losses estimated at more than $1 billion a year in lost production. This project involves researchers from Crop and Food in New Zealand (at Lincoln, Christchurch) and Agriculture Victoria in Australia

(Knoxfield, Victoria). It will involve scientific exchange of expertise and knowledge about PCN and bacterial wilt from both countries.

The DNA probes developed will be tested extensively in the field and once their accuracy is confirmed they will be able to be used for surveys of potato production areas to prove areas are free of disease.

This test will help manage potential outbreaks and provide a tool to show disease free status of areas to improve market access and replace current cumber-some diagnostic tests (e.g. forking, elutriation, floatation).

The ability of the probes to provide information on pathogen inoculum levels will also help further research into disease management strategies.

This project will help match phytosanitary declarations between New Zealand and Australia and between states in Australia.

Project duration: 3 years

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Evaluation and commercialisation of common scab resistant clones of commercial potato varieties

Common scab is still one of the most costly diseases of Australian potatoes, particularly in Tasmania and Victoria. Losses from the disease are conservatively estimated at $3.5 million a year in Tasmania alone. Local factors appear to worsen the problem, including the presence of different species of the disease. There are no suitable management strategies that ensure disease control.

Studies have shown that pathogenic strains of common scab produce a toxin (*thaxtomin*) which brings on the disease, and that improving the plant's toxin tolerance will allow it to resist the disease.

The project will commercialise outcomes from an earlier HRDC project which successfully produced variants of two commercial potato lines with enhanced *thaxtomin* tolerance. These resistant lines will be field tested and plant breeder's rights secured for the best clones.

With the most challenging aspects of this work successfully accomplished, it is feasible to predict the elimination of common scab disease as an economic problem in Australia, without imposing additional production costs.

Additional research is also proposed on important but poorly understood aspects of the disease which should help in further developing disease management strategies through inhibition of *thaxtomin* production and desensitisation of plants to *thaxtomin*.

Project duration: 3 years

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Monitoring and developing management strategies for soil insect pests of potatoes

This project aims to provide potato growers across Australia with tools to monitor soil insect pest populations and assist them in determining the need for a pre-plant soil pesticide.

It also aims to improve reliability of pest control, should soil pesticides be needed.

The result of the work will be information packages to identify pest, beneficial and benign soil insects in the potato rotation systems studied. The work will also include a review of existing and new insecticide registrations for soil insect pests of potatoes.

Soilborne insect pests of potatoes are a direct threat to grower returns with their effect on tuber quality and yield. They present a special challenge to potato growers to protect their crops and, for seed potato growers, to reduce the risk of transferring soil insect pests to farms that are not infested.

As part of the project, researchers will work with growers, crop scouts and other industry personnel to monitor soil pest populations and evaluate control options.

They will conduct soil pest counts in paddocks before planting and then assess the effect of pest activity on tuber yield and quality. The results of the monitoring will be used to develop sampling and decision guides.

These decision guides will be developed in detail in Western Australia and Victoria for the known major soil insect pests. They will form the basis for other potato growing regions of Australia. Modification of the disease guides will be made for each region from information generated by the project.

The project will compare the efficiency of different pesticide treatments on major soil insect pests of Australian potato crops. Identification of the range of species of soil insect pests will be the first priority in Queensland, New South Wales and Victoria.

The consistent use of monitoring to define pest risk, together with improved reliability of strategic soil insect pest controls will lead to a greater proportion of potatoes meeting consumer specifications and a reduction in the risk of transferring soil pests.

Project duration: 3 years

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Prediction and molecular detection of soil-borne pathogens: The way forward for the Australian potato industry

The project will provide cutting-edge diagnostic tests for two important potato diseases, rhizoctonia (black scurf) and powdery scab, and lay the groundwork for expanding the technology to include other important potato diseases.

This research is linked to the project - *Enhanced detection of potato cyst nematode and bacterial wilt to improve quarantine procedures and market access for the Australasian potato industry.*

Extensive field testing will form the backbone of the research and ensure that the DNA probes can accurately identify and measure the diseases in the field.

The tests will be developed at the Institute for Horticultural Development (Agriculture Victoria) and results will be available for other diagnostic laboratories in Australia.

C-Qentec is keen to commercialise the probes into a predictive service that can be offered nationally to the potato industry. To do this, major research laboratories will be licensed to support the tests and possibly satellite laboratories established to provide regional access to these services.

Project duration: 3 years

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Understanding the implications of pastures on the management of soil borne diseases of potatoes

This project will investigate the effectiveness of pastures as a disease break for potato crops. Potatoes are normally grown after a pasture phase, even on leased paddocks, and it was always assumed that the pasture provided a high degree of disease control in the following potato crop. However, there is evidence that pastures may act as a reservoir for some soil borne diseases of potatoes, perhaps exacerbating disease levels in the crop.

The focus will be on seed potato production. Seed certification standards not only demand very low levels of disease on tubers, but also require paddocks to be rested from potatoes for a minimum of three years. The outcomes will also be relevant to the other industry sectors.

The project will aim to identify which pasture species and pasture management options favour or suppress the development of disease in subsequent potato crops. It will look at the fungal pathogens that cause rhizoctonia stem canker, powdery scab, common scab and pink rot, as there appears to be a link between their survival in pasture and disease in potatoes.

This work will improve our understanding of the relationship between potato diseases and pasture, identify both the benefits and disadvantages of pastures in the potato production cycle. It will also result in a more strategic use of pastures for sustainable disease management in potatoes. The project will provide important information on the impact of pastures on yield and quality of potatoes relevant to Integrated Crop Management programs for potato production.

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AusHort

Horticultural audit of production and sustainability, phase two – best practices study

The final report for Stage 1, "Horticulture Productivity and Sustainability" has been published and is available from Horticulture Australia.

The project will review current and emerging environmental management practices and define common elements of good environmental practice for horticulture.

Case studies will be conducted to identify issues affecting growers' capacity to change.

Guidelines will then be developed for formulating and implementing codes of practice which impact on the environment. These will be tested and modified through consultation with growers and other industry groups in Australia.

Project duration: 1 year

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How can horticulture best capture, store and make available relevant information on environmental management

Horticultural industries need to keep abreast of environmental issues that can impact on their businesses.

The aim of the project is to identify a better means of collecting, assessing and disseminating relevant environmental information to the horticultural industries.

Project duration: 1 year

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Key genes for horticultural markets

This project focuses on identifying, isolating and characterising new genes to increase the consistency of quality and availability of fruit and vegetables in the market place and to enhance their novelty in terms of shape, colour, 'mouth feel' properties and antioxidant content. Our target genes can be used generically to alter these characteristics, contributing to the future growth of Australian horticultural products in domestic and export markets. By protecting the Intellectual Property (IP) generated, additional value may be gained by either licensing the IP or using it to gain access to IP owned by others.

Three linked approaches have been selected, two of which focus on the identification of genes in developmental pathways that directly control the physical formation of fruit, seed or leaf. Approach 1 concerns an already isolated gene, FWF, and its unknown interactors, that are central to fruit and seed set and shape characteristics. In approach 2, novel genes which help the action of the plant growth regulator gibberellic acid, are sought to manipulate stem, leaf, fruit and seed characters. Approach 3 aims to identify genes that modify important characters of colour, mouth feel and health properties.

Effective use of these genes will produce for consumers while growers can plan annual production and marketing with increased surety of success and a quality product.

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Scoping study for value adding technologies for Australian horticulture

This project will involve a study to identify value-adding technologies that would have broad application across a number of fruit and vegetable industries.

The project will involve the use of a strategic research planning tool "Technology Value Mapping" (previously known as 'Research Value Mapping') to identify the research program in value adding technologies of greatest benefit to the industries.

The recommendations will focus on a research program with a high probability of success in increasing market opportunities and export income, and improving industry viability.

Project duration: 9 months

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Statistical scoping study for the Australian horticultural industries

Access to accurate horticultural statistics has been an ongoing issue for the industries. Unfortunately, resources are being withdrawn from the Australian Bureau of Statistics (ABS) who conduct a statistical census every five years for agriculture (including horticulture) with sample surveys in the interim years. ABS will conduct more regular surveys for industries on request, but on a user pays basis. For many industries this is beyond their resources. Other industries have used private consultants to conduct these collections, but this approach is

risky as only the ABS has the legislative power to compel completion of the survey forms.

As a first step in addressing this issue, the AusHort R&D Committee have requested that this scoping study be conducted to provide a basis for future decision making.

Project duration: 3 months
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Worker exposure to endosulfan in the horticultural industries

The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) is undertaking assessment of older chemicals that have been in use for some time. Many of these have not had the same amount of study that is now required of newer chemicals.

Endosulfan is one of these chemicals. It is currently used in Australia by industries including vegetables, cotton, tree fruits and nursery crops.

The Australian Centre for Agricultural Health and Safety is undertaking a study of worker exposure of endosulfan for the Horticulture Australia. Workers include mixers, loaders and applicators as well as those required to enter sprayed crops.

The study uses methods defined by the US Environment Protection Agency (EPA), and involves the attachment of filter paper patches to key places over and underneath the work clothes of workers who are exposed to endosulfan in the course of spray application. The patches and gloves will be sent to a laboratory to measure the amount of endosulfan in each sample, and from this the total amount of endosulfan exposure is calculated.

Field work is being undertaken by personnel of the Centre for Pesticides Application Safety (CPAS) of the University of Queensland and about 40 percent of the field work has been completed to date.

Project duration: 8 months
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Coordination of the National Cadmium Minimisation Strategy

Australia has adopted a strategy to maintain safe levels of cadmium in its agricultural soils and produce, an important move in ensuring safe food for Australians and a competitive edge for our agricultural exports.

The National Cadmium Minimisation Strategy, commissioned by the Standing Committee on Agriculture and Resource Management (SCARM) in July 2000, provides a consistent and coordinated program to address issues related to the control of cadmium in soils and crops. Coordinator, Mike McLaughlin, manages implementation of the strategy and will monitor its success.

Cadmium is a naturally occurring element. Although cadmium is present at low concentrations in all soils, its accumulation in soil and hence through the food chain may lead to a health risk in humans.

In Australia, natural levels of cadmium in the soil are low by world standards, but cadmium levels in soil have been increased due to additions in phosphatic fertilisers, sewage biosolids and organic fertilisers/ wastes.

Cadmium can cause health problems in humans after long-term exposure. It accumulates in the body, mainly in the kidneys, leading to gradual kidney damage if exposure is high over a long period. While it is anticipated the Australian population is unlikely to experience cadmium related health problems, the potential for any increased health risk in the future needs to be addressed now.

Guidelines for a 'tolerable' level of cadmium intake have been established by the World Health Organisation and maximum levels in horticultural produce have been set in Australia and many countries overseas. Cadmium is likely to become an increasing factor in international trade negotiations as countries establish standards to control cadmium residues in food.

National control of cadmium in soils and crops ensures safe levels of cadmium in foods

The key elements of the National Cadmium Minimisation Strategy are

- development of Best Management Practices for production and processing of agricultural produce for those industries and/or areas which have an existing or potential problem with cadmium levels in their produce
- development of a Code of Practice by the fertiliser industry to target low cadmium fertiliser to those areas/industries which have an existing or potential cadmium problem
- continued commitment by all states to reduce the regulated maximum level of cadmium (Cd) in phosphatic fertilisers to a practical minimum
- all states to consider the labelling of fertilisers and soil ameliorants, to alert growers to their cadmium content.

Several initiatives have already occurred since the strategy began. Agreement has been reached with all States on national standards for cadmium concentrations in fertilisers, and a national database for crop cadmium concentrations has been established. Fertiliser manufacturers have released special low cadmium brands of single superphosphate for high-risk crops or soils. Further reductions in inputs of cadmium to soil are also likely now a new low cadmium source of phosphate rock (Duchess) has been developed for fertiliser manufacture in Queensland by Western Mining.

Funding for the strategy is provided jointly by Horticulture Australia on behalf of horticultural industries including potatoes and the Commonwealth Government, the Fertilizer Industry Federation of Australia and the Grains Research and Development Corporation. The project started in June 2000.

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Effect of calcium nutrition on decay of summer sown seed potatoes

Grading out smaller tubers may exacerbate problems with tuber decay, while careful management of cool-stored tubers before planting may help tubers resist the disease.

Tuber decay caused by the soft-rot bacteria *Erwinia carotivora* is a sporadic problem throughout the growing, marketing and retailing chain in Australia, particularly for potatoes grown on sandy soils.

Previous research has indicated that high tuber calcium levels may protect tubers against decay or at least delay the disease long enough to enable the crop to establish. However, we have not yet been able to demonstrate an association between higher tuber calcium levels and establishment of potato crops in the field.

Contributing factors

The project team has shown that manipulating tuber calcium levels using micro-nutrient supplementation is possible. However, the elevated tuber calcium levels are not associated with either increased establishment in the field or delayed progression of the disease in the laboratory, when tubers are deliberately infected.

Other factors appear more important than tuber calcium levels in determining whether seed will rot: inoculum load is probably the most important of these and it was shown certified seed usually out-performed seed graded from the previous crop.

Our team has observed diminished tuber weights in *Coliban*, where the mother tuber rotted soon after establishment. We assume these smaller tubers are carrying more disease, so by grading out small tubers for seed, growers are inadvertently increasing the proportion of infected tubers in their retained seed.

Wake up time critical

Tubers take time to 'wake up' when removed from cool storage. Our experiments have shown it takes around eight days for tubers to reach maximum resistance to deliberate *Erwinia* infection. During this time the tubers should be protected from conditions that promote rots including rough handling, high temperatures and free water. Water is a problem particularly in summer, when vapour condenses onto cold tubers.

The Desiree crop (L) and Coliban crop (R), both planted at the same time, show dramatic differences in susceptibility to soft rot.

A one-year extension of this project has been granted, enabling a more thorough investigation of factors contributing to soft rot and how these might be managed. This project is made possible with the assistance and cooperation of Riverina and MIA potato farmers, AusVeg and Horticulture Australia.

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Potato tuber quality management
in relation to environmental and nutritional stress

Brown fleck damages the internal flesh of potato tubers, resulting in a brown discolouration.

The disorder does not involve a disease or produce obvious external symptoms, but is reportedly worse in large, rapidly growing tubers. It downgrades product quality, resulting in poor prices and tarnishes consumer perceptions of potatoes.

Brown fleck is prevalent in northern Australia and is sporadically reported in southern districts. Worldwide, the disorder has received little attention. It is related to temperature but a lack of understanding of the role of temperature is possibly why many studies have been inconclusive.

Critical role of temperature

Our research project highlighted the critical role of temperature in favouring development of brown fleck. An important part of the work was to mimic the conditions that favoured the development of brown fleck in the glasshouse. This would then allow management strategies, particularly the manipulation of nutrition, to be tested in order to solve the problem.

The results

A glasshouse experiment was conducted to evaluate the effects of temperature on the incidence of brown fleck in the cultivar *Sebago*. (Table 1).

The temperature treatments imposed in the final weeks of plant growth and tuber bulking had a substantial affect on the severity of the brown fleck. The percentage tuber area affected in Treatment 1 (18°C/13°C continuous) was 5%, compared with that in Treatment 9, which had 22% surface area affected. Treatments where only one phase of high temperature was imposed (Treatment 3, 7 and 8) exhibited intermediary incidence of about 8%. The low incidence in Treatment 1 was still significant and the cause of brown fleck in the lower temperature treatment will be further evaluated.

Temperature effect on dry matter in tubers

A further important finding has been that temperature in the final three weeks of tuber bulking is critical in determining the proportion of dry matter in tubers. Under cool bulking conditions dry matters were the highest at 20% or an SG of 1.079. In contrast, tubers that bulked under high temperatures had the lowest dry matters 17 and 15% or SGs of 1.063 and 1.057 respectively.

