POTATO AUSTRALIA

VOLUME 4
JUNE 1993

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Editorial

Two years ago, few in the Potato Industry wanted to talk about the crisis they were facing although everyone recognised the fact. It took Rene De Jong to put into words what many people were thinking in his article last year entitled, "The Potato Industry: Crisis or Restructuring".

Industry leaders and processors believe they have some of the solutions to the problems posed by Rene, namely to encourage our industry in becoming "internationally competitive" and adopt "bench marking" as a strategy. Many do not even understand these terms, let alone know what is needed to meet them. I hope that in this issue we can help you to come to terms with these ideas.

A perpetual need is to transfer the technology from the scientist to the farmer. Again it is hoped that reports on current research projects will stimulate your thinking to adopt appropriate technology to assist you in achieving "international competitiveness".

A further area always of concern is marketing. This year not a great deal is devoted to that topic, but I do request that some of you might write on this for the next issue.

It is good to see that we received some better prices for fresh market potatoes recently. I hope it continues!

Thank you for your support and all the best for the 1993/94 season.

- JOHN SALVESTRIN, Editor

INVITATION TO CONTRIBUTORS AND ADVERTISERS

This magazine will be published annually in June. Articles are welcomed on any topic related to potatoes. Please submit copy of articles and advertising to:
The Editor, Potato Australia, P.O. Box 1087, Griffith, NSW 2680.
Phone (069) 630555 Fax (069) 630255.

Contents

ACKNOWLEDGEMENT:

Front cover photograph-
Romic Pajak and John Farrow of the Department of Primary Industry, Hobart, Tasmania.

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From **Incitec** People with answers

Chairman's Report

WAYNE CORNISH is the Chairman of the Australian Potato Industry Council.

Another edition of Potato Australia is now with us. The quality of the production is being commented on around Australia. It is the flagship for the Australian Potato Industry and is slowly but surely becoming an industry institution.

Teething problems are being resolved. Our one remaining problem, distribution, is being addressed with urgency. Our aim is to achieve total industry circulation through every sector, a major task but we are determined to succeed. If you are aware of someone who is not receiving 'Potato Australia' please notify your local Industry organisation to have the problem corrected.

The year has been one of great contrast. Weather, price, crop and quality have all been somewhat unpredictable and varied. Those who have and are still suffering at the hand of adverse weather, both flood and drought have perhaps the most difficult challenges to overcome.

I'm pleased to report that the National Potato Levy is working extremely well with compliance in excess of 90 percent which is very encouraging considering the short length of period the scheme has been running. Our continued efforts to achieve a quick and equitable fund, through co-operation and vigilance with the Levis Management Unit DPI-E have been rewarded. This fund is now allowing those areas of high priority Research and Development to be undertaken on an ever increasing scale.

Anticipated expenditure in the 1993/94 year will be in excess of $1.2m.

The review of Potato breeding and cultivar evaluation work in Australia is completed. The findings have been considered and a new Nationally oriented approach is being adopted. Toolangi and the complementary State activities have been structured to take a more collective approach. New management and technical committees are now in place to oversee this important area of R & D.

The ongoing debate regarding potato promotion continues to be progressed. The Australian Horticultural Corporation has funded an Industry Strategic Plan. The completion of this plan will be achieved after all the relevant inputs are to hand.

One vital input to the plan will be the findings of the Horticultural Research and Development Corporations Market Research project due to be completed in July this year. I look forward to the outcome of these joint exercises and sharing that plan and report with you shortly. Industry simply must come to grips with consumer education, awareness, and promotional problem as soon as possible. Continued failure to do so is costing us as a total industry, dearly. Potatoes have major market place competitors. We must recognise that and extend the virtues of the "not so humble potato".

The Horticultural Policy Council's report on the impacts of Potato Cyst Nematode is complete and I sincerely hope it will be with industry very soon. I ask industry to be prepared to study the report and recognise the positive nature of it.

With the Industries Commission report and findings, now the hot topic of the moment is the continuous calls for best practise and international competitiveness. One wonders what the future holds. A more lateral view of industry costs and the recognition of the real impediments to us, across all sectors of industry must be adapted before any meaningful progress will be made.

My thanks to Neil Dvorak from the Western Australian Potato Marketing Authority who has represented merchants as an APIC councillor since APIC inception. Neil has decided to retire from his position as Manager with the Authority and consequently has stepped down from the APIC council.

Neil was a tireless worker for the APIC and myself. Thanks Neil and all the very best for the future. To take over from Neil, I welcome Bev Steggles from Newcastle. Bev attended her first meeting in June and I'm sure her knowledge, enthusiasm and ability to get things done will serve APIC well.

My thanks to John for putting 'Potato Australia' together again and our advertisers for their continued support. I wish you all a top season and year.

RESEARCH & DEVELOPMENT

JONATHAN ECCLES
is a Program Manager with the Horticultural Research and Development Corporation in Sydney.

The Horticultural Research and Development Corporation is the research arm of the Australian horticultural industries. It is responsible for the co-ordination and funding of horticultural research and development at a national level.

The Levy

A statutory levy was introduced in 1991 to support R&D within the potato industry at a national level. The levy is collected from both growers and processors.

The levy is collected at the first point of sale where potatoes are destined for the fresh market or sold as seed. The levy is collected by the processor where the potatoes are destined for subsequent processing.

THE RATE IS:

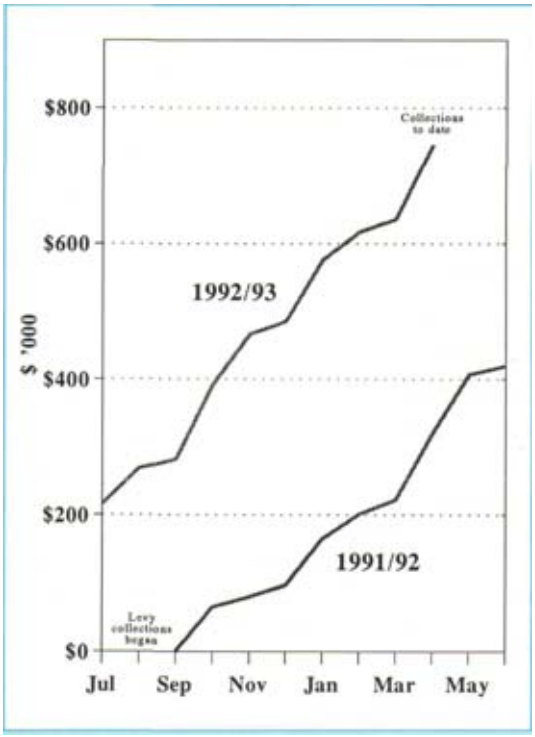
- **50 cents/tonne paid by the grower for potatoes destined for the fresh market;**
- **50 cents/tonne paid by the grower for potatoes sold for use as seed;**
- **50 cents/tonne paid by the grower for potatoes destined for processing; and**
- **50 cents/tonne paid by the processor for potatoes used for processing.**

Levies are collected by the Levies Management Unit of the Commonwealth Department of Primary Industries & Energy. Funds are then transferred to HRDC.

Levies collected in a financial year are used to fund R&D projects in the following year. This means that levies collected in 1992/93 will be used to fund projects in 1993/94. Levies are matched by the Commonwealth Government $ for $ to form the potato R&D program.

Levy collections in 1992/93 have improved since last year allowing increased funding in 1993/94 (Figure 1).

FIGURE 1: National Potato R&D Levy 1991/92, 1992/93



The Priorities

In September 1992, the APIC R&D revised the industry's R&D priorities. The priorities and key objectives supported by industry to achieve these outcomes are:

Increased productivity and efficiency of potato production

- Control of pests, diseases and weeds, use of integrated pest management to develop integrated crop management practices and their dissemination to reduce the use of chemical inputs.
- Varietal improvement combining conventional breeding and plant molecular biology to improve pest resistance and to achieve better adaptation to the diverse Australian production environments to achieve greater production efficiency.
- Strategic research to improve the assessment of soil fertility and the more efficient use of applied nutrients and water as part of the development of economically viable and sustainable soil management and landuse practices.
- Provision of high quality certified disease free seed potatoes and the development of better designed machinery to improve seed handling and planting procedures.

Provision of a consistent supply of assured quality potatoes to meet the needs of the end users

- Varietal improvement through conventional breedng and molecular biology to ensure a consistent supply of product with an assured quality and uniformity which meets the needs of the fresh market consumers and processors.
- Improved crop management practices to produce a high yield of uniform grade, quality tubers, free from disease and with minimum levels of chemical residues and other contaminants.
- Improving the machinery used in harvesting, grading and transport to minimise the loss of quality caused by mechanical injury and bruising.

Ensuring a reliable supply of uniform, high quality potatoes following postharvest handling and transportation

- Development of protocols for quality assurance standards to improve the performance of the industry at all stages of production, postharvest handling and processing.
- Research to improve the current practices of handling and storage of potatoes to achieve a more uniform quality product and to minimise waste through reduction in problems of greening, sprouting and losses through storage.

Increased consumption and export of potatoes through market research, new products and better handling

- Market research and market intelligence to improve consumption through better understanding of consumer needs.
- Development of improved varietal labelling and packaging of potatoes for particular end use for the fresh market.
- Research to develop new and alternative value added potato products and the use of by-products to minimise waste.
- Studies of retail handling to improve the storage, presentation, handling and labelling of fresh market potatoes to improve optimum quality and the end use of particular varieties.

Improved mechanisms of technology transfer within the potato industry

- Promote the adoption of new technology through more effective mechanisms of extension.
- Provide means of communicating with all sections of the industry in ways which are easily understood and which attracts attention.
- Build better linkages between researchers and practitioners through workshops and seminars.

The Projects

Applications seeking funds from the potato levy were considered by the APIC R&D Committee in April 1993. This Committee comprises representatives from the farming, merchant and processing sectors of the industry. Recommendations on projects are made to the Board of the HRDC which is responsible for the R&D program. However, it is only the Board which is empowered to approve project applications.

Table 1 lists those projects which have been approved by the HRDC for funding in 1993/94. Funding is conditional on final approval of the program by the Minister of Primary Industries & Energy. The 36 potato related projects total $1.7 million and 25 are funded from the levy. The remainder are funded from voluntary contributions from regional groups and other organisations.