Apart from cultivar selection, the effect of temperature at bulking is a major factor influencing SG in potatoes grown in tropical and subtropical regions. This needs to be considered in making decisions on when and where processing potatoes of high dry matter are to be grown.

Under high temperature at bulking, tubers had high incidence of fleck and very low dry matters. This would indicate that there was an association of brown fleck and the breakdown of carbohydrate reserves at higher temperatures.

In the current season, field trials will evaluate the effect of nutrition on the incidence of brown fleck. The symptoms of brown fleck from glasshouse plants will be compared against those of field grown tubers affected by the disorder. The field incidence will also be related to environmental and weather conditions.

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Table 1*: Incidence of brown fleck and dry matter percentages for potatoes grown under different temperature treatments*

Treatment	Days after planting			Dry Matter %	Brown Fleck % area affected
	10–91 days	91–101 days	101–118 days		
1	Day18°C Night 13°C	Day 18°C Night13°C	Day18°C Night 13°C	20	5
2	Day18°C Night 13°C	Day18°C Night 13°C	Day 23°C Night 18°C	18	8
3	Day18°C Night 13°C	Day18°C Night 13°C	Day 28°C Night 23°C	16	8
4	Day18°C Night 13°C	Day 23°C Night 18°C	Day18°C Night 13°C	19	3
5	Day18°C Night 13°C	Day 23°C Night 18°C	Day 23°C Night 18°C	17	10
6	Day18°C Night 13°C	Day 23°C Night 18°C	Day 28°C Night 23°C	15	18
7	Day18°C Night 13°C	Day 28°C Night 23°C	Day18°C Night 13°C	18	9
8	Day18°C Night 13°C	Day 28°C Night 23°C	Day 23°C Night 18°C	16	8
9	Day18°C Night 13°C	Day 28°C Night 23°C	Day 28°C Night 23°C	17	22

Brown fleck measurements need to be different by at least 7% to be significant.

Sustainable use of reclaimed water
on the Northern Adelaide Plains

As the project enters its final year, the benefits and value of reclaimed water as a renewable and sustainable water resource have been confirmed.

With the adoption of good agronomic practice, growers of the Northern Adelaide Plains can look forward to a guaranteed supply of quality water, which will enable sustainable horticultural and economic development for the region.

The success of this reclamation and reuse scheme has paved the way for several other horticultural based schemes around Australia.

This year we have finalised research into the use of reclaimed water and produced Grower and Reference manuals for producers and advisors.

We have also finalised results of research into nutrient budgeting for several crops, including potatoes. On the Northern Adelaide Plains as much as 10% of a potato crop's nitrogen and phosphorus requirements and 50% of the potassium requirement can be supplied through irrigation with reclaimed water.

The Grower and Reference manuals will be an invaluable resource for the industry, providing information on best practice management for producers using reclaimed water. The manuals will be ready for delivery to industry in October and December 2001.

As an adjunct to this project, also with support from Horticulture Australia, an opportunity was provided for 25 producers, water industry representatives and legislators to visit Israel and California to look at horticultural production using reclaimed water and advancements in water management and irrigation. Two stories were screened on ABC TV's Landline Program and these will be rerun due to the high level of interest. Videos will be available later through Horticulture Australia.

Tour participants were particularly interested in the use of subsurface drip irrigation in horticulture in both countries. In Israel, in the second year of subsurface dripper trials using reclaimed water, potato crops demonstrated a 40% reduction in water use while maintaining yield and crop quality.

Drip irrigation on the Biet Kama Kibutz in Israel is providing 40% water savings for the same yield and quality of potatoes

Funded by the vegetable industries including potatoes and the Commonwealth Government. The grower manual has been funded by Primary Industries and Resources South Australia and the National Heritage Trust.

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Potato Varieties

The potato breeding program is targeting varieties specifically adapted to Australian production areas and production periods. A number of new varieties have been released after collaborative trials with the industry.

The Victorian Department of Natural Resources and Environment operates Australia's only potato breeding program.

A large gene pool is maintained and assessed at the Toolangi Research Station. Cross breeding and early stage selection from hybrid seedling populations is also carried out at Toolangi .

Powdery scab disease screening and winter production screening are conducted at screening sites at Frankston in Victoria and Berrigan in NSW.

Germplasm from these projects is the basis for variety evaluation throughout Australia. Variety trials are located on commercial growers' properties, and are used to select new varieties in collaboration with industry. The testing of new varieties in a series of independent trials is an essential part of the breeding program.

Recent Releases

Commercial crops of *Sonic, Dawmor, Riverina Russet (Eureka), Shine* and *Ruby Lou* were all successful during the 2000-01 season. Most of these new varieties have been selected as 'low input' varieties which have disease resistances requiring less chemical protection and vigorous plants requiring less irrigation and fertiliser. *Shine* and *Ruby Lou* have short growing period and short dormancy and are more suited to double cropping programs than *Coliban* and *Desiree*.

Sonic -a new storage crisping variety

Most crops produced very high yields of round medium sized potatoes. The long growing period and powdery scab susceptibility were problems with some crops. Vigorous plants and resistance to target spot disease were major advantages. The crisp quality has been excellent from direct delivery and early storage.

Riverina Russet (Eureka) - a new direct delivery fry variety

Crops in the Riverina produced high yields and excellent processing quality. The vigorous plants and large canopy protected tubers from the summer heat. Another advantage was the high level of resistance to target spot. Fry quality was excellent with dry matter content higher than *Shepody*.

This variety has also been commercialised for the fresh market in Western Australia where it is being called *Eureka*. The West Australian industry accepts oblong potatoes for the fresh market, so a wider range of varieties are being considered acceptable by consumers. The excellent fry quality of *Eureka*, its good boil, mash and baking qualities have been well received by consumers. In initial trials, *Eureka* has produced high yields and a superior tuber appearance to *Delaware* across a range of planting times.

Dawmor - a new crisping variety suitable for export (photo 1)

Spring planted crops in the Manjimup/Pemberton region of Western Australia have produced very high yields of round, medium sized potatoes. Strong plants that live long enough to fill out high tuber numbers are a major advantage. *Dawmor* has a longer growing period than *Atlantic* (up to 4 weeks), sets many more tubers, has higher yields, similar dry matter but less internal disorders than *Atlantic*. Crisp quality and storage are excellent with most production being well received by export markets.

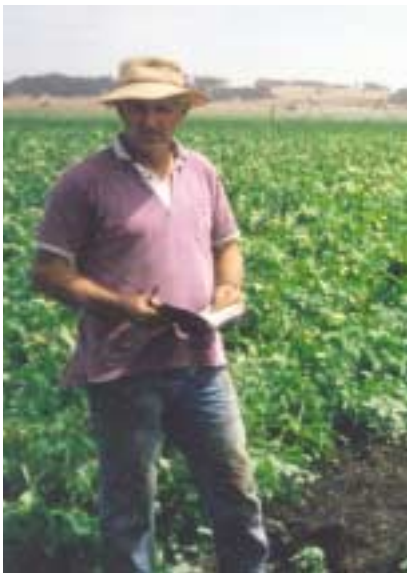
Peter Dawson, WA Department of Agriculture, with tubers of the new variety Dawmor in South Perth

Ruby Lou - a new red skin fresh market variety

Crops in the Murray Mallee (SA), Riverina (NSW) and Swan Coastal Plain (WA) produced high yields of high quality potatoes for washing. Plants have vigorous growth and short growing periods. Crops grown for harvest in winter have better tuber shape and darker red skin colour than *Desiree*. *Ruby Lou* tubers are resistant to common scab disease and target spot, and are resistant to skin scuffing and shatter crack tuber damage.

New lines in trials

A number of new lines have been outstanding in variety trials and small commercial tests during the past season. These will continue to be tested in trials while being multiplied in certified seed potato programs in the coming season.



Don Ferguson, potato grower at Kalangadoo with the test French fry variety 92-37-1

Harvesting seed crop at Lyn Cor, Robinvale, Vic

92-37-1 - a new direct delivery fry variety (photo 2)

Trials have tested this variety for direct delivery from winter harvest crops grown in the Riverina. *92-37-1* has also produced high yields in autumn harvest trials in French fry potato production areas. The best tuber shapes have been from lighter sandy soils. Yields from trials harvested in July are economic and of a quality suitable for processing. Plants are vigorous with long growing periods, but tubers often bulk early in growth.

92-19-10 - a new white skinned fresh market variety

Trials and commercial tests on this variety have identified a short growing period, short dormancy and suitability for double cropping from kept seed.

In the Riverina and Murray Mallee, *92-19-10* has produced high yields of attractive bright white skinned tubers with excellent eating quality.

Acknowledgements

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Planting a potato variety trial at Toolangi, Vic

Harvesting potato variety trail at Andrew Widdisons, Kalagadoo, SA

Potato growers show support for potato variety trials

A record 150 growers attended a potato variety field day at Lameroo in July to take a look at 29 new potato varieties from overseas or selected from Australia's only potato breeding program at Toolangi.

New varieties, such as Winter Gem, Shine and Ruby Lou had shown 15 to 20% higher yields of top quality marketable tubers from winter crops compared to the standard Coliban, due in part to shorter tuber dormancy and suitability for double cropping in the Mallee. The first commercial potato crop was grown in the South Australian Mallee in about 1982 with over 60,000 tonnes now grown each year, mostly for the fresh market.

The Mallee has the benefit of underground water for irrigation and lighter texture soils, which are not as prone to soil-borne microbes and water effects that discolour potato skins in heavier clay soils.

The lighter soils also allow more air and water infiltration resulting in fewer blemishes and a more saleable light skin coloured potato with sheen. It also allows the potatoes to be left longer in the soil during winter to be dug when the market requires and the grower can capture higher prices.

The breeding program has been effective in introducing a range of new varieties for industry. If an independent variety testing program is important to industry though, growers need to support it. Feedback from growers regarding the program is encouraged.

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Inset photos: Some of the 150 growers that inspected 29 new potato varieties at Lameroo, July 2001

Latest R&D reports

The following is a list of Horticulture Australia Final Reports released in the past three months.

Addressing quality management and food safety issues in horticultural industries	**AH99007**
Improved labelling of pesticides to encourage optimum use in horticultural crops	**AH99003**
Needs analysis of codex issues as they relate to horticulture	**AH99012**
Potato Export Market Development	**PT98022**

Reports are available from Horticulture Australia for $22.00 each in Australia or $US30 outside Australia including postage. To obtain reports send a cheque or money order with a note quoting the project name/s and project number/s to:
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Alternatively, reports can be purchased through the Horticulture Australia internet site at www.horticulture.com.au.

Your Levy @ Work

Increasing the opportunities for use of organic wastes in the Tasmanian vegetable industry

Organic wastes are potential sources of nutrients and organic matter for horticulture. Using recycled organic materials can assist with developing more sustainable production methods and help efforts to meet emerging market demands for produce from farms with environmentally responsible farm practices.

The project aims to address some of the barriers to the more widespread use of recycled organic materials in Tasmania by:

- determining the amount, types and locations of organic waste available in Tasmania
- identifying alternative processing and reuse options
- comparing the economics and logistics of processing recycled organic materials in small scale on-farm, medium scale regional and large scale centralised operations
- identifying QA, HACCP and environmental issues with regard to the processing and use of recycled organic materials and reviewing these in relation to their increased use.

Industry feedback highlights increasing interest in the use of recycled organic materials, with recognition that the practice could enhance sustainability of the production system. In particular, marketers see opportunities to improve the image of the industry arising from the use of these materials in the production sector.

Both the production and marketing sectors of the industry have expressed qualified support for the use of recycled organic materials. For producers, it must be economically feasible, and for marketers, the practice must not compromise food safety and QA requirements.

A survey of businesses producing organic wastes is scheduled for completion by the end of June 2001 and survey data will be recorded in a GIS database for easy retrieval by waste producers and potential end users. Some work has been completed on assessing the economics of ROM processing, with a particular focus on the production of compost.

Funded by the vegetable industries including potatoes, Commonwealth Government and the Rural Industries Research and Development Corporation. Project started October 2000.

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Your Levy @ Work

Coordinating technology transfer in the Australian potato industry

The aims of this project are to:

- improve adoption from the technology transfer program
- improve communication in the industry
- develop a Code of Practice for Potato Cyst Nematode (PCN).

The project has been completed with the exception of the Code of Practice component, the Information Directory and evaluation of the project. Technology transfer work since December 2000 now comes under the project *Implementing the potato industry's Communication Plan* (see p46).

Information Directory

The Information Directory has been put on hold until it is decided whether the development of a national internet site (see p45) is to go ahead. If the internet site proceeds, the goal is to have Eyes on Potatoes, Potato Australia, Potato Archives (see p48), the Information Directory and the internet site compliment each other. This has implications for the design of the *Information Directory*.

Code of Practice

The Code of Practice component has not been finalised due to a delay in the commencement of the National PCN Management Strategy project. The two projects are linked by the hygiene component of the Code of Practice, which becomes a component of the National PCN Management Strategy.

Evaluation

Once the Information Directory and the Code of Practice have been finalised an evaluation will be carried out and a report summarising the outcomes and future implications for technology transfer will be published in a future edition of Eyes on Potatoes or Potato Australia.

Funded by the Potato Levy and the Commonwealth Government. Project started August 1996.

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Biofumigation
– optimising biotoxic *Brassica* rotations

This research is investigating the use of biofumigation with biologically-active Brassica species to suppress soil-borne pests and diseases in horticultural production systems.

Brassica species produce isothiocyanates which are toxins similar to those produced by the soil fumigant metham sodium used widely in horticulture. However their toxic activity varies widely.

Current research is examining the timing and quantity of release of toxic compounds into the soil by brassicas, and their fate once in the soil. This is aimed at determining the most appropriate isothiocyanates and developing methods for improving their release into the soil and optimising their biofumigant performance.

Analytical techniques have been developed to measure individual isothiocyanates in soil around brassicas in the field. Preliminary results show that the amount of isothiocyanate in soil related well to levels in the plants, but indicated that ratios may vary. This may be to do with the differences in the volatility of various isothiocyanates.

A free twice-yearly *Biofumigation Update* newsletter is now sent to about 600 interested growers, consultants and researchers to help keep them abreast of research developments by various groups around the world. It is available by contacting John Matthiessen.

Funded by a number of horticultural industries including potatoes and the Commonwealth Government. Project started July 2000.

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Incorporating Brassicas into the soil

National
PCN Management Strategy

This project builds on past information to develop a national PCN management strategy. The localised occurrence of PCN in Australia has restricted trade and market access for Australian potatoes. This is despite original outbreak sites being officially controlled and no recent new sites being found. No nationally agreed strategy has yet been implemented to manage PCN in Australia.

The plan will include strategies to minimise the risk of PCN outbreaks, to deal with an outbreak and to manage affected areas. The project uses information from earlier reports, consultants and other sources. A steering committee has been formed and a wider stakeholder network developed to help develop a draft document. The draft will then form the basis of a workshop to resolve outstanding issues. Endorsement of the plan will be sought from industry and government stakeholder groups.

The project, which has been delayed and has only started in 2001, is funded by the potato industry and the Commonwealth and State governments.

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Your Levy @ Work

Cleaning and disinfection practices for potato farms

The project aims to develop hygiene protocols for potato farms to help minimise the risk of contaminating clean seed stocks with potato diseases in the potato shed.

Trials point to cleaning as an important step in the disinfection process in the potato shed. Droplets of the bacterial wilt pathogen *Ralstonia solanacearum* suspended in protein or potato broth were placed on a metal surface and allowed to dry. The bacteria suspended in the broths survived the drying process, whereas bacteria suspended in sterile water did not. The proteins help protect the bacteria.

The potato slurries that coat bins, rollers and other equipment are sources of contamination of clean seed potatoes with the common potato diseases. Washing surfaces to remove this material is an important first step in the disinfection process and should be done before disinfectant chemicals are used. Many disinfectant chemicals are inactivated by organic matter, such as potato slurry, and by soil.

Tests were done using potato tubers affected with rhizoctonia black scurf as a model to find which disinfectant chemical treatments could be effective in the potato shed. Chemical treatments belonging to the peroxygen, phenolic detergents and the quaternary ammonium groups were found to be effective and safer alternatives to the traditional formaldehyde treatments used by growers. However, further tests showed that some of these treatments could damage potato sprouts.

The effectiveness of disinfectant treatments against potato pathogens on wood, metal, plastic and concrete surfaces is also being tested.

The project started in 1998 and is funded by the potato industry and the Commonwealth Government.

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Pink rot control in field and storage

A South Australian study has successfully identified the main disease-causing organism of pink rot in potatoes and assessed 12 fungicides and alternatives for their effectiveness in controlling the disease.

Pink rot in potatoes

In particular, the study found:

- Pink rot is caused primarily by the fungus *Phytophthora erythroseptica*
- No potato cultivars are resistant to Pink rot
- Ridomil is the most effective fungicide for the control of Pink rot
- Ridomil Gold granules applied at 20kg/ha at planting is the most effective treatment, Costing approximately $330/ha
- Ridomil Gold MZ applied as a foliar spray at 2.5kg/ha at 200-500L/ha at tuber initiation and 14 days later is also effective, costing $172/ha ($86 per spray)

What the research uncovered

Cause of Pink rot and cultivar susceptibility

Fungi isolated from diseased tubers, potato plants and soil showed that Pink rot was associated mainly with *Phytophthora erythroseptica* and occasionally with *P. cryptogea*. Other species included *P. megasperma and P. parasitica. P. erythroseptica* was recovered from tubers and soil from South Australia, Tasmania, Western Australia and Victoria, showing that the problem is widespread in Australia.

The susceptibility of 17 potato cultivars and breeding lines was evaluated by artificially inoculating tubers. No tubers were resistant to Pink rot, although differences in susceptibility were detected. *Russet Burbank* was the least susceptible with 40% of the tuber infected, and *Ruby Lou* the most susceptible with over 90% of the tuber infected.

Detecting Pink rot in soil

Studies also looked at methods to detect the fungus in soil as it was thought this may be a valuable management tool enabling growers to plan control strategies depending on the presence or absence of Pink rot in a particular field. A technique using Camellia leaves was found to be the most effective. However, when sampling was carried out in a paddock known to be infested with Pink rot, the test was not sensitive enough to pick up low levels of fungus. Further investigations are needed to determine the minimum levels at which the disease can be detected.

Control options

Studies were carried out to evaluate the potential of using alternatives for the control of Pink rot. Mustard meal and mustard pellets were assessed as biofumigants. They release isothiocyanates which are powerful fumigants similar to those manufactured commercially for use in the horticulture industry.

Both materials were successful in controlling the growth of the Pink rot in the laboratory, however when mustard meal was applied at one and 3t/ha at planting in a field experiment, it showed little effect on the level of Pink rot. Even if higher rates of meal were effective in controlling Pink rot in the field, it is unlikely that it would be cost effective.

Cost effective control

A number of glasshouse experiments were also set up to evaluate the effectiveness of soil applied fungicides with the aim of simulating the control achieved when fungicides are applied to the soil surface and leached through the soil by rain or overhead irrigation. The results showed that Ridomil controlled Pink rot completely at depths of 15 centimetres and was more effective than other fungicides such as Shirlan, Zoxium and SZX722, an experimental material.

Twelve fungicides were tested for the control of Pink rot and Ridomil was found to be the most effective. Ridomil can be applied to soil as granules, as a foliar spray or as an in-furrow spray. Investigations into application methods showed that either two foliar sprays (at 2.5kg/ha, 1.25kg/ha per spray) applied at 200-500L/ha at tuber initiation and 14 days later, or the granular application at 20kg/ha at planting are effective.

At the present cost of around $34.60/kg for the foliar Ridomil Gold MZ and $16.50/kg for the granules, two sprays at 1.25kg/ha costs around $172/ha ($86 each spray) compared to $330/ha for the granule treatment. Granular application at planting may be the most appropriate in areas where high levels of Pink rot have been detected while foliar sprays may be the best option in other Pink rot affected areas.

Large scale experiments on commercial properties in 1999-2001 were established to evaluate Ridomil applied in furrow at planting. Pink rot did not develop on any of the properties where the disease had previously been reported. However, in one experiment an in furrow treatment of 1.04kg/ha of Ridomil at planting was as effective as 20kg/ha of Ridomil granules when both were applied at planting.

Further experiments are required to look at different application methods of Ridomil and to evaluate alternative methods of control.

We thank Horticulture Australia and the Potato Industry for funding the work. We are also grateful to the staff at the Plant Research Centre and Lenswood Research Centre for their help. Particular thanks go to all the potato growers who allowed us to carry out field trials on their properties.

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Your Levy @ Work

Pot-Tainer
non-refrigerated transport

A cost effective transport system using air circulated at normal temperatures rather than refrigerated air, has been developed to keep potatoes in peak condition during shipping to distant markets.

The Pot-Tainer is a development of the Fantainer, used to export onions without the need for expensive cooling systems.

Developed by Food Science Australia and the Sydney Postharvest Laboratory, the Pot-Tainer continually recirculates air through the container to maintain the humidity necessary for stored potatoes, introducing just enough fresh air to remove any gases produced by the potatoes.

Other than for short journeys, premium quality potatoes have normally been exported from Australia in refrigerated containers. Like onions though, potatoes can be shipped to distant markets without refrigeration. To do this successfully they need to be handled appropriately, cured properly and kept dry during the journey.

The challenge is to keep the surface of the produce dry when it goes through different climatic zones. As with onions, this can be done using fan-forced ventilation. This helps the load to follow the changes in the outside temperature during the journey.

How it works

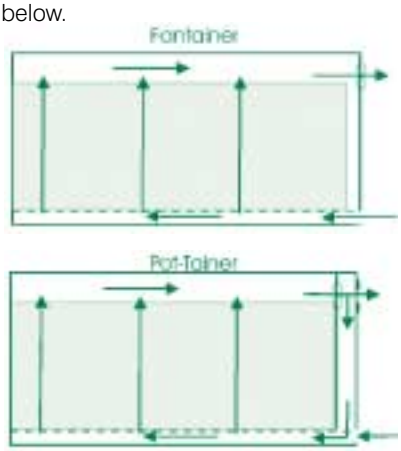
Food Science Australia developed the Pot-Tainer to provide cost effective shipping of potatoes to help grow export markets, particularly in Asia.

Unlike onions that store best at low humidity, potatoes keep best at high humidity (90-95% Relative Humidity), so they need a differently designed container than the fantainer.

Our aim was to adapt the Fantainer to make it suitable, reliable and economical for shipping potatoes.

Special features

The Pot-Tainer combines several special features using newly available control equipment and sensors to maintain a high rate of air circulation. This keeps a uniform temperature within the stow, but also produces a high humidity in the loadspace. This principle is shown in the schematic below.



How air moves through the Fantainer and Pot-Tainer

While the Pot-Tainer ventilates the potatoes and controls humidity in the optimum range, it is not the complete answer to top quality export. No container can improve the quality of the produce it is carrying, it can only maintain it. For the Pot-Tainer to work properly, it should be used as part of an integrated system that combines a modified fantainer with a postharvest handling protocol.

The importance of postharvest handling

The protocol recommends that potatoes need to be free of all damage except minor skin grazing prior to export, that they are properly cured and preferably treated with a fungicide. It is also important that the Pot-Tainer is properly stowed to create uniform airflow as well as ideal airflow pathways through the produce.

The system has been tested in several simulated shipments between Melbourne and Singapore and Melbourne and Hong Kong, using the container test facility at Food Science Australia. In this facility the atmospheric conditions were varied as if on a real voyage.

Potatoes from the simulated shipments. A comparison of potatoes that were cured plus a fungicide treatment (1), cured only (2), fungicide dipped only (3) and a control with no disease introduced and only dipped in water(4).

We introduced fungi and bacteria to the potatoes and placed them at various positions throughout the Pot-Tainer. Importantly the disease did not spread in potatoes that had only minor skin grazing and had been cured and/or treated with fungicide.

Later, a real export shipment from Melbourne to Hong Kong compared a Pot-Tainer with a conventional container. Part of the load was low in mechanical damage and treated with a fungicide and had little disease when it reached its destination. Another part was high in mechanical damage, without curing or fungicide prior to export and there was a lot of bacterial rot.

The Pot-Tainer technology worked well, but it could not compensate for the high level of damage and lack of postharvest disease control treatment in the load. This confirms the importance of ensuring that only high quality, properly treated produce is selected for export in the Pot-Tainer system.

When used properly we hope that careful postharvest handling and the Pot-Tainer export system will help ensure that potatoes can be exported without refrigeration. This will allow expansion of the industry in Australia and enable Australian growers to capture a much larger share of the rapidly growing Asian market.

The team at Food Science Australia express their gratitude to Horticulture Australia and Food Into Asia programs and the Australian potato industry levies, that have funded this project.

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Development of extreme resistance to common scab

Common scab is an important disease of potatoes that is difficult to control.

This project is developing durable resistance to scab by targeting tolerance to the poison (*thaxtomin*) produced by the disease during infection.

We have achieved this by selecting cells in tissue culture that are tolerant to the toxin.

Thirteen lines of *Shepody* and four lines of *Russet Burbank* that grow in the presence of thaxtomin have been selected – all were grown under conditions that required extreme resistance.

Three distinct types of resistance have been observed within the selected lines suggesting the presence of multiple resistance genes. These may be important in future breeding programs as multiple resistance can result in varieties or clones with more durable resistance to diseases.

Production of plants from tissue culture is currently underway, after which disease trials will be conducted to confirm resistance.

Pitted scab in potatoes

Funded by the potato levy and the Commonwealth Government. Project started July 1998.

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Enhanced biodegradation of metham sodium soil fumigant

Metham sodium is an unusual pesticide. It is not a toxin, rather it reacts with moisture in the soil to produce toxic MTC (methylisothiocyanate). One of its attributes is that it does not leave persistent residues.

The downside though is that it can be broken down in the soil by bacteria before its job is done – a process called enhanced biodegradation.

Soil sampling in horticultural areas across Australia has shown that enhanced biodegradation is growing, with it now identified in four horticultural areas.

CSIRO Entomology is aiming to better understand enhanced biodegradation to enable growers to make informed decisions about their use of soil-applied pesticides and help to prevent the problem. It cannot be cured.

Laboratory trials of soils with metham sodium to induce enhanced biodegradation has shown that it is induced more easily in sand than loam and it occurs about twice as quickly in soil at pH 7.8 than soil at pH 6.8, and much more slowly as pH falls below that.

Soil from a site severely affected by enhanced biodegradation is being tested periodically over a long period of time to measure how it recovers. Of 17 soil bacteria highly tolerant of metham sodium from the site, two have been identified as the degraders.

All the bacteria are types very resistant to environmental extremes, so recovery of affected soil is expected to be slow and the problem likely to rapidly re-emerge following further pesticide application.

The project is continuing and a free annual newsletter *How Degrading* is available by contacting John Matthiessen.

Funded by the vegetable industries including potatoes and the Commonwealth Government. Project started February 1999.

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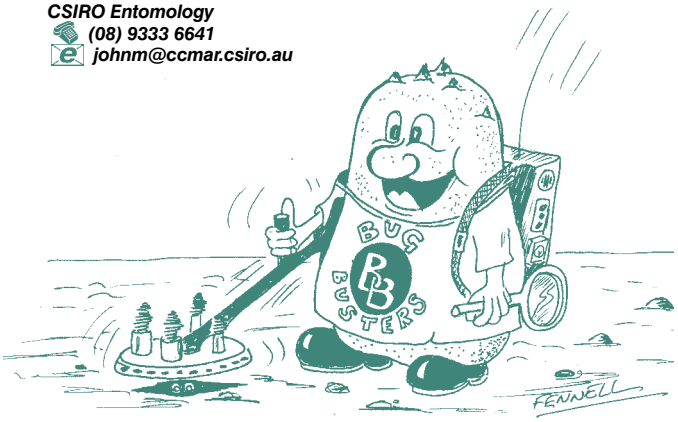

Fumigation rig used to apply metham sodium

Your Levy @ Work

Influence of rotation and biofumigation on soil-borne diseases

The practice of growing brassicas for biofumigation may aggravate the rhizoctonia problem in potato crops, this study suggests. The study also showed that rhizoctonia could also be associated with pasture in potato-pasture production systems.

Two different strains of the *Rhizoctonia solani* fungus, AG3 and AG2, were commonly found in potato crops during studies of the relationship between crop rotation and the rhizoctonia diseases stem canker and black scurf. AG3 is a potato attacking strain of the fungus, whereas the AG2 group is normally associated with brassicas, clovers and other legumes. Until now, it was not known as a problem in potato production in Australia.

In glasshouse tests the AG3 strains produced typical Rhizoctonia cankers on the stems and stolons of potatoes, as well as the characteristic 'black scurf' sclerotia on tubers, but did little damage to fodder Brassica, Indian mustard or red clover. However, this group produced abundant sclerotia on the roots of the brassicas and clover plants indicating that these rotation crops could maintain populations of *Rhizoctonia* in the period between potato crops. Large sclerotia of AG3 strain had also been found on the roots of fodder brassica grown in field plots.

The AG2 strain of rhizoctonia also caused stem and stolon canker on potato plants in the glasshouse tests, as well as damping-off in fodder rape and Indian mustard seedlings, symptoms of 'wire-stem' in the two brassica species, a crown rot in red clover and small numbers of tiny sclerotia on the roots of all species except clover.

The project started in 1996 and is funded by the potato industry and the Commonwealth Government.

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Your Levy @ Work

An agronomic and economic blueprint for a round seed system

The aim of the project is to find the best way of producing round seed and then determining an equitable payment system for seed growers.

Two successful field trials were conducted in Tasmania in the first year of the project. At each site, Technitubers were compared to whole and cut sets and planted at densities ranging from 1.5 to 20 sets per square metre.

At each site, the highest total tuber yield was produced from cut and whole sets. The highest round seed yield was also produced from cut and whole sets, except at one site where more round seed was produced from cut sets compared to whole sets.

As the number of stems increased, so did the yield of round seed.

Planting density had a slightly different effect on total yield at each site. Under exceptionally good growing conditions at one site, all planting densities produced similar total yield, except at 1.5 sets per square metre, which produced lower yields. In contrast, at the second site where growing conditions were not as good, higher total yields were achieved at planting densities of 12 and 20 sets per square metre.

Round seed yield was very sensitive to planting density. The highest yields were achieved at the highest planting density.

Phil Brown, in his Horticulture Australia project *Improving Seed Potato Production*, showed that the natural sprout suppressant Carvone can significantly increase the number of stems per plant, resulting in a higher proportion of round seed and greater uniformity of seed size.

Two field trials were conducted during the past season, concentrating on cut and whole sets at a range of densities, with and without Carvone. Results are not yet available. Once analysed, directions will be determined for the third year's work, which will include an economic assessment of round seed production and ways in which seed growers may be best rewarded.

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The Tasmanian Potato Industry

Tasmania is an ideal place to grow potatoes, with a cool, temperate climate and an abundance of fresh water, clean air, and rich, fertile soils. These natural qualities co-exist with progressive farming attitudes that readily embrace the new and best-practice technologies required to grow quality potatoes.