TABLE 1: Potato projects approved for funding in 1993/94

- *Improving international competitiveness of the Trench fry potato industry in SE Australia.* Mr Mark Heap, SA.
- *Improved productivity & quality of crisping potatoes in Australia.* Mr Tony Myers, VIC.
- *The management of cadmium levels in potatoes and other vegetables.* Dr Ian McPharlin, WA.
- *Development of crop management strategies for improved productivity & quality of potatoes.* Mr Norbert Maier, SA.
- *A national survey of cadmium in potato tubers and soils.* Dr Michael McLaughlin, CSIRO Division of Soils.
- *Phosphate, nitrogen and irrigation management in potatoes.* Dr Ian mcPharlin, WA.
- *Evaluation of round potato seed in Queensland.* Dr Ken Jackson, QLD.
- *Trace element requirements of vegetables and poppies in Tasmania.* Dr Ali Salardini, TAS.
- *Sustainable potato production in highland areas of Australia.* Mr Clarrie Beckingham, NSW.
- The *reduction of cadmium contamination in Tasmanian vegetables and poppies.* Dr Leigh Sparrow, TAS.
- *Evaluation & development of new potato genotypes for SAfor Trench fry, crisp & fresh markets.* Dr Chris Williams, SA.
- *Potato breeding & cultivar trials in Australia - Western Australia component.* Mr Peter Dawson, WA.
- *Potato breeding in Australia - Variety evaluation for New South Wales.* Mr Ben Dowling, NSW.
- *Potato breeding & cultivar trials in Australia - Queensland component.* Dr Ken Jackson, QLD.
- *Breeding Trench fry potato varieties.* Dr Roger Kirkham, VIC.
- *Breeding fresh market potato varieties.* Dr Roger Kirkman, VIC.
- *Breeding crisp potato varieties.* Dr Roger Kirkham, VIC.
- *Production of virus resistant potato plants to enable reduced use of insecticides on potatoes.* Dr James Hutchinson, VIC.
- *Utilising potato microtubers for field production of seed potatoes.* Mr Ben Dowling, NSW.
- *Non frozen fresh potato products.* Mr Ian Gould VIC.
- *Adding value and improving the utilisation of potato waste.* Ms Karen Freeman, VIC.
- *Soil insect pests of potatoes.* Mr Stewart Learmonth, WA.
- *An investigation of Black Dot disease of potatoes and its control.* Mr Ian Macleod, Serve-Ag Pty Ltd.
- *Control of Black leg, Black scurf and other postharvest storage rots of seed potatoes.* Dr Satish Wimalajeewa, VIC.
- *Development of phosphate and phosphonate based fungicides for control of late blight in potato.* Dr Bruce Grant, University of Melbourne.
- *Integrated management of potato common scab.* Ms Lois Ransom, TAS.
- *Control of stem end browning of Russet Burbank potatoes.* Dr Tony Kellock, VIC.
- *Development of a commercial assessment method to detect parasitoids of the potato moth.* Dr Paul Home, VIC.
- *Epidemiology and control of powdery scab of potatoes,* Mr Rudolf de Boer, VIC.
- *Rhizoctonia control on fresh market potatoes.* Dr Trevor Wicks, SA.
- *The development & application of an integrated crop management program for crisping potatoes in SA.* Ms Pamela Strange, Potato Crisping Group of SA.
- *Development & application of training programs for IPM techniques in Southern Australia.* Ms Pamela Strange, Potato Crisping Group of SA.
- *Attendance at Potato Conference - Madison - USA.* Dr Trevor Wicks, SA.
- *Development and extension of potato hygiene strategies.* Ms Amabel Fulton, TAS.
- *Workshop packages for effective extension.* Dr Keith Chapman, TAS.
- *Improving the adoption of advanced potato production and handling practices.* Mr Bruce Beattie, TAS.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Insufficient leaf area limits yields in the Lockyer

KEN JACKSON and
CRAIG HENDERSON
are Senior Horticulturists
ALAN DUFF
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JOHN KERR
is a District Adviser based at Gatton.
All are with the Department of Primary Industries, Queensland.

The long-term average yield for No. 1 Grade potato production in the Lockyer Valley is 20 t/ha. Recent growth and development studies at Gatton Research Station, indicate that average district yields of at least 30 t/ha should be achievable. To identify what is limiting district crops from averaging more that 20 t/ha, four district crops were monitored during spring, 1992.

The major outcome was that insufficient top growth was limiting yield potential in the Lockyer.

Site details

The crops monitored were planted in June and harvested in October/November. The variety Sebago was common to all four sites. Data collected at each site included plant emergence, growth measurements, light interception, tuber number and yield, irrigation application, plant chemical analyses and disease occurrence. Irrigation management was monitored using Jet-Fill tensiometers, installed at 15 and 60 cm below the tops of the hills, about 2-3 weeks after 50% emergence. At each site, two, 5 metre rows were hand-planted with Sebago seed, maintained at Gatton Research Station to compare different seed sources. At maturity, three, 1 metre row plots were randomly selected (within the monitored block) at each site and harvested for yield estimation. Two, 1 metre row plots were harvested for yield estimation in the two-row plots planted with Research Station seed. Grower yields at the four sites were also recorded.

The four properties on which the crops were monitored are referred to as Sites 1, 2, 3 and 4. Details of site history and management at planting are presented in Table 1.