The Past

The first recorded potatoes were grown at Kingston in the south of Tasmania in 1803. Production expanded into the north of the state as settlers cleared land. A regular trade to the mainland of Tasmanian potatoes started in the 1870's.

By the 1920's, the annual potato harvest was 69,000 tonnes, with yields increasing from 5 to 15 t/ha through better growing techniques. In 1944-45, potato production peaked at 350,755 tonnes, with processing of canned and dehydrated product at four facilities across the northern end of the state. 1963 saw the beginning of production of frozen French fries at the Edgell Ulverstone plant.

The Present

The Tasmanian potato industry today comprises about 600 potato growers, producing around 435,000 tonnes of potatoes from more than 10,000 hectares. This industry continues to focus on the processing sector with production of French fries for the Australian retail and fast food markets. Most of the processing crop is grown in the fertile red ferrosol soils of the north west coast.

Two French fry companies have processing facilities in Tasmania. Simplot Australia has processing plants in Ulverstone and Scottsdale, and McCain Foods have one at Smithton. Both companies produce French fries and associated products for the Australian retail and fast food markets, including McDonalds and KFC.

The main processing variety grown is *Russet Burbank*, with smaller quantities of *Kennebec, Shepody* and *Ranger Russet* allowing for early season production. The potato harvest starts late January, with most of the crop dug into storage facilities from April to June. Harvest continues over winter with the last of the crop dug in August.

Tasmania also has a fresh market potato industry, where produce is sold locally though supermarkets, greengrocers and roadside outlets. Tasmanian fresh market production is also seeing an increase in specialty and gourmet lines of potatoes, which are much sought after by caterers and specialist retailers on the mainland. These varieties include *Pink eye* and *Kipfler*. However, with the greater availability of proprietary lines subject to Plant Breeders Rights, more specialty varieties are now also being grown for these markets.

Potatoes grown for processing and fresh market are produced from certified seed. The Tasmanian Seed Potato Certification Scheme was founded in 1933. The scheme has recently undergone some changes with the implementation of National Standards for Seed Certification in 2001. The Tasmanian seed potato scheme involves 110 growers, producing more than 25,000 tonnes of seed of 25 varieties. These seed potatoes not only supply the local industries, but there is also strong interest from mainland buyers due to Tasmania's isolation and relative freedom from pests and diseases.

The Future

With a value in excess of $85 million, the potato industry makes up about half of the gross value of vegetable production in Tasmania.

In the past few years, many advances in technology have been made in the Tasmanian potato industry, particularly in the area of irrigation management. There has been a significant increase in the number of centre pivots in the Midlands and North east growing areas as well as a greater understanding and uptake of irrigation monitoring and scheduling practices in all areas.

Work is also being done on crop nutrition and disease management, with a greater understanding of these issues having the potential to increase productivity and efficiency.

Although in recent times there has been conflict between growers and the processing companies over potato pricing, the processing sector remains the backbone of the Tasmanian potato industry.

Tasmania has the potential to support an annual crop tonnage of up to 500,000 tonnes in the future, with the main limiting factors being water, grower and land availability. The first is being investigated by the Department of Primary Industries, Water and Environment through the newly-developed Water Development Plan. The issues of land and grower availability are being addressed in part through the development of non-traditional potato growing areas.

So, next time you venture into KFC, McDonalds or purchase French fries anywhere in Australia, there is a very good chance they were grown and manufactured in Tasmania.

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Can blood and bone save potatoes?

Trials in Ontario and Prince Edward Island, Canada, have found that under the right conditions, organic waste products such as blood and bone, liquid swine manure and fish emulsions can be used to control diseases in potato crops.

A world leader in this area of research, Dr George Lazarovits from Agriculture and Agri-Food Canada, presented his research findings to Australian scientists at a forum earlier this year.

Potatoes are a high value annual crop in Canada and are subject to severe disease pressure from two soil-borne diseases - common scab, caused by the bacterium-like organism *Streptomyces scabies* and erticillium wilt, caused by the fungus *Verticillium dahliae.*

Crop rotation has not controlled these diseases, as both pathogens survive in soil for up to a decade. According to Dr Lazarovits, growers in infected districts were in danger of losing a large part of their crop value, unless the soil was disinfected.

In recent decades horticulture industries have relied on the pre-plant soil fumigant, methyl bromide, to control soil-borne diseases and weeds and also to improve yields. However, the use of methyl bromide will be banned with the decade.

Benefits of traditional methods

Yet, Dr Lazarovits' team discovered the more traditional applications of blood and bone and swine manure produced similar benefits, depending on the composition of the organic product and the soil type.

These organic materials have high concentrations of nitrogen which, when ploughed into the soil, break down to produce ammonia and nitrous acid, both effective natural fumigants.

Organic products are not widely used to control plant diseases in Canada, but there is potential for these materials to become a viable disease control strategy for potatoes and other high value crops.

George Lazarovits (L) and Nigel Crump (R), London, Ontario, Canada

"Before this happens, organic products must meet guaranteed quality standards, long shelf life and consistency from lot to lot. We found that all amendments work best when fully incorporated into the soil, but this wouldn't suit no-till agriculture," Dr Lazarovits said.

Having identified blood and bone and swine manure as potential alternatives to methyl bromide, the challenge is to understand how these organic materials work so commercial products can be developed.

"Effective methods of applying the quantities of organic products required will need to be further developed. There is the need to generate unbiased, tested and accurate advice in order to bring a level of trust to these products," he said.

Use of treatments in Australia

Agriculture Victoria scientist Dr Nigel Crump has joined Dr Lazarovits and his team at the Agriculture and Agri-Food Centre in Canada to learn more about disease management using the organic products.

During the next four months Dr Crump will learn about:

- the tests used to determine soil types suitable for organic treatments
- the tests that monitor the effect of treatments on pathogens such as common scab
- how these treatments work

Dr Crump will also be testing soil samples from a Victorian common scab 'hot spots' to determine the possibilities for organic treatments.

Future plans for the Integrated Pest Management team at Knoxfield are to develop a program to evaluate organic products for managing diseases such as common and powdery scab.

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Elders Limited - **The Potato Professionals**

Elders have obtained the Plant Breeder's Rights to many new and exciting potato varieties. We are now taking this opportunity to inform the potato industry of the potato varieties we have an invested interest in, to ensure we can maintain the required control and management of these lines. The following extract defines the general nature of plant breeder's rights, and the obligations growers have under the act.

"Subject to sections 16, 17,18, 19 and 23, PBR in a plant variety is the exclusive right, subject to the Plant Breeders Rights Act 1994 and including amendments, to do, or to license another person to do, the following acts in relation to propagating material of the variety:

a produce or reproduce the material;

b condition the material for the purpose of propagation;

c offer the material for sale;

d sell the material;

e import the material;

f export the material;

g stock the material for the purposes described in paragraph a, b, c, d, e or f."

(Information sourced from the Plant Breeders Rights Act 1994, prepared by the Office of Legislative Drafting, Attorney-General's Department, Canberra.)

Elders Limited has formal agreements in place for the commercialisation of new potato varieties with the following breeding organisations:

a Caithness Potato Breeders Ltd;

b Cygnet Potato Breeders Ltd (excluding W.A.);

c Cornell University;

d Boreal;

e Hettema-ZPC (excluding Tas. and W.A.) through Forth Farm Produce Pty Ltd

Varieties now under license to Elders Limited for commercial evaluation and development include;

a Nadine, Kestrel, Heather, Argos, Tiffany, Harmony, Valor, Winston, Redgem, Celine, Verity, Osprey, Maxine, Friar, and Brora;

b Cabaret, Saxon, Admiral, Midas;

c Eva, Keuka Gold, Andover, Reba;

d Satu, Sini, Suvi;

e Bimonda, Courage, Platina, Xantia, Mondial, Novita, Remarka, St Johns, Liseta.

Elders are looking to develop and grow our market share of both the domestic and export potato market through the use of superior lines of potatoes that will match the buyers requirements, and suit the growers conditions. The use of professional staff within the Elders national network, will improve our ability to increase returns for all stakeholders within the value chain.

Elders have a responsibility to ensure the protection of the above mentioned varieties under the PBR act, and would remind all people having access to those varieties of their obligations under the act.

For any enquiries in regards to the Elders Potato Program you can contact the following people
Rene De Jong Elders VP-Ballarat **m: 0418 523710** or Gary O'Neill Elders-Roseworthy **m: 0408 980055**

Elders
WE WORK

Your Levy @ Work

Management of tomato spotted wilt virus in potatoes

Tomato spotted wilt virus (TSWV) is a sporadic but important disease of potatoes, particularly in the southern Australian growing regions.

The disease causes foliar symptoms similar to early blight (accurate diagnosis may require laboratory testing) and may cause internal tissue death in tubers.

This project aims to:

- characterise the major environmental influences associated with disease outbreaks, to develop models to predict likely disease risk factors and seasons and determine how these may be manipulated to control the disease
- evaluate relative susceptibility of major commercial varieties to TSWV infection (including analysis of tuber infection and quality)
- undertake preliminary studies on insecticides for disease control

Data needs to be collected over several seasons before we can determine the impact of environmental conditions on the disease, but it is likely that temperature, rainfall, weed and alternate crops in the vicinity of the potato crop and seed health are important.

Western flowers thrip is not believed to be important in spreading TSWV in potato as most evidence suggests onion thrips and possibly tomato thrips are the main ways of spreading the virus to potatoes.

Virus infection of the crop can come from infected seed but more commonly from other host plants external to the crop (meaning that seed certification may be of limited value in controlling this disease in epidemic years).

Funded by the potato levy and the Commonwealth Government. Project started January 2001.

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Tuber symptoms associated with TSWV infection in Russet Burbank (left) and Shepody (right)

Foliar symptoms associated with TSWV infection in cv. Shepody

Your Levy @ Work

Enhanced metalaxyl breakdown and its implication in Australian horticulture

This project aims to raise the awareness of growers and industry on the proper use of the fungicide metalaxyl, to improve the management of its use and provide a better understanding of how metalaxyl is broken down.

The use of metalaxyl is expected to increase as an effective fungicide treatment for the control of *Pythium, Phytophthora* and downy mildew diseases in vegetables, as well as pink rot and late blight diseases of potatoes.

However recent studies have shown that if the fungicide metalaxyl is not properly used on potato and other vegetable crops, poor disease control will result in it breaking down more quickly in the soil.

One outcome from the project is expected to be an information leaflet with guidelines for the effective use of metalaxyl.

Funded by the vegetable industries including potatoes and the Commonwealth Government. Project started January 2001.

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New Chemical treatments
for fungal diseases of seed potatoes

Seed potato farmers have started using disinfectant chemical treatments on seed potatoes after harvest as a tool to manage seed-borne diseases.

Laboratory trials identified a peroxyacetic acid/hydrogen peroxide-based chemical as a possible alternative to the traditional, although unregistered, formaldehyde treatment used by seed growers. In later fields trials these treatments were not as effective as in controlling seed borne rhizoctonia black scurf as the registered protectant fungicide treatment pencycuron (Monceren 250 FS®). The effectiveness of the alternative treatment depends on concentration and time of contact with the pathogen. Despite this, disinfectant treatments may be useful in killing pathogens that contaminate the surface of seed tubers after washing. The advantage of the new treatment over the protectant fungicide is it does not have a residual effect.

Trials are currently under way to test the efficacy of disinfectant treatments against powdery scab spore balls.

The project started in 1997 and is funded by the Commonwealth Government.

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New cut seed treatment
reduces surface rot

A new treatment for cut seeds may hold the key to reducing surface rot, three separate Tasmanian studies have found.

Three laboratory studies indicate that Nubark™, a new fir bark product used for treating cut seeds, can help reduce tuber rot by reducing bacterial and fungal infection through cut tuber surfaces.

Each study resulted in Nubark™ performing better than conventionally used Plant Medicine (PM) fir bark.

As a result of these successful trials, Serve-Ag arranged for a small shipment of Nubark™ to be brought to Tasmania on behalf of the processing companies for use in December 2000. Nubark™ will be available again for the 2001-02 planting season in limited quantities.

PM FIR BARK **NUBARK™ ONLY** **UNTRTEATED CONTROL**

The need for rapid healing of cut surfaces

After cutting, a potato seed undergoes a natural healing process. First, a layer forms to seal off the wound, preventing moisture loss and providing protection from infection. Later, a layer of corky cells forms a permanent, protective barrier against infection and water loss. If the layer forms slowly, infection can occur.

Douglas fir bark powder is often dusted onto cut tuber seeds to dry and separate cut tubers. It also promotes rapid healing, reducing rot on the cut surfaces. Poor or slow sealing of the cut tuber surface results in seed-piece breakdown due to fungal or bacterial invasion.

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No new late blight strains - yet!

The first signs of the new strains will be an increased frequency and severity of outbreaks of late blight which cannot be controlled with metalaxyl.

To date, we appear to have none of the new destructive strains of potato late blight in Australia - but can we afford to be complacent?

A study of Australian populations of the potato late blight fungus, *Phytophthora infestans*, has found none of the new strains that are wreaking havoc in potato crops across Europe, North and South America and parts of Asia.

The Australian strains tested so far are like the old European and North American strains. Tests showed they were very sensitive to the *Phytophthora* specific fungicide metalaxyl (Ridomil®), confirming that late blight can still be controlled with the fungicide.

Further evidence that we do not have the new strains is that late blight still only occurs sporadically in Australia, usually on the north-west coast of Tasmania and in the central highlands region of Victoria (Ballarat), and that serious outbreaks have been managed effectively with metalaxyl. However, in many other countries, late blight has become the single most destructive and costly disease of potatoes.

Late blight caused the Irish potato famine during the 1850's. The original populations of the fungus, which spread to Europe with the introduction of potatoes from South America, consisted of only one 'mating' type of the fungus, the A1 type. The fungus survived from one season to the next only on volunteer potatoes and infected seed tubers.

Spread of aggressive strains

A second wave of migration of the fungus from central Mexico, began in the mid 1980's, spreading new A1 strains, as well as a second mating type (A2) throughout the world. The new populations now consist of many different strains of the A1 and A2 mating types. These strains are much more aggressive and cause severe stem lesions, readily infect tubers and produce sexual spores (oospores) which can survive in a dormant state in soil for several years in the absence of a host plant.

These strains are also able to infect the potato crops under a much wider range of environmental conditions, causing major losses where the disease was easily managed in the past. They are also resistant to metalaxyl, with the result that crops in Europe must be sprayed continuously with protectant chemicals, at intervals as little as five days apart, to achieve control.

Because of the presence of the two mating strains, the new populations are more genetically diverse and adaptable and have very quickly replaced the old, less aggressive strains in Europe, North and South America, Russia and parts of Asia.

Investigating Australia's disease status

The aim of this study was to compare the Australian late blight fungus against other strains from around the world. This was a collaborative project between Agriculture Victoria (Dolf de Boer), AQIS (Lois Ransom), Serve-Ag (Hoong Pung) and the Cooperative Research Centre for Tropical Plant Protection, Queensland (André Drenth). Samples were taken from several diseased crops and diseased volunteer potatoes in north-west Tasmania and Victoria during the 1998-99 and 1999-2000 seasons. The disease develops in these areas after several days of warm, still and humid conditions with accompanying periods of dew in mid to late summer after canopy closure.

Late blight on plant foliage

André Drenth, who conducted the tests on the fungus, found the Australian late blight fungus was more difficult to grow and maintain in the laboratory compared to reference strains from Europe and North America. Nevertheless, more than 30 cultures were successfully obtained from the Tasmanian samples. They were found to all belong to the A1 mating type.

Unfortunately, culturing from the Victorian material was not successful. As the disease is not a serious problem in Victoria and can be managed with metalaxyl, it is more than likely the Victorian strains will be similar to those from Tasmania. However, further sampling and testing will be necessary to confirm this.

Although the evidence suggests that we only have the old A1 strains in this country, we cannot afford to be complacent. The inadvertent introduction of the new strains of *Phytophthora infestans* into Australia could be catastrophic. We must determine the risk of this happening and develop strategies to minimise the risks and deal with any incursion.

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Managing bacterial breakdown in washed potatoes

Bacterial breakdown or soft rot is a significant disease in potatoes and often occurs after washing, causing major losses for wash-packers.

The research into soft rot found:

- most of the soft rot contamination occurred in the initial wash and tumbler stages
- sanitisers effectively controlled *Erwinia* bacterium in clean water
- sanitisers added to infected tubers at the final rinse do not appear to prevent tuber soft rot
- hot air drying of infected tubers successfully minimised tuber soft rot

A survey of washing plants indicated the major source of contamination was *Erwinia* bacteria in the wash water from the initial dumping tank and tumbler regions. Tests showed when potatoes were immersed in contaminated water, the incidence and severity of tuber soft rot increased.

Sanitisers tested

As washing plants are using sanitisers in their water and through the final rinsing sprayers to control *Erwinia*, commercially available products were tested in the laboratory to determine their effectiveness. The six sanitisers tested so far (bromochloro dimethlyl hydantoin (Nylate®), calcium chlorite (Klorman®), chlorine dioxide (Oxine® and Phosphoric acid®), didecyldimethyl ammonium chloride (Sporekill®), sodium hypochlorite (Liquid Pool Chlorine®) and peroxyacetic acid hydrogen peroxide acetic acid (Proxitane®)) when applied at concentrations between 0.1 to 100 ppm were successfully able to control *Erwinia* in clean water. However their effectiveness was reduced when an organic load was introduced into the water.

The sanitisers were then tested in a mini potato washing plant built to simulate the action of commercial washing plants. Potato tubers were infected with the *Erwinia* bacteria and the sanitisers applied either with the final rinse water or in the tumbler by overhead spray nozzles. The potatoes were induced to rot by placing tubers in a tent under continuous misting for four days before assessing for the incidence and severity of soft rot.

Little effect

Applying sanitisers with the final rinse sprays did not reduce the incidence and severity of tuber soft rot. Initial testing also indicated that applying sanitisers by spraying in the tumbler region had little effect on the level of soft rot, however this testing is ongoing. Trials are also underway to determine if there is a threshold level of *Erwinia* in the water below which the sanitisers would be effective.

Mini potato washing plant with tumbler spray nozzles

Promising option

The most promising method found to reduce soft rot was to dry potato tubers with hot air at 45°C prior to packaging.

Investigations are continuing into effective sanitiser use and other methods to reduce the levels of soft rot.

We wish to thank the washing plants in South Australia for their help and cooperation with this project.

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Australian potato export challenges and opportunities

There are massive export opportunities for Australian potatoes in the Asian market. However, according to a study just completed for the APIC and Horticulture Australia these opportunities can only be realised by addressing several major issues.

The aim of the two year study was to investigate how the Australian potato industry could improve its export performance and identify future potential in export markets.

Dr David McKinna, a leading marketing strategy consultant, prepared two reports outlining possible directions for the industry's future.

Industry limitations

In 1997, the Centre for International Economics identified the high cost of production and insufficient commitment to export by traders as limitations for the Australian potato industry.

McKinna concluded that Australia is unlikely to be able to compete at the bottom end of the market because of cheap imports from the US and Holland and the emerging threat from China and Indonesia. Because of the sheer size of their industries and their cyclical nature of production, the US and Holland can land product at half the price of Australian product.

Opportunity for premium markets

However, there is an opportunity to build the premium markets in Hong Kong, Singapore and Malaysia with smaller, spasmodic trade in PNG, Mauritius and Fiji. Opportunities in these premium markets total about 14,000t, but because of Australia's cost structures and inconsistent quality, it is likely that Australia's share will be about 7,000t.

The main issues in developing these opportunities are:

- reducing the cost structure through higher-yielding varieties
- developing efficient supply chain clusters
- reducing freight rates

- differentiating product, based on fitness for purpose
- addressing labelling and supply protocols
- developing branding, supported by marketing and promotion

Major threats

Major threats to realising these opportunities are Australian freight rates (which account for up to 15% of landed price of the product), inefficient packaging systems and the quality and consistency of Australian product.

The Australian industry has no coordinated capability for gathering market intelligence or supporting a marketing and promotion campaign for potatoes on domestic or export markets. There needs to be stronger ties between our markets, to offset the advantage held by the US and Holland, which are able to move product freely between domestic and export markets.

The main long-term opportunities for the Australian industry are in the development of elite seed production technology, the establishment of offshore facilities in key markets and variety development with highly attractive performance factors in terms of cooking and processing.

Key Recommendations

1. APIC and Horticulture Australia Limited should continue facilitating discussion and debate about the potential establishment of an industry organisation capable of supporting coordinated market intelligence, market development and promotion activities.
2. APIC, Agriculture Victoria and Horticulture Australia Limited should support the development of high yielding varieties, with strong market acceptance attributes, based around fitness for purpose.
3. Elite seed production technology needs to be further developed.
4. APIC and Horticulture Australia should develop and implement a best practice strategy through a Product Quality Pathway System.

Russell Sully led the Potato Export Market Development project from the Institute for Horticultural Development at Knoxfield, Victoria.

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Remote sensing as an aid to horticultural crop recording and husbandry

The aim of this project was to find out whether crops in a mixed farming area could be distinguished on satellite images. This would enable the location of crops to be determined relatively cheaply.

The project team also looked at whether crop yield could be predicted from satellite information.

A computer program was developed to recognise about 20 different horticultural crops, fallow and pastures as they appeared together in satellite images. This was more accurate than human interpretation of the same images.

By the end of the project the program could recognise about 80% of the crop types and fallow from an image. 100% recognition of paddock crops together was not achieved. The best recognised were onions, peas, potatoes, poppies and pyrethrum.

The work on using satellite information to predict crop yield focused on poppy and pyrethrum crops. It found that poppy yield could be predicted, but accuracy could be improved.

Other studies in the area have found that yield predictability improves over several seasons, which may mean that, over time, the effects of climatic and crop management factors on yield may be able to be predicted and the yield potential of poor paddocks improved.

Funded by the vegetable industries and the Commonwealth Government. Project started August 1997.

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About 80% of crop types and fallow can be recognised from a satellite image

Hygiene for managing bacterial wilt of potato

In the past few years, bacterial wilt outbreaks have occurred in several potato growing regions in Australia. Agriculture Victoria has produced a poster with tips for growers to minimise the disease's occurrence and spread, using hygiene practices.

The poster is A2 size (60x42cm) and has a durable plastic coating.

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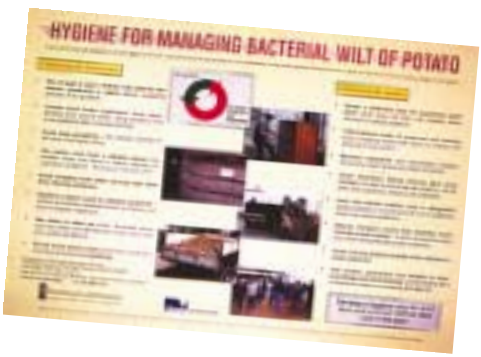

National Seed Potato Certification System: A leap forward

The National Seed Potato Certification scheme – to be introduced for seed crops sown after August 1, 2001 – is a leap forward for the Australian potato industry.

An initiative of the Australian Potato Industry Council (APIC) in 1998, the scheme will provide a uniform national system of seed potato certification, using simple terminology.

One of its features is that any generation of seed can be certified provided it meets the standards. Under the old schemes, only generation four (G4) or five (G5) could become 'Certified Seed'.

New seed descriptions

The new scheme describes seed by its generation, variety, size and attributes that relate to the disease and defect status. Terms used in the old scheme, such as Mother Seed, have gone.

Under the new scheme, if a G4 crop reaches the standards normally associated with a G1, its description will highlight that it has these attributes. This will allow the buyer to access more information and a greater range of seed quality, and sellers to expect the price will reflect the higher quality seed.

This change will provide greater flexibility for the industry and encourage the development and introduction of new seed production technology.

Under the old system, if G4 seed reached the standard expected of G2, it was not possible to recognize the high quality of this G4 seed.

Main benefits

The main benefits of the National Seed Potato Certification scheme are that it will:

- facilitate movement of certified seed between states and seed schemes
- fast track new varieties for specific markets
- promote buyer confidence, with a uniform label for all certified seed
- allow seed to be differentiated on quality
- enhance buyer confidence in the quality of the product by providing more information, expressed in commonly used terms
- assist in the development of export markets through recognition of a single Australian export label

Certification agencies are working more closely, assisting the exchange of ideas and leading to developments that will improve the seed scheme for the whole Australian industry.

Gaining agreement on the scheme has taken several years to achieve. However, the benefits have already been enormous and there are many more to come. Until this scheme, there were four main seed schemes operating in Australia with slightly different approaches, standards and terminology. The US has more than 20 schemes and Europe, at least four.

Implementation

The scheme will be implemented by the existing certification agencies, but there will be greater coordination to allow an annual review and updating by a new Seed Potato Advisory Group to be chaired by an independent chairperson provided by APIC.

The standards will be lodged with Horticulture Australia Limited (HAL), which will be custodian on behalf of the industry. Any changes will be considered by APIC before acted by HAL and implemented by the certification agencies. Authorization to use the national standards will be based on criteria developed by the Seed Potato Advisory Group and agreed to by APIC.

Common label design and logo

A common label design will be registered for the national standards, with *Australian Certified Seed Potatoes* prominently displayed. The label will be for use by certification agencies and will carry state identification.

In future, a logo for product certified under the national standards may be developed, as a way of promoting seed potatoes produced to the national standard.

The last hurdle to be overcome is approval of the standards by the Interstate Plant Health Working Group and the State Governments. Once finalized, each certification agency and APIC will sign a Memorandum of Understanding establishing how they will work together to implement the standards in the long term.

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Seed potato age
and managing tuber number in seed crops

The importance of seed potato age is well known in the industry but surprisingly little is done to manage it.

The problem for growers is that seed age can't be reliably predicted before planting. This results in unpredictable stem numbers being produced from each seed. Stem density is closely linked to tuber number. Low stem densities produce small numbers of large tubers, while high densities produce large numbers of small tubers.

That said, experience pays and many growers can predict seed performance from a batch reasonably reliably by sourcing seed from one supplier year after year. However, that sourcing is not always possible and so a better indicator of seed age is needed.

This three year project in Tasmania showed that there's no easy solution to predicting seed age or producing reliable stem numbers in crops. Growers need to be aware that both the age of the tuber and planting conditions will influence stem number and crop vigour. The project focused on seed ageing and its effect on tuber number and size distribution.

At this stage the best strategy available to growers to manage seed physiological age is to identify a reliable supplier whose seed performs well under their own growing conditions and stick with that supplier. It is also worth considering that there are likely to be large differences in performance (vigour and sprout number) between seed lots, so trialing seed from a number of sources may be a useful strategy to identify the best supplier.

Major findings

Factors affecting seed age, stems and tubers

It is common knowledge that young seed gives rise to fewer stems and fewer tubers per plant but can support higher yields over a long growing season, while older seed results in more stems and more tubers but a shorter growing period and lower overall crop yield. Seed growers prefer to use older seed while growers of processing potato crops aim to use young seed.

Characteristic behaviour of physiologically young and old seed tubers.

Young Seed	Old Seed
Slow emergence	Rapid emergence
Apical dominance	Multiple main stems
Few main stems	Increased stem branching
Vigorous, large plants and root systems	Smaller, weaker plants and root systems
Fewer tubers per plant	Many tubers per plant
Long bulking period	Rapid bulking
Long tuberization period	Relatively uniform tuber set
Large tubers at harvest	Smaller average tuber size
High yields	Lower yields
Delayed senescence	Early senescence

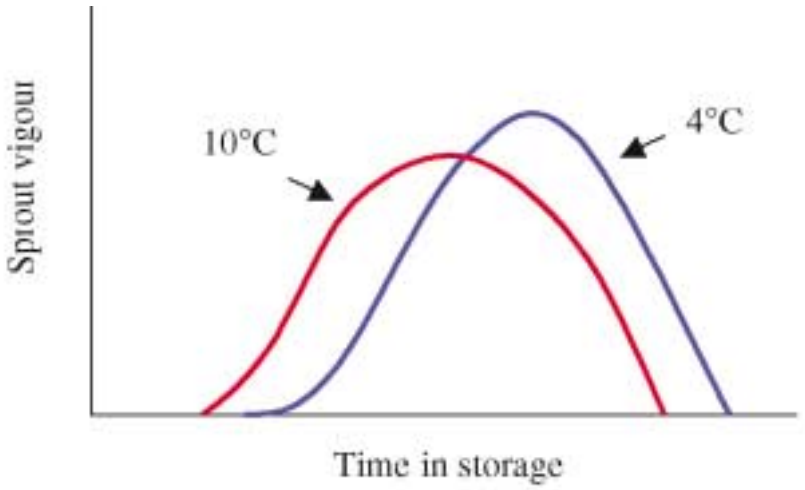
Seed tubers are living organisms and they age over time. Temperature is the most important factor influencing rate of ageing. Temperature management in storage, along with time in storage, is the major way of managing tuber age. There are, however, a number of other factors known to influence age. These include the seed growing environment (temperature, moisture, fertility, seed maturity at harvest, harvest conditions), storage environment (temperature, humidity, light, carbon dioxide, oxygen) and planting environment (temperature, moisture, soil conditions). Management of age under Australian conditions therefore requires some understanding of the importance of these factors on the rate of ageing.

Measuring seed age

The mechanisms underlying the process of physiological ageing are complex and poorly understood. While a number of internal changes during ageing are known, there is as yet no specific physiological marker that can be used to accurately determine the age of a tuber. Several markers were examined in the project but none were able to accurately indicate the sprouting pattern and vigour of seed.

Sprouting of tubers under standard conditions is a useful indicator of seed condition and was used to demonstrate the importance of growing conditions on seed ageing. Seed from 13 locations in Tasmania was stored at 4∞C for 10 weeks following haulm death and then sprouted in moist sand at 20∞C for four weeks. The tuber sprouting capacity (total sprout weight as a percentage of tuber weight) varied with the most vigorous seed lots producing

Effect of storage temperature on sprout vigour



more than five times the weight of sprouts as the weakest seed lots.

There were also big differences between seed lots in the number of sprouts produced per tuber. Seed produced from crops left to die off naturally tended to have a very short or no single sprouting (apical dominance) phase but still displayed strong vigour associated with young seed. In contrast, seed from crops killed early displayed the characteristic ageing cycle (dormancy, single sprout/apical dominance phase, multi-sprout stage, sprout branching stage, little tuber stage).

The original research on ageing, undertaken in Europe where seed crops are killed off early, therefore needs to be carefully interpreted in Australia given the range of climatic conditions under which crops are grown and the range of crop management practices used. More attention may need to be paid to matching seed physiological condition (strongly influenced by seed crop growing conditions) to likely planting conditions instead of concentrating on management of ageing in storage.

Age and planting conditions

Soil temperature and soil moisture content influence the sprouting pattern and vigour of planted seed tubers. Cooler temperatures or limited water availability at planting tend to produce slow emerging plants with few stems. These plants develop larger, more vigorous haulm and root systems, characteristic of young seed. The influence of planting conditions on sprouting behaviour were demonstrated in a field trial conducted last season; seed was planted at one site on 30th October and 22nd November, and at a second site on 1st November, and resulted in 2.1, 1.5 and 2.5 stems per plant respectively. The seed planted at the first site performed like younger seed at the second planting date compared to the first planting date.