Leaf canopy measurement

An estimate of the leaf canopy or leaf area was determined at regular intervals by measuring light inerception by the plant tops. Using light receptors to

Poor emergence at Site 1 (68%) was a major reason for reduced canopy development

Excellent leaf area coverage in Site 4

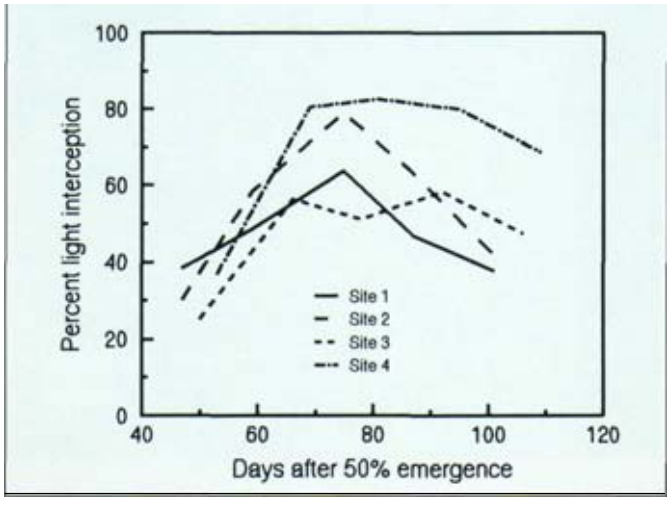
TABLE 1: Cultural, planting and emergence details for potato crops monitored at four sites in the Lockyer Valley.

	SITES											
DETAILS	1			2			3			4		
Paddock history	1991 Spring potatoes 1991/2 Summer grain sorghum			1991 Springs potatoes 1991/2 Summer grain sorghum			1991 Springs potatoes 1991/2 Summer grain sorghum			1991 Spring potatoes 1991/2 Summer forage sorghum		
Seed bed	Dry cloddy and high trash level			Rough and cloddy			Rough, dry surface and high trash level			Deep ripped, hilled, declodded, dry and fine at planting		
Seed treatment	Douglas Fir bark			Cement powder			Mancozeb and talc			Mancozeb and talc		
Planting date	2-6-92			11-6-92			22-6-92			27-6-92		
Row and plant spacing	80cm, 25cm			80cm, 25cm			80cm, 25cm			80cm, 25cm		
Fertilizer (kg/ha)	N	P	K	N	P	K	N	P	K	N	P	K
Planting Side-	94	27	71	114	22	80	75	22	56	124	41	85
dress Total-N, P	107	0	76	109	41	76	94	0	0	42	0	0
& K	201	27	14	223	63	156	169	22	56	166	41	85
Sulphur	147			216			81			144		
Hillings (no.)	1			2			1			0		
Herbicide	nil			Pre-emergence Gramoxone			nil			Pre-emergence Spray seed Post emergence Sencor		
Final emergence %	68			88			86			97		

measure light above and below the crop canopy, the percentage of light intercepted by the plant tops was recorded (Figure 1). These light sensors only measure the photosynthetically active radiation (PAR), i.e. the part of the light spectrum that helps crops grow.

We have found that, at approximately 75% light interception during the bulking period, the plants have a leaf area index (LAI) of around 3. A LAI of 3 means that the area of all the green leaf surfaces above a given area of land is three times the area of the land. It is generally believed that, unless the potato crop reaches a LAI of 3, there is little chance of maximising yields. Moreover, the yield potential of the crop is determined by how long the leaf area is maintained at, or above, the LAI of 3. Assuming the light interception of 75% approximates a LAI of 3, it can be seen from Figure 1 that only at Site 4 was the LAI maintained above 3 for an extended period. This occurred between days 65 and 105 after emergence. At Site 2, this period was for only nine days (days 70-79), while light readings at Sites 1 and 3 indicated that neither crop reached a LAI of 3.

FIGURE 1: Changes in light intercepted by plant canopies during the growth of four commercial potato crops in the Lockyer Valley in Spring, 1992.



Yield

The yield data (Table 2) reflects the level of light interception in each of the crops.

Factors affecting reduced leaf area development

No common factor was responsible for the reduced leaf area develpment at Sites 1 to 3. At each of these sites, however, we ascribed the major cause to a single factor:

Emergence

Poor emergence (68%) at Site 1, compared to 86-97% at the other three sites, is considered a major cause for reduced canopy development at this site. This low emergence was associated with a relatively high incidence of blind seedpieces and the presence of the fungus *Rhizoctonia solani.* This disease organism prevented emergence in some cases and in others it reduced the number of shoots emerging per seedpiece. Emergence of hand-planted Gatton Research Station seed at Site 1 was 88%, compared to 85-100% for the same seed source at the other three sites. We believe that the lower emergence at this early planted site increased wind damage. We have

TABLE 2: Actual yield of No. 1 Grade (t/ha) measured at each site, compared to estimated yield from plots harvested from the trial area, as well as estimated yield from plots planted with Research Station seed.

Site	Actual Yield	Estimated Yield (Growers[1] Seed)	Estimated Yield (Research Station Seed)
1	24.0	25.9	37.4
2	20.0	23.3	20.6
3	23.4	13.9	15.8
4	39.5	43.3	46.1

observed that denser canopies reduce the entry of wind into the crop, resulting in less damage to leaves.

Disease

All crops suffered some disease, but Sclerotinia (caused by *Sclerotinia sclerotiorum)* was particularly severe at Site 2, where 30-40% of plants in the monitored area were affected. This disease was primarily responsible for the sudden fall in light interception at 75 days after emergence (Figure 1). Tuber counts at this site were substantially higher than at the other three sites, but fewer reached the No. 1 Grade size, reflecting the effect this disease had on potential yield.

Irrigation

At Site 2 the major cause for reduced growth is attributed to insufficient water supply in the early stages. At this site, shallow tensiometer readings peaked at 80 kPa on two occasions, between five and eight weeks after emergence (Figure 2(a)), with another peak of 60 kPa at nine weeks. The mean watering interval (either irrigation or rainfall) was about eight days. Dips in readings from the deep tensiometers, after the irrigations at 8, 9 and 10 weeks, indicated drainage losses. In contrast, at Site 4, the crop was watered every five days on average, with the shallow tensiometers seldom registering more than 40 kPa (Figure 2(b)). The deep tensiometer data at this site indicates that some drainage occurred when the 37 mm of water was applied. Consistent irrigation at 28 mm would have been more efficient, unless leaching was required because of poor water quality.

General comments

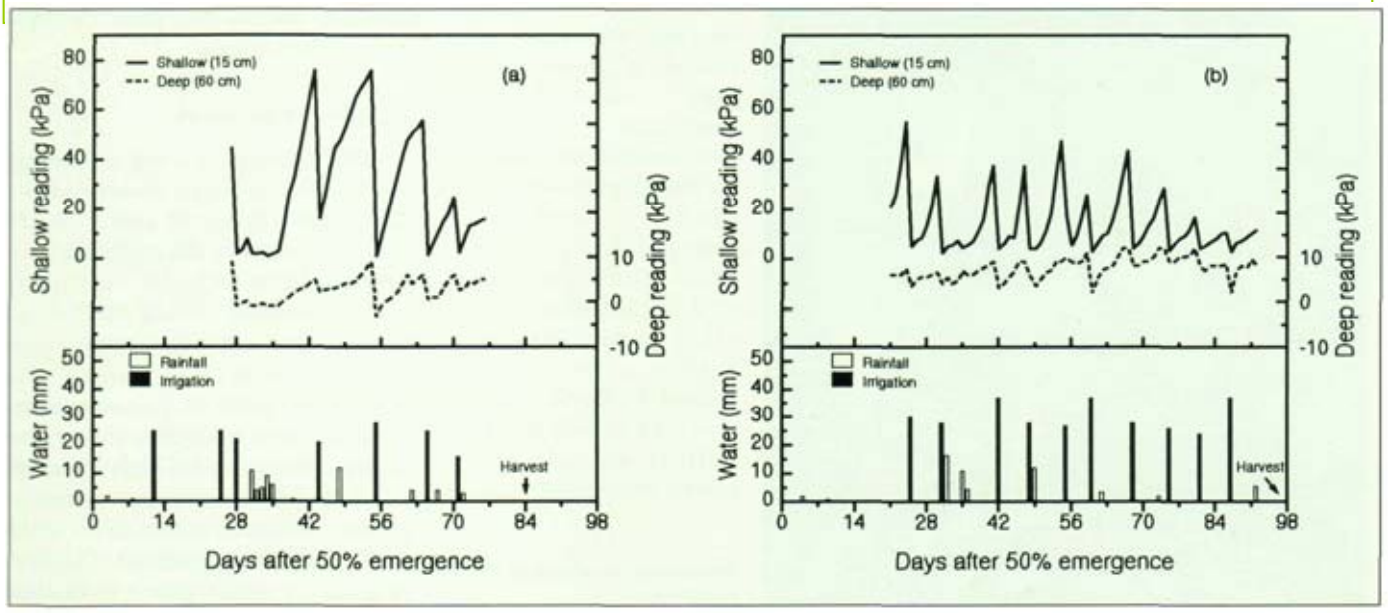
The disease Verticillium wilt *(Verticillium dahliae)* was apparent in all four crops. It was most severe at Site 4. Leaf roll virus was only minor in all four crops.

Soil and plant nutrient analyses indicated that nutrition was not limiting yield potential at any of the sites.

GENERAL CONCLUSIONS

Disease management appears to be the most difficult problem facing potato growers in the Lockyer Valley. Although insufficient irrigation and low emergence were highlighted as problems, these can be overcome. Strategic use of tensiometers should overcome irrigation deficiencies and excesses. Currently, irrigation scheduling studies in potatoes are being conducted at Gatton Research Station. Emergence can be improved by reducing the number of blind seedpieces, and by chemical control of seedling diseases. The intensive cropping regime in the Lockyer Valley, however, will continue to make control of Verticillium wilt and Sclerotinia difficult.

FIGURE 2: Shallow and deep tensiometer readings reflect rate of rainfall and differing irrigation regimes at Site 3 (a) and Site 4 (b).



Correct population MORE IMPORTANT THAN spacing uniformity

JOHN McPHEE
is an Agricultural Engineer and
BRUCE BEATTIE
is a Horticulturist, both at
Devonport and with the
Department of Primary
Industry and Fisheries,
Tasmania.

Although uniform spacing is a desirable aim in a crop of potatoes, it would appear that achieving the correct population is of more importance.

Most growers like to see uniform plant spacings in an emerging crop - but how do we define "uniformity" and what does it mean to crop yield? Some Tasmanian growers have been concerned that processing yields may be suffering due to poor spacing uniformity, resulting in too many undersize tubers if plants are too close together, or second-growth and large tubers if they are too far apart. Some growers question the ability of planters to perform up to their expectations.