Management of Tuber Number

The density of stems in a crop has a major impact on the number of tubers produced. Management of stem density has generally been achieved by changing plant spacings and, if possible, selecting appropriately aged seed tubers. It is interesting to review previous research on round seed production in Australia to highlight the difficulty in managing seed age – in almost all cases, optimum spacings vary between sites and between seed lots at any one site.

The project is also investigating the management of stem number (and therefore tuber number) by applying of the sprout suppressant Carvone prior to planting. This treatment has consistently increased tuber numbers by around five percent for Russet Burbank. Application of the growth retardant Paclobutrazol at tuber initiation has also been shown to significantly increase tuber set, and other treatments applied at this stage have also given promising results in an observational trial. Further information on this work is available from the author and will soon be available in the project final report from Horticulture Australia.

Acknowledgments
Funding support from Horticulture Australia and the potato levy is gratefully acknowledged.

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Towards a better understanding of market needs

Growers are generally more concerned about the productivity of a variety than they are about how well it is accepted by the consumer.

Potentially, unless the varieties cultivated continue to satisfy consumer needs, there is the risk of further erosion of market share. In his keynote address to Potatoes 2000 in Adelaide, Malcolm Kentish suggested that poor market planning had the potential to cost the industry as much as $215 million per year because of variations in supply and demand and the failure of the industry to produce what the market required. He urged the potato industry to invest heavily in market research and supply chain management.

With fresh potato consumption decreasing and productivity per hectare increasing, the variety a grower chooses to cultivate will have a significant impact on profitability. With the exception of the processing industry, where the variety a grower produces is often determined by the specific needs of the processor, growers will generally select higher yielding varieties with resistance to disease, good eating quality and desired tuber characteristics. However, the extent to which the grower's selection criteria meets the selection criteria used by market intermediaries has a significant impact on the grower's sales and profitability.

Criteria evaluated

In an effort to evaluate the consistency of the selection criteria within the market supply chain, a recent study in Western Australian has shown for all but one criteria (cooking characteristics), significant differences exist between the importance growers place on various criteria and the importance placed on the same criteria by wash packers and retailers.

Differences observed

The importance of the flesh colour, skin colour, visual appearance of the tuber, depth of eyes, multi-purpose use of the variety and consumer acceptability of the variety were all rated significantly lower by potato growers than by wash-packers and retailers. Conversely, potato growers placed high importance on productivity per hectare and the proportion of the crop that is graded as high quality. These results indicate that growers are more concerned about the productivity of a variety than how well the variety is accepted by the consumer.

Significant differences were also observed between the wash-packers and the retailers. Of particular note is the very high importance placed by the wash-packers on the prices received and prices paid for tubers of a particular variety. Price was more important for the wash-packers (5.00) than it was for either the grower's (4.61) or the retailer's (4.41). This suggests that wash-packers are most vulnerable to the effects of retail demand and grower yields. They must offer a high price in order to attract the growers business, but they must also meet the retailer's desire for the cheapest possible product.

While there was some agreement over the importance of flesh colour, skin colour and storage characteristics, retailers rated the importance of consumer acceptance, cooking characteristics, tuber size, visual appearance and the depth of eyes much higher than wash-packers did. This suggests wash-packers also have a limited understanding of retailer and consumer needs.

A limitation of this study was the assumption that the retailer best understands consumer requirements. Previous research conducted across the fresh produce industry has found that retailers needs do not always reflect consumer needs. This aspect requires further investigation.

In Western Australia, most growers do not sell directly to retailers. Being far removed from the consumer, consumer needs are of secondary importance . However, if growers do not address consumer needs, they will be exposed to greater competition from a range of other substitute products and /or interstate producers who may be better able to meet the needs of retailers and consumers.

Importance placed on tuber characteristics

(1 is not important and 5 is very important. Values with the same colour are NOT significantly different statistically.)

Tuber characteristics	Growers	Wash s packer	Retailers
Flesh colour	3.11	4.50	4.50
Skin colour	3.94	5.00	4.91
Tuber shape	4.22	4.50	4.27
Tuber size	4.06	3.75	4.32
Visual appearance	4.06	4.75	4.86
Freshness	4.11	4.00	4.91
Storage characteristics	3.78	3.50	3.50
Cooking characteristics	3.50	3.50	4.41
Multi-purpose application	3.17	4.75	4.27
Deep eyes	2.67	3.75	3.86
Yield per hectare	4.56	1.50	1.05
Price received/paid	4.61	5.00	4.41
Proportion of premium: first grade	4.28	3.75	3.50
Consumer acceptance	4.00	4.77	5.00

Example of how to interpret the table

Wash-packers and retailers place more importance on skin colour than growers. There is no significant difference between wash-packers and retailers on the importance they place on skin colour.

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Your Levy @ Work

Vegetable industry internet site

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A business plan has been developed for a national internet service, specifically designed for the Australian vegetable industries.

The proposed service will provide information on technical contacts in the industry, publications, past articles from Eyes on Potatoes and Potato Australia, Horticulture Australia Final Reports, a potato news service, local weather, calendar of events, major industry issues and training.

The Potato Internet Starter Pak will be incorporated into the site to provide links to other potato internet sites. An associated email service will allow members to subscribe free of charge to a range of relevant information services.

Why another internet site

Some people may wonder why develop another site – aren't there enough sites already?

The answer lies in the services provided: this site will enable users to access the information generated from levy funded research, most of which is not on the internet or available in an easy to use form.

The site will also provide access to services throughout the world. This should reduce the time required to look for information. Even within Australia, information is scattered across a number of organisations, many which are state based. By providing a portal or a single access point, the site will serve as an entry point to relevant technical information on the internet.

The proposed site focuses on providing users with personalised services, such as local weather information and automatic notification services, to provide relevant and timely information more quickly and simply than the current publications.

When developing the plan, we kept in mind that:

- growers are largely problem driven and want to find solutions quickly and simply
- the internet site needs to be fast, with few graphics
- it must be easy to use

How was it done

The Electronic Information Services levy project – led by Nathalie Jarosz, formerly of the Department of Primary Industries, Water and Environment, Barry Philp of Primary Industries and Resources South Australia and Leigh Walters – provided the foundation for the business plan.

We developed a prototype internet site, to consolidate the ideas collected. This was further developed with the assistance of growers and service industry representatives in each state. The prototype became the basis for developing the business plan.

Why does it cover other vegetables

Delegates at the national workshop in 1999 for the Electronic Information Services project decided the potato industry should work with the whole vegetable industry on an internet site.

After further discussions it was decided that we would develop a business plan to provide a clear strategy, actions and budget – and a framework for developing the internet site as a semi-commercial service.

The site

The proposal is initially for 10 mini-sites: one each for potatoes, carrots, Brassicas, lettuce, beans, pumpkin, celery, sweet corn, green peas and, marrow and zucchini. Development costs can be saved by using the same approach with each mini site and, by having a site for each crop, users can quickly and easily find what they want.

Who will pay

The internet site will be semi-commercial, with levy and government funds used to establish and run the service. Over time the aim is to increase income from other sources.

Levy payers will have free access to the site, although there may be a charge for some specialised services as the site develops.

Where to from here

The project team has ascertained what is needed and what can be provided at a reasonable cost at this point of time.

It is now up to the R&D Committees to determine whether this is something they wish to support. The decision is not an easy one!

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National internet site

News
PLUS **Weather**
PLUS **R&D Information**
PLUS **Contacts**
PLUS **Publications**
PLUS **Email updates**
PLUS **Coming events**
PLUS **Links**

Implementing the potato industry's Communication Plan

The aim of the project is to employ a Technology Transfer Manager (Potatoes) to help implement the national Communication Plan. The Potato R&D Committee oversees progress in implementing the Plan.

Goal 1 - Raise awareness of industry issues

As a result of market research carried out in 1999, Potato Australia and Eyes on Potatoes had been undergoing changes to address concerns raised by readers. With our Editor, Nathalie Jarosz moving to the Citrus industry in August 2000, the upgrading of the publications was put on hold while a replacement was found and briefed. The new Editor, Cathy Sage, and her team have now been involved in two Eyes on Potatoes and this edition of Potato Australia, so our focus can now return to upgrading the publications.

Another strategy under this goal was to investigate the interest in an email information service. Users could select from a list of options and the information could be automatically emailed to them as it became available. For example, they could be informed when new chemicals were registered.

The idea of the service was that users always had the option of removing their names from the mailing list at any time and were therefore in control of information they were receiving. There is nothing worse than being stuck on a mailing list, whether it is a conventional or electronic, and not being able to get off it. Junk mail systems we do not want!

Test emailings have been carried out with those who have received the Potato Internet Starter Pak, about 300 users, with quite positive results. Users particularly liked short sharp messages without the "waffle".

A chemical update email service has also started but this is currently limited to industry advisers until I can set up a pilot internet site 'front door' for the service. Once this is done, users can access the internet site and chose the information they want to receive. Ultimately this will become part of the national internet site if it goes ahead.

A simple prototype of how the service would work has been developed and tested with groups around Australia as part of the proposed national internet site for the vegetable industries. The response has been quite positive with ideas about what the site could be used for adding greatly to the number of possible topics. The service has also been demonstrated to the Potato and Vegetable R&D Committees and the Australian Potato Industry Council.

Goal 2 - Improve access to industry information

An important part of improving access to industry information is the national distribution system. This provides the means by which we can provide information to the people who need it. The system consists of computer databases in each state for growers and a national database of government and service industry contacts.

The computer database program that stores all the mailing information, which is used by many of the state groups and myself nationally, has undergone a major upgrade. The additional features will greatly assist in providing a better service in the future.

The accuracy of information on the database is currently being checked or validated.

To improve access to a range of industry resources, an internet service has been proposed (see p45 for details). A business plan has been developed for a national internet service for the vegetable industries and is being considered by the Potato and Vegetable R&D Committees.

The Potato Internet Starter Pak was developed to assist industry access potato internet sites. More than 300 people have received the Starter Pak. Version 4 is currently being finalised.

Providing easy access to information generated by our levy funded research and development program is an important goal for the industry. A project to put this information onto CDROM is also currently underway (see p45 for details).

Goal 3 - Improve understanding of industry information

Consolidation of information into books and management tools helps people to better use the knowledge that has been generated. As one farmer said to me after looking at a whole range of disease sites on the internet, "You should be pulling all this information together to make it easier for me to use. It would also save me a lot of time!"

Paul Horne and Dolf de Boer have already put together a book on pests and diseases. This is currently at the printer.

Delays in the publication have been due to difficulties in finalising the commercial arrangements. The book is due for release early next year

A pocket field guide has been produced to accompany the pest and disease book, to assist identification in the paddock. This will be sent out free of charge to all levy payers and is available for sale with the book.

Proposals for an irrigation book and variety guide were submitted to the Potato R&D Committee but were rejected. The variety guide will be reconsidered once the review of the breeding and evaluation program has been completed.

Goal 4 - Facilitate implementation of Communication Plan

As Technology Transfer Manager for the industry, my role is to facilitate and work on projects to achieve the goals outlined in the plan. I also:

- provide editorial support and articles for Potato Australia and Eyes on Potatoes
- work with growers, researchers and the service industry to facilitate networking and better use of information products
- work with researchers to ensure the maximum benefit is gained from work being funded through the potato levy
- participate on the Potato R&D Committee as a Technology Transfer (TT) Adviser and provide TT support to APIC and AUSVEG where required
- coordinate and help maintain the national distribution system

To obtain a copy of the Australian Potato Industry Communication Plan, please contact me or Amani Ahmed at Horticulture Australia on (02) 8295 2300 with your name and mailing address.

Funded by the potato industry and the Commonwealth Government. Project started December 2000.

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Making past industry information from R&D more accessible

The Potato Industry and the Federal government have invested about $15.5 million in research and development since 1989.

A lot of this research has been reported in *Potato Australia,* industry newsletters, workshop notes, information leaflets and HRDC Reports. Many of the more user-friendly publications for industry, such as *Potato Australia*, have not always been kept. Also, before problems in the distribution system were sorted out, they were not necessarily received.

To help industry gain value from this important resource, the information is being put onto CDROM.

The CDROM has several advantages. It is relatively cheap, CDROM players have become standard on most computers and they hold an enormous amount of information. Another advantage is that if the CDROM is designed properly, information can be searched for easily. Ask for information on powdery scab and all the documents with powdery scab in the title will be listed. Click on a document in the list and the document is displayed.

So the CDROM has potential to become the industry reference library for a range of publications. It will not replace publications but rather provide access to past articles and publications that may or may not still be in circulation.

Having the information in internet format means it can be easily moved to the internet at a later date quite cheaply.

Progress to date

The project started in March with an initial focus on identifying what material was already in electronic format and the approach to use in developing the archives.

Since the project was designed, internet and computer technologies have evolved to a point where new options are now available to do the job.

The technology options are being reassessed to ensure the best is chosen.

Three key issues are being considered:

- ease of use of the final product
- cost of developing the archives
- cost and ease of updating the archives with new material

Given the archives will be around for a long time, it is important we make the right decision on how we store the information.

At this stage, unless we run into problems, the work should be finished by Christmas.

Funded by the potato industry and the Commonwealth Government. Project started March 2001.

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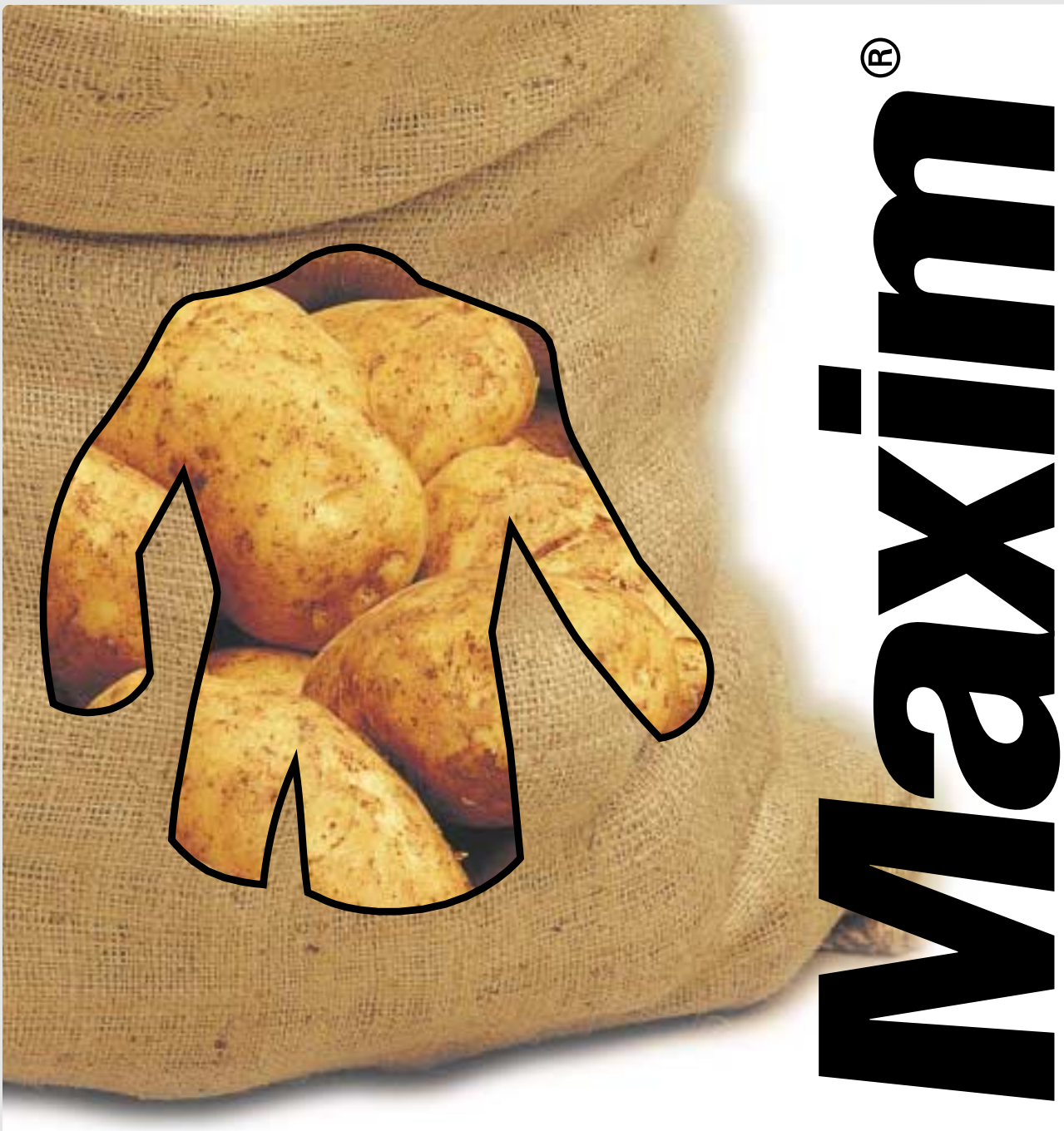

Maxim®

MAXIM is the new standard in potato seed treatment. MAXIM combines outstanding control against a range of tuber-borne diseases such as Black Scurf, Stem Canker and Silver Scurf with excellent crop tolerance.