To gather information on this problem, a field survey and literature search was conducted in the 1992/93 planting season. We were trying to find out:

- what level of spacing uniformity is being achieved in the field;
- how this compares with elsewhere, and
- what effect spacing uniformity has on marketable yield.

Although some measurements of set spacing were taken at planting, most data was collected at emergence.

Information recorded included planter type used, paddock topography, plant spacing distribution, and target and final plant population. The survey covered 59 Russet Burbank crops that had been planted with clamp, cup and needle style planters.

Measuring set spacings at planting.

What do the 'terms' mean?

Before discussing the results, it is important to define what is meant by "spacing uniformity", as this term is often confused with "average plant spacing".

SPACING UNIFORMITY refers to the regularity of the spacings between plants.

AVERAGE PLANT SPACING is the average distance between plants. This is determined by the population density. For example, a population of 4.2 plants/m^2 will give an average plant spacing of 30 cm on 80 cm rows, but the same population could have a range of spacing uniformities, depending on a range of factors.

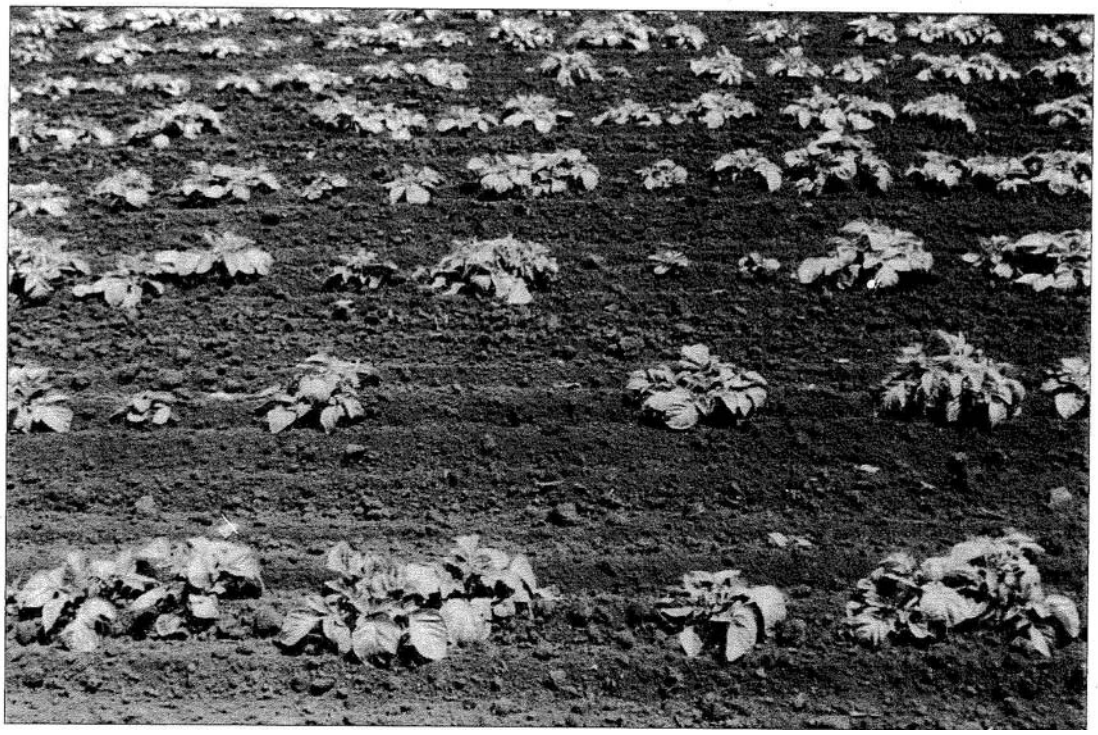
Spacing uniformity can be measured using the "coefficient of variation", or cv. This is a measure of how much the plant spacings vary from the average spacing. A perfectly regular spacing would have a cv of 0%. A crop with a target spacing of 30 cm and a cv of 50% would have up to 25% of the spaces between plants less than 15 cm or greater than 60 cm.

Results of surveys

The average spacing uniformity across all the crops measured was 52%, with a range of about 30-70%. Fifteen percent of the crops had a cv greater than 60%. In the United States, in-field cv's of 50-70% are normal, and research in other parts of the world has shown that marketable yield of Russet Burbank does not seem to decline to any great extent, unless cv's are higher than 60-70%. An often expressed desire by growers is for all plants to be within 5 cm of the target position. This level of accuracy would give a cv of about

10%, and there is no evidence to suggest that this would give improvements in yield.

On the basis of this survey, it would appear that problems with spacing uniformity in the Tasmanian industry are not serious. However, the survey data points to some problems in achieving the correct plant populations. The plant population currently recommended for Russet Burbank is 3.5-4.2 plants/m^2, which gives average plant spacings of 30-35 cm on 80 cm rows.



Set spacings in emerging crops may appear irregular, but will probably not be a major concern provided the population is correct.

We considered the population to be in error if it varied by more than 10% from the desired target. Of the crops visited, 15% were overpopulated and 19% were underpopulated, with populations ranging from 25% over, to 33% under, the desired target. Errors such as these cost money.

Overpopulation wastes seed and may increase the number of small tubers in the crop. Crops with a low population still require the same inputs and may have reduced yields and second-growth. We excavated many large gaps in emerging crops and almost all of them were due to the absence of a seed piece, which is a function of planter performance.

Off-target populations and poor spacing uniformity seem to go hand-in-hand. Many of the crops that had high cv's (>60%) also had populations that were more than 10% off-target. On the other hand, very few had a poor uniformity combined with an acceptable population. This suggests that, if the population is correct, spacing uniformity is unlikely to be a problem. This is supported by research from the US, which identified correct calibration to give the right population as the most important issue.

Types of planters

It was not possible to pick differences in uniformity between different types of planters in this survey. The performance of a planter is determined by a range of factors including the design of the planting mechanism, size and shape of the seed, the level of maintenance given to the machine and the operating speed. No data was collected regarding seed and machine conditions, but it is felt that machine maintenance and operating speed are probably the most important factors in achieving a good performance from the planter.

Although it is widely used, we feel that cv, as a measure of spacing uniformity, has limitations and is not very "farmer friendly". It is not an easy measure to use in the field and very few people have a concept of what it means or what a "good" cv looks like. On the basis of work done elsewhere, it appears that marketable yield of Russet Burbank will only start to suffer significantly if spacings between plants are less than about 15 cm or greater than about 60 cm. On this basis, it may be more appropriate to assess planter performance and spacing uniformity on the basis of the proportion of the plant spacings that lie in the desired range (say between 15 and 60 cm). Basically, this translates to being able to tolerate the occasional missed set, provided the population is kept in the correct range by the occasional close spacing. Too many double or multiple misses should be avoided, as should multiple drops.

Some of these thoughts are a bit speculative, as we don't have complete information on the importance of small and large plant spacings, and what proportion of small and large gaps can be tolerated before marketable yield suffers. However, we would be interested to hear of comments that others in the industry may have.

In the meantime, the best advice we could give would be to ensure that planters are calibrated correctly. If you are achieving the correct population, it is unlikely that the spacing uniformity is going to be a limitation to marketable yield.

SNOW GEM
Fresh market variety

Graeme Wilson and Ben Dowiing grading potato variety trial at Savernake, NSW.

ROGER KIRKHAM and GRAEME WILSON
Department of Agriculture, Victoria
BEN DOWLING
NSW Agriculture

Snow Gem is a new potato variety which is being released for the fresh market. Snow Gem has been produced by Australia's only potato breeding program which is located at Toolangi, Victoria

Fresh market potato industry

Despite an expanding potato processing industry, most potatoes in Australia are still sold in the fresh produce market. However, most of these potatoes are washed before sale and appearance is the most important factor influencing sales. Smooth, bright white and unblemished skin is demanded in the marketplace.

This has lead to a change in production districts to areas with sandy soil types, such as the Riverina, which produce the required skin type.

The demand for bright white skin type has also lead to changes in varieties, with Coliban and Crystal becoming preferred varieties for washing before sale.

Potato breeding

The Victorian Department of Agriculture has Australia's only potato breeding program and this is based at Toolangi. Germplasm from this program is distributed to all states in Australia for testing in local potato growing districts. Potato variety trials are located in the main growing regions in Australia where breeders' lines are compared to commercial varieties.

The trials test new varieties for disease resistance, yield and, for fresh market varieties, tuber appearance and cooking quality.

Snow Gem

Snow Gem has performed better than commercial varieties in most trials. Snow Gem tubers have short dormancy and plants grow quickly, with early tuber bulking and early maturity. These characters mean Snow Gem performs well in the Riverina area where two crops are grown each year.

Snow Gem tubers have bright white and smooth skins which are suitable for washing before sale. The lenticels on Snow Gem tubers are small, even when plants are grown under wet conditions.

Development of Snow Gem

Snow Gem has been developed over the past 13 years, with, three year's testing at Toolangi and 10 year's testing in the main fresh market potato production areas of Victoria and in the Riverina, NSW. The trials in production areas were on commercial potato growing properties.

Snow Gem was produced by crossing the Australian variety, Coliban with the American variety, Norgleam. Snow Gem has been tested as the breeding line 80-98-16 and was tested in advanced trials under the potato variety name Wilsprout.

Yield

Table 1 shows Snow Gem has high yields than Sebago, which is the most commonly grown, fresh market potato variety. Plants produce few tubers, which may grow large-sized and are usually oblong-shaped.

TABLE 1: Average Yield (No. 1 Grade, 80-450g} of Sebago and Snow Gem (t/ha)

Area	No. of trials	Snow Gem	Sebago
Gembrook	2	42.7	36.1
Toolangi	3	48.7	43.1
Berrigan*	3	30.4	30.3
* Winter harvest			

Cooking quality

Cooking tests have also shown the superiority of Snow Gem over other varieties. Most potatoes bought in the fresh market are boiled and mashed, with whole-boiled, roasting and salads being other main uses.

The tubers do not break up when boiled and do not blacken after cooking, which are major disadvantages with some other fresh market varieties. They have low dry matter and high-reducing sugar content, which produces dark fried products. This variety is not suitable for processing into either French fries or crisps.

Recommendations

Snow Gem has short tuber dormancy, and early plant maturity, and is particularly recommended for dual-cropping areas where seed is saved. Snow Gem plants produce few tubers and tuber size can be large. Close spacing of seed tubers is recommended and tuber size should be monitored during crop growth.