MAXIM protects at the earliest stages of crop development. This ensures a rapidly emerging and uniform crop, and ultimately produces optimum yield with the desired grade and shape.

Best dressed in the field

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AusHort projects

Addressing quality management and food safety issues in horticulture

This project seeks to tackle food quality and safety issues.

Progress to date has focused on raising awareness and understanding about food quality and safety issues in the industry (for example, for retailers, distributors and auditors) and the general community. We have also:

- developed an Action Plan for dealing with emerging issues.
- created a 'Food Safety Forum' on the www.horticulture.com.au web site to provide the latest information for all. This site has resulted in ongoing enquiries from all sectors.

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Advancing horticulture's response to the Existing Chemical Review program

The current project employs a consultant to provide a coordinated response from horticulture to the National Registration Authority (NRA) Existing Chemical Review Program (ECRP).

The chemicals currently under review include Diazinon, Chlorpyrifos, Azinphos methyl, Aldicarb, Fenthion, Dichlorvos, Fenitrothion, Endosulfan and Dimethoate.

A large part of the project supports communication with industry associations and Industry Development Officers, who relay the information to growers through association newsletters and industry media.

In the potato industry an email service has been set for information coming out of the project and is maintained by Leigh Walters. If you wish to be included on the email list contact Leigh on (08) 8232 5555 or lwalters@saff.com.au. People currently on the email list include industry associations, processors, consultants, government advisers, government managers and researchers.

Gene Technology Newsletter

The GMO Communications Working Group has continued to meet via phone hook up over the past few months. Its major tasks have been:

- to produce a simple policy development framework, which industries can adapt for their own purposes, to clearly state that industry's position on GMO issues (eg investment in reserach, produce labelling)
- to develop the GMO communications project (near completion). One part of this project is the production and distribution of the GMO newsletter to industry development officers, R&D corporations and peak industry bodies.

The Policy Development Framework was made available to industries in May 2001.

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Horticulture Emergency Plan (HEP)

The Horticulture Emergency Plan (HEP) is a national emergency management plan that individual industries can use to develop their own emergency plans. It is a template to help industries deal with a range of emergency situations from pest and disease incursions to food safety issues.

Practically speaking, it arms industries with a plan of actions that can quickly be turned on when a potential emergency becomes a reality.

After extensive consultation with industry, the HEP plan is almost finalised and will be distributed to peak industry bodies in September 2001. It will also reside on the Horticulture Australia website for easy access to all industries - www.horticulture.com.au.

Release of the plan will follow a final check and test by industry groups using two to three different scenarios to ensure that there will be no problems in implementing it in a real situation. The plan will also need to be maintained to ensure that it is kept up to date.

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Implementation of the Freshcare on farm food safety program

Freshcare is the HACCP based on farm food safety program developed by the fresh produce industry to meet customer and government requirements for safe produce. To drive it forward into an industry owned and managed program requires many steps.

The Freshcare Code of Practice is an industry owned standard which describes the practices required on farm to provide assurance that fresh produce is safe to eat and has been prepared to customer specifications.

The program offers benefits to suppliers and customers. For suppliers, it verifies that an industry recognised food safety program is followed. Certification to the program is achieved through independent auditing to the Code of Practice. Customers can use Freshcare certification as a minimum requirement for suppliers under their approved supplier program.

Underpinning the integrity of the program is a business plan, developed by the fresh produce industry that establishes the necessary infrastructure to manage program implementation. This includes incorporation of Freshcare Limited, an industry-owned non profit company, limited by guarantee, which draws its membership and Board of management from industry participants.

The commercial viability of Freshcare will be measured by the extent of adoption of the program by the fresh produce industry. Freshcare has been designed to be self-funding in the long term through income streams from publication sales and an annual certification fee paid by each business participating in the program. For this, participants will be registered on the database, receive newsletters and notices of changes to the standards, have audit reports processed and records maintained, have access to an inquiry hotline, and have certificates issued. The Freshcare business plan identifies a requirement for seed funding for the first two years to support these services until there are enough participants in the program to ensure an ongoing viable income source to run it.

In the short term, seed funding provided by this project is directed to the establishment of the necessary infrastructure and activities involved in providing industry support in the initial implementation phase and the processing of initial applications through to certification.

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Improved labelling of pesticides to encourage optimum use in horticultural crops

This project is identifying various issues regarding labels on pesticides. These range from inconsistencies (such as recommendations varying between States), to missing information (such as recommendations for different sprayer types), lack of clarity (such as size of print or volume of information), or any other issue.

Based on this information the research team developed recommendations and an action plan to enable the horticultural industries, with National Registration Authority and Avcare (the chemical companies association) to address these issues.

Some of these issues have moved from being a nuisance to a potential threat to businesses, with the advent of quality management systems, spray records and the need to prove strict adherence to label recommendations at all times. This is a chance to help growers manage this confusing part of their business.

An industries committee to decide key priorities and actions will include representatives from the nursery industry, vegetables and tree crops as well as AusHort R&D Committee, chemical companies, original project leaders and Horticulture Australia.

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Understanding the implications of Codex issues to horticulture

The Codex organisation has world-wide responsibility for setting Maximum Residue Limits or MRLs for food products.

A needs analysis provided background information on the Codex organisation and determined that a coordinated investment in Codex issues was required for horticulture. The AusHort program is resourcing this investment and a coordinator has been appointed.

Discussions have been held with representatives of Codex Australia, Agriculture, Fisheries, Forestries, Australia (AFFA), NRA, Avcare and individual chemical companies regarding the current status of proposed MRL changes.

Proposed MRL changes of relevance to horticulture were collated and are being circulated for comment. Of concern were proposed MRL changes for chlorpyrifos, fenamiphos, flusilazole, hexaconazole, malathion, methiocarb, methamidophos, mevinphos, paclobutrazol and pyrazophos.

Comment is being sought from industries potentially affected by proposed Codex MRL changes.

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Potatoes
put soils under pressure

Growing potatoes in some soil types can do more damage to soil structure than other crops, a sustainability study in Tasmania's Midlands suggests. However, sound soil management can help arrest the problem.

A project looking at the sustainability of vegetable cropping in Tasmania's Midlands has found that growing potatoes significantly degrades many duplex (sand over clay) soils and these changes are not associated with growing other crops such as cereals, poppies and peas.

Soil biological, chemical and physical properties were tested and the farmers were asked their views on their soils' health.

When potatoes were included in the rotation the soil degraded resulting in smaller soil aggregates (clumps), aggregates that broke up more easily, lower infiltration rate and increased density of the soil.

The clay loam Cressy soils were more robust and did not show significant changes in soil physical properties under potato production.

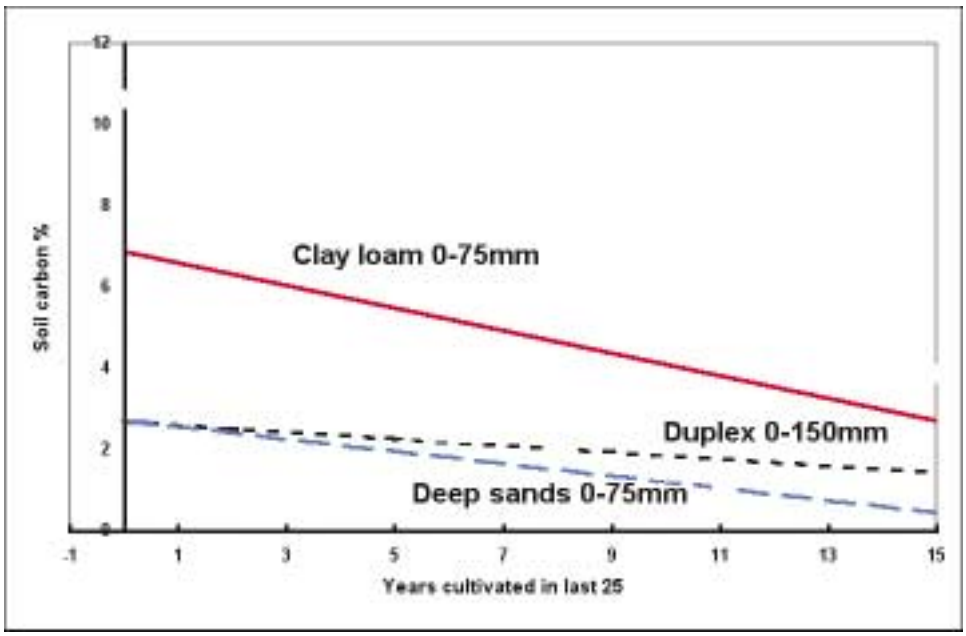
Subsoil compaction occurred under all types of cropping on deep sandy soils, particularly following potatoes.

Lower soil organic matter

One of the most concerning findings was the reduction in soil organic matter from cropping - the more crops grown over the past 25 years, the lower the soil carbon content. (The amount of carbon in the soil being directly related to the amount of organic matter.)

Reductions in soil carbon over this period were 30% on duplex, 40% on clay loam and 57% on deep sandy soils compared with long term pasture paddocks. The loss in soil carbon was due to soil cultivation which results in carbon being converted into carbon dioxide and being lost into the atmosphere.

Soil preparation for potato growing and harvesting tends to be more rigorous and deeper than for other crops such as cereals and poppies in Tasmania's Midlands and therefore the loss of carbon is greater in potato paddocks.



A decline in soil microbes was associated with the loss in organic matter but there were no significant changes in earthworm numbers under crops and only a slight increase in weed seed germination with cropping. Plant available phosphorus increased, particularly following potatoes. There was no change in plant available potassium or pH, and salinity levels remained low.

The magnitude of the changes in the soil associated with potato cropping is of concern, particularly as these soils have been cropped for only a relatively short time.

Management options

The major challenges, if production systems are to be sustainable, are to:

- maintain organic matter levels
- minimise tillage
- avoid deep mixing of topsoil
- promote surface drainage

The best way to arrest the decline in soil organic matter is to minimise tillage and grow vigorous green manure crops, such as short rotation ryegrass. The latter is becoming more feasible in the Midlands, with the installation of centre pivot irrigators by many farmers.

This project is a joint project between the Department of Primary Industries, Water and Environment and the Tasmanian Institute of Agricultural Research, with funding from the Natural Heritage Trust.

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A tool for irrigation benchmarking

A self contained Irrigation Benchmarking Module has been developed by PIRSA Rural Solutions and four Riverland Local Action Planning Groups to help groups of irrigators improve their irrigation management by comparing their performance.

With water becoming a more valuable and expensive resource, those who use it most effectively and efficiently will have an advantage over their competitors.

By benchmarking their performance farmers can improve their irrigation management.

Benchmarking can influence profitability and increase yields by helping to identify whether or not the plants are being given too much water.

The Irrigation Benchmarking Module can be repeated regularly over time to measure the impact of changes they have made and identify areas for further improvement.

The Irrigation Benchmarking Module is in two sections. The first section is an Irrigator's Manual with instructions for benchmarking group members on assessing both their irrigation system and the soil, by entering information into a series of questionnaires.

The second part of the module includes a Coordinator's Manual and computer database. The manual gives advice on the setting up and running of a benchmarking group, managing information, entering it into a database and generating the reports.

Confidentiality of participants is ensured by using codes to identify sites.

The group's coordinator collects information covering the irrigation system, irrigation management and crop returns and enters it into the database. The database then automatically generates a range of indicators and a summary table of each member's operations.

The group can compare their performance through a standard set of eight performance indicators, including:

- Yield per Megalitre (t/ML)
- Application Efficiency (%)
- Gross Return per Cost of Water ($/$)
- Gross Return per Megalitre ($/ML).

The indicators are shown in a graph (as seen below), which ranks them in order of increasing performance from left to right.

The package comes in a CDROM format and contains a copy of all questionnaires, the Irrigator's and Coordinator's Manuals and a copy of the database. Minimum system requirements to run the programs are Microsoft Word 97 and Microsoft Access 97.

The Irrigation Benchmarking Module was developed with funding from the Natural Heritage Trust, through a series of pilot programs run in both the Riverland and the South East of South Australia. Copies of the Module are available for $50.

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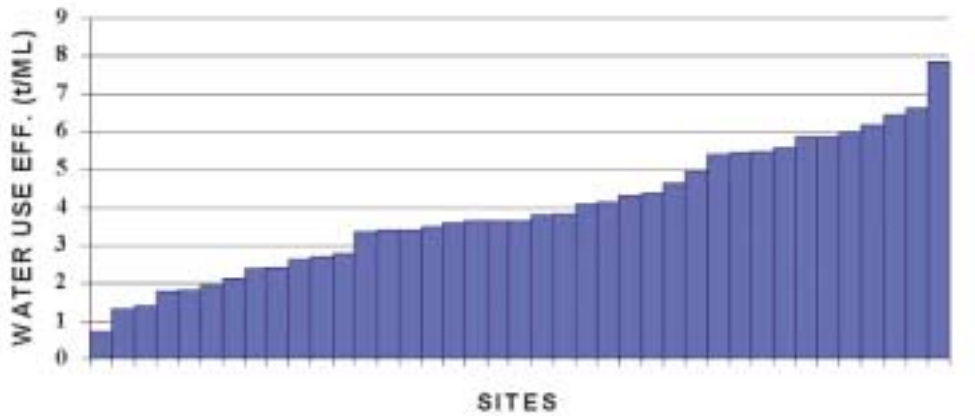
What is benchmarking

Benchmarking is a process by which groups or individuals can identify ways to improve their management by comparing their performance with others and making changes based on what is learnt.

The process can be repeated in subsequent years to measure the impact of the changes made and identify areas where further improvement may still be possible.



Seed potato folklore

This article examines some of the facts in seed potato selection, and aims to dispel some of the folklore.

Selecting, purchasing and caring for seed potatoes is one of the most important tasks for achieving successful and high yielding potato crops. Unfortunately the rules used by many growers in making their seed selections are shrouded by a mixture of commercial needs, science and folklore. The science is often poorly understood and badly interpreted.

Seed quality is affected by many factors, some of which are difficult to even define in precise terms. The imprecise nature of seed quality has resulted in the development of rules which sometimes evolve into folklore.

Folklore No.1

Some seed growers have better lines of seed

This item of folklore has been carried forward for the past 20 years and is a remnant of the period when seed growers used the selection of clones to underpin their own seed production. This is no longer the case. All seed potatoes in a certification scheme are now derived from identical parent material propagated by tissue culture. It is not possible to select a different line of seed through the short number of generations from tissue culture to certified seed. For the one cultivar, all seed stocks are essentially from the same clone.

This is not to deny that seed from some seed growers may perform better than others. One of the most important quality factors in seed potatoes is physiological age and experience has demonstrated that a particular seed grower's production system will mesh well with the planting scheduling and precise size requirements of a particular commercial grower. This is often interpreted by the buyer as a better line of seed. But this is incorrect as the seed line is no different from any other batch of seed of the same variety and from the same seed scheme. It is just better suited to the buyer's needs in terms of physiological age.

Some seed growers may also have a better understanding of an individual buyer's requirements in terms of seed size, packing, transport and crop health, with the result that they consistently supply a better product. Again the buyer may consider that the line of seed is better, but what is really happening is that the seed grower is doing a better job of meeting the buyer's needs.

A line of seed normally results from a variant due to minor mutation and discovered by observation and selection. Or it may be a positive selection to minimize viral infection and produce a clean line of seed. The result should be an overall improvement in seed quality. A search for old seed lines of the variety Kennebec in the late 1970's by Strange and Blackmore identified 10 potentially different lines of Kennebec, two of which had unique characteristics that may have been an improvement to the original Kennebec. One of these lines has persisted in our industry and is marketed as Kennebec Line 2 through the seed schemes. However such mutations are rare and the selection work required to develop a new line takes many years.

When seed buyers refer to one line of seed as being superior, they are most commonly referring to a particular seed grower producing seed which better matches their own requirements for physiological age, crop health, seed size, packing and transport.

Folklore No.2

Early generation seed will always out perform late generation seed

Seed potatoes are classified according to the number of generations removed from tissue culture in the controlled environment of a glasshouse. Until recently the nomenclature for generations differed between seed schemes, but the new National Standards for Seed Potato Certification has removed these differences. Thus G1 seed is one generation removed from tissue culture, G2 seed is two generations removed and so on.

A perceived benefit of early generation seed is that it will have a lower level of disease and will produce a higher yielding crop. There have been very few scientific trials conducted to support this claim. Differences between generations are more likely to reflect the physiological age of the different seed stock than any real benefit from early or later generation seed.

One trial in Australia that has been undertaken according to correct scientific principles compared Russet Burbank seed at G2 and G15 (yes, fifteen generations removed from tissue culture) to determine whether there were measurable impacts on yield. The conclusion reached by the researcher (F Mulcahy) was that in the low disease environment of Tasmanian tablelands, the G15 material performed as well as G2.

A trial comparing more conventional generations of seed (G2, G3 and G4)

conducted at Kimberley, Idaho in the US produced inconsistent differences between generations. All differences were very small.

It would seem from the information currently available that the generation of seed is less important than others factors which can be influenced by management.

Another perceived benefit of early generation seed is a lower incidence of tuber blemish in seed tubers, due to less field exposure to diseases such as silver scurf, black dot, powdery scab and common scab.

A survey of disease incidence in G1 tubers in Australia by De Boer and Curtis identified that 74% of G1 seed had already been infected with one or more of these diseases by the time it had been through one field generation and stored ready for replanting. Silver Scurf in particular was present on more than half of the samples of G1 seed.

De Boer and Curtis concluded that the place of storage of minitubers, farm hygiene, field disease pressure and cultural practices were major determinants of the rate of infection of seed lots. Early generation seed is certainly no guarantee of freedom from blemish diseases.

In theory, earlier generation seed should have lower disease levels and potentially perform better than later generation seed. But in practice, the skills of the seed grower, the choice of seed district, the disease pressure from virus and fungi, and the cultural practices used in seed production are all likely to be more important than the number of generations.

It has also been clearly established through the certification process that some second generation seed lots can have higher levels of disease than many fifth generation seed lots.

Generation number is no guarantee of seed quality.

Folklore No.3

Certified Seed is certified to be free of disease

Unlike many other horticultural crops, potatoes are a vegetatively propagated plant. Because it is vegetatively propagated, the crop is very prone to disease problems being passed from one crop to the next, and being multiplied and magnified in the process.

Certification schemes were introduced to give the seed buyer a level of assurance that the seed crop had sufficiently low levels of disease that the subsequent crop health of the commercial planting would not be compromised. The emphasis originally was on virus and bacterial diseases and increasingly attention has been focussed on fungal diseases.

The process of certification means that the crop has met prescribed tolerance levels for a spectrum of diseases. These are tolerances that have been derived from research and practical observation and which give confidence to the buyer that disease levels will generally not affect the yield or marketability of the subsequent crop. It does not mean freedom from disease, only that the impact of these diseases will normally be of no commercial significance. These tolerances have been developed and fine tuned over many years and are of a similar nature world-wide.

The exception to this is for two specific diseases which are of special importance. Bacterial wilt is a highly contagious disease of potatoes and is very difficult to eradicate once on a farm. Potato cyst nematode is more insidious in that it is slow to spread, but once present it is also very difficult if not impossible in some situations to eradicate. Both of these diseases have a zero tolerance level in certified seed under the National Standards for Certification. These diseases have always had zero tolerance for certified seed potatoes in Australia.

We will never have certified seed free of disease. From the moment minitubers are removed from a glasshouse they are potentially being infected with spores of silver scurf. Planting in virgin soil, with seed applied fungicides, sealed containers for harvested and stored seed, and impeccable farm hygiene will still not produce seed that is free of disease. We are, after all, dealing with biological products, and it is all a matter of managing the environment in an economically and sustainable way. No seed buyer should put unrealistic expectations into his seed purchase. Seed lots with virtually zero disease levels will not necessarily perform any better than seed which barely meets certification tolerance levels.

In summary

These are just three areas of seed potato folklore and there are plenty of others. When selecting and choosing certified seed, the best results are likely to be achieved by choosing a seed producer who knows and understands your requirements, has consistently supplied a quality product in the past, and operates within an independent inspection service or certification authority. If making comparisons between seed stocks, remember that physiological age is likely to mask any other effects due to generation, crop health etc. If the seed has been certified, then it has passed certain standards of crop health which have been shown to be important for minimising disease problems with the subsequent crop.

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Tackling exotic pests and diseases

Effective management of exotic pests and diseases is critical to minimise financial and personal hardship. Problems in recent suspected outbreaks highlights the importance of work currently been undertaken by Plant Health Australia.

Plant Health Australia has been working on three issues that are very important to the potato industry:

- stocktake and assessment of contingency plans for exotic plants and diseases
- identifying a national approach to managing pest and disease risks
- funding and compensation arrangements for emergency eradication of exotic plant pests and diseases

The stocktake and assessment of industry plans has been completed and the report is available from Plant Health Australia by calling (02) 6260 4322. This is the first step to developing a more national approach to the management of exotic pest and diseases.

To build on the above work Plant Health Australia has commissioned AusVet Animal Health Services to develop a national approach to minimise pest and disease risks in Australia's plant industries. Effective management is critical to reduce the risk of introduction, establishment and spread of these problems. For any strategy to work it will be critical for industry and governments to work together and these arrangements sorted out in advance to avoid the 'emotion of the moment'.

In any outbreak involving exotic pests and diseases it is important that the problem is identified and dealt with quickly. For families involved though it can be very traumatic and if the property is quarantined, have a significant impact on cashflow.

Compensation for people affected has always been a 'thorny' issue as it raises the question of who pays. Yet if we do not tackle the issue we risk people not wanting to speak up when a problem occurs and this could be devastating if we want to minimise the costs of an outbreak. It is much easier and cheaper to control an outbreak in the early stages when it is small. The implications on trade can also be minimised.

A discussion paper has been prepared on the funding and compensation arrangements and is available from Plant Health Australia by calling (02) 6260 4322. The extract from the report summary "Cracks exist in the current system" sums up quite well the problems we have with the current system.

Plant Health Australia is a public company established to identify and coordinate plant health issues in Australia and to promote international and domestic confidence in Australia's plant industries. It has 23 industry and government members. AUSVEG represents the potato industry.

Cracks exist in the current system

At present, eradication programs for exotic plant incursions are currently funded through a cost-sharing arrangement between the Commonwealth government and the State and Territory governments. The former pays 50% of the eradication costs while the States share the remaining 50% based on the gross value of production of susceptible crops in each State or Territory. There are several shortcomings to this arrangement:

- Under the Commonwealth and State cost-sharing arrangement, no compensation is paid to producers whose crops are destroyed or otherwise disadvantaged as a result of an eradication campaign. This provides incentives not to report suspected exotic incursions
- Industry representatives have observer status on decision-making committees but are not involved in decision-making and there are claims that consultation is inadequate
- Industries do not contribute to the costs of eradication although, in some cases, indirect costs may be incurred by industries
- Governments have expressed concern about the lack of any contributions from industry in cases where there are clear private benefits from considerable government expenditures on eradication
- Governments are under budgetary pressures which may be biasing judgements against eradication in some cases.
- Governments and industries need to seriously consider whether a government and industry partnership arrangement, including a funding partnership, might not lead to better outcomes, particularly reduced risks of incursions becoming established.

(Extract from the summary in ***Funding and compensation for emergency eradication of exotic plant pests and diseases: A discussion pape***r)

Reducing impact damage
for greater profits

Damaged and bruised spuds reduce customer confidence in the product and can lower grower profits. PIRSA Rural Solutions consultant Jim Hill looks at the issue, likely causes and possible solutions.

Losses from bruising, scrapes and subsequent discolouration and infections can be minimised by taking action in harvest and packing processes. The bottom line will be better than average dollar returns.

PIRSA Rural Solutions in South Australia has research data and information to help avoid postharvest damage. This includes:

- research data on the correct temperatures to harvest, handle and store potatoes
- data relating critical impact forces to the risk of bruise damage
- good basic information on sanitation
- videotapes on setting up and operating harvesters to avoid damage.

A worse case scenario for causing damage is bouncing the crop during post harvest handling – that is, through the harvester, then onto other produce in the bin, through the washing plant, through the grader, through the packing equipment and then into a plastic package where it sweats and rots. This damage can be worsened by pallet stackers dumping bags in place and truckers walking on the load.

Some equipment in packing sheds and on harvesters could bruise every potato that goes through. I have measured impact forces about five times greater than the force required to bruise 90% of all potatoes under normal conditions. The good news is that these impacts on machines can be eliminated, often simply and cheaply, to achieve less than 10% of the bruising potential they once had.

Equipment with solid supports, rollers or chutes below impact areas on or after belts and drop points can also increase the risk of damage. This equipment will often have too many elevators, drops, turns, bends, sharp edges, and changes in width that become high damage risk sites.

Most damage is caused when the potato moves from one section of equipment to another. Generally there is also a change in direction or height at these points. The rule of thumb is if you can hear a potato hit, then it is generally being damaged to some extent.

Gentle handling is the key, that is keeping drops to a minimum and carrying the potato wherever possible are two good strategies. If the potato must fall, we can ensure it lands on a soft and smooth or flexible surface, such as belt material, not steel. Apple packing lines are a good yardstick – most are able to handle the fruit without inflicting a bruise.

Clearly, potatoes that are not exposed to damaging situations arrive at retail outlets healthier, more appealing to the consumer and result in better prices and sales.

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Labelling information

GM-free labels

The ANZFA document cited below makes these points:

- "…the claim 'GM-free' is viewed as an absolute claim that no GM food, ingredient, processing aid or additive has been employed in the production process."
- "The Australian Competition and Consumer Commission (ACCC) have advised that negative claims [ie GM-free] must not be deceptive or misleading, and that such claims must be supported with evidence."
- "…the absolute nature of the claim 'free from' has been successfully tested in the courts and should be given thorough consideration before it is used."

For more information see ANZFA's 'Labelling GM Food Compliance Guide to Standard A18' (Draft only): www.anzfa.gov.au/Documents/gen31_00.pdf

Documentation

A letter currently can be obtained from GMAC/IOGTR stating that if no application for general release has been made for a particular product, then that GM product has not been released for commercial planting in Australia.

For more information about this process contact: Letitia Toms - 02 6271 4224

News on an Australian research project

Low browning potatoes were one of the first GM horticultural crops developed in Australia and give an actual example of the development process.

Potatoes, and many other fruit and vegetables, brown when cut or damaged and this reaction results in wastage for potato processors, such as crisp manufacturers. CSIRO researchers isolated the gene that causes this reaction and found that by inserting a back-to-front (anti-sense) copy of the gene they could greatly reduce the amount of browning that occurred.

Regulatory permission

Permission was obtained from the Genetic Manipulation Advisory Committee (GMAC) to conduct gene technology research and field trials.

In the laboratory

The gene that is responsible for causing the browning reaction was cloned in the laboratory in 1993. Following this, in 1994, CSIRO scientists modified the 'Atlantic' potato variety by inserting a back-to-front copy of the gene that causes the browning reaction.

The plants were then monitored for several years in specially designed laboratories and glasshouses [known as physical containment (PC2) facilities], which were registered with GMAC and inspected annually.

Then the glasshouse/greenhouse

The modified potato plants grew as expected in glasshouse trials, and GMAC approved field trials in the Adelaide Hills, on state government property.

Field trials

About 200 minitubers of the modified potatoes were generated and planted out in a single isolated plot.

Field trials are the final step in the assessment process, and they help determine how well plants perform in different regions under different weather and soil conditions. GM plants ready for field-testing will have already been assessed thoroughly before this stage for obvious things such as toxicity and allergenicity.

Trial conditions

The potato plot was surrounded by a three row buffer strip of non-GM potatoes.

Buffer zones are common safeguards used around GM field trials, to ensure that GM material does not spread beyond the trial site. Buffer zone distances usually depend on the size, movement and viability of pollen. Pollen is usually not an issue if a trial plot is grown among unrelated plants. Sometimes related plants are deliberately grown adjoining a GM crop to see if there is any pollen flow from the GM plants.

After the trial

Mature potatoes were harvested in both 1995 and 1996 and taken back to CSIRO for testing, including mechanical damage and cutting.

Excess potatoes were destroyed each year and at the end of the trials all remaining material was destroyed. Spent GM horticultural plant material such as prunings, fruit, plants that die, even the soil they grew in (which may be part of the experiment), are destroyed by autoclaving, that is, they are sealed in bags and steamed at high pressure and temperature. There was no trace of the GM potatoes at the trial site following its completion.

The technology today

There are no GM potatoes commercially available in Australia yet. This technology in potatoes is now being further developed in the US and Europe. The technology is also useful in other crops and researchers are currently applying it to bananas in the UK, pineapples in Malaysia and apples and pears in Canada. CSIRO will receive license fees from the organisations using the technology, and will receive more if they go into commercial production. The international agreements state that the technology is freely available to the Australian industry.

In Australia the low-browning technology has been applied to sultana grapes which are currently undergoing field trials. The result should be lighter coloured dried sultanas. Whether or not these vines are grown commercially will be determined by the Australian industry and community over the next few years.

Information about approved trials in Australia can be found at: www.health.gov.au/ogtr

Articles from GMOs – *Guiding Meaningful Options* The Gene technology Newsletter for the Horticulture Industry – Compiled by Agrifood Awareness Australia for Horticulture Australia.

Office of the Gene Technology Regulator

For more information on GMOs visit: *www.health.gov.au/ogtr/*

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