Plant Variety Rights (PVR)

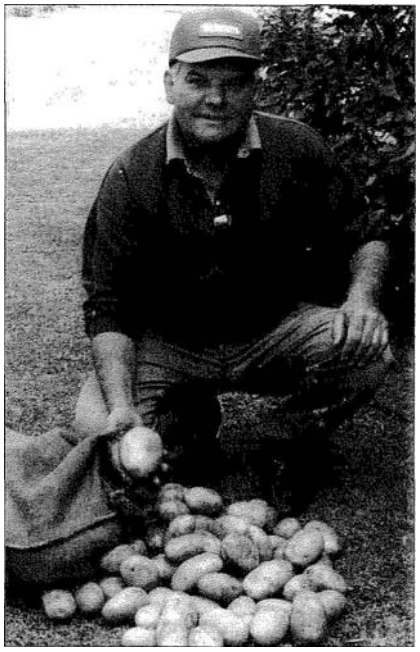
Snow Gem is being released under PVR in Australia. A small royalty will be added to the price of the seed of this new variety and the licensee for Snow Gem is the Certified Seed Potato Growers of Victoria. Certified seed of Snow Gem was sold for the first time in Autumn, 1993.

ACKNOWLEDGEMENTS:

Some funding for variety trials was obtained from the Riverina Potato Growers' Association and the Horticultural Research and Development Corporation. We would like to thank Bruce Ure (Gembrook), Philip Boustead (Savernake) and Bob Cornish and Sons (Cobram) for variety trials on their properties.

NADINE Promising in WA

PETER DAWSON,
JEFF MORTIMORE and
TONY NELLA
WA Department of Agriculture



Nadine is a new, fresh market potato variety, well-suited to winter production in Western Australia. Nadine boils well, like the standard variety Delaware, but can also be microwaved, baked or roasted.

- **NADINE IS RESISTANT TO POTATO CYST NEMATODE.**
- High yields of exceptionally even-shaped, oblong tubers, with very shallow eyes are produced in winter. The skin is cream in colour, fairly smooth and looks attractive after washing. These attributes have led, so far, to good grower, packer and consumer acceptance.
- A commercial planting at Perth last winter gave outstanding results. Yield was high, 2.4 hectares yielded 136 tonnes (60 t/ha) and packouts were also very good. Packout results over the 136 tonnes were 30 percent premium grade and 62percent Class 1. The Nadine packout is equal to the better Delaware packouts for this time of year.
- A market survey by the Potato Marketing Authority showed 94 percent of consumers thought Nadine cooked well and was a good potato, and only six percent did not like it. The variety was accepted most favourably by retailers because, in loose-fill, most of the tubers were taken by shoppers. There was very little waste left to be thrown out.
- Nadine was bred in Scotland and is eligible for Plant Variety Rights in Australia. An Albany seed grower, Mr Laurie Eldridge (098) 446269 is the agent for this variety.
- The research team is supported by the Potato Growing Industry Trust Fund, the Horticultural Research & Development Corporation and the Department of Agriculture. Len Mahaljevich is thanked for his help in testing this variety.

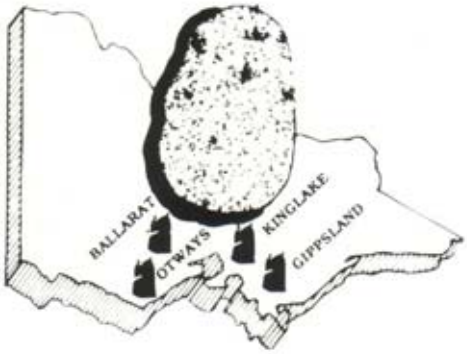
SNOW GEM

A NEW POTATO VARIETY FOR THE FRESH MARKET IN AUSTRALIA

Features...

- ☆ BRIGHT WHITE AND WAXY SKIN
- ☆ EXCELLENT TUBER BLOOM FOR WASHING
- ☆ RESEARCH RESULTS SHOW GENERALLY 10% HIGHER YIELDS THAN SEBAGO
- ☆ EXCELLENT EATING QUALITY

For limited quantities of certified seed from the 1994 harvest, contact:



Victorian Certified Seed Potato Growers Committee Inc.

The Executive Officer

Victorian Certified Seed Potato Growers Committee

PO Box 571
Warragul
Victoria 3820

Telephone: 018 514 581
Facsimile: 056 234 596

PERFORMANCE SEAL OF QUALITY PROVEN

USE ONLY VICTORIAN CERTIFIED SEED POTATOES – THEY ARE PERFORMANCE PROVEN.

EVANS... a new crisp potato for storage

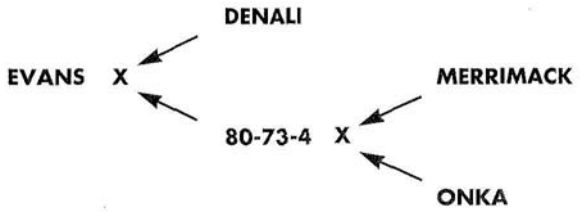
ROGER KIRKHAM and GRAEME WILSON are Plant Breeders of the Institute of Plant Sciences, Toolangi, with the Department of Agriculture, Victoria.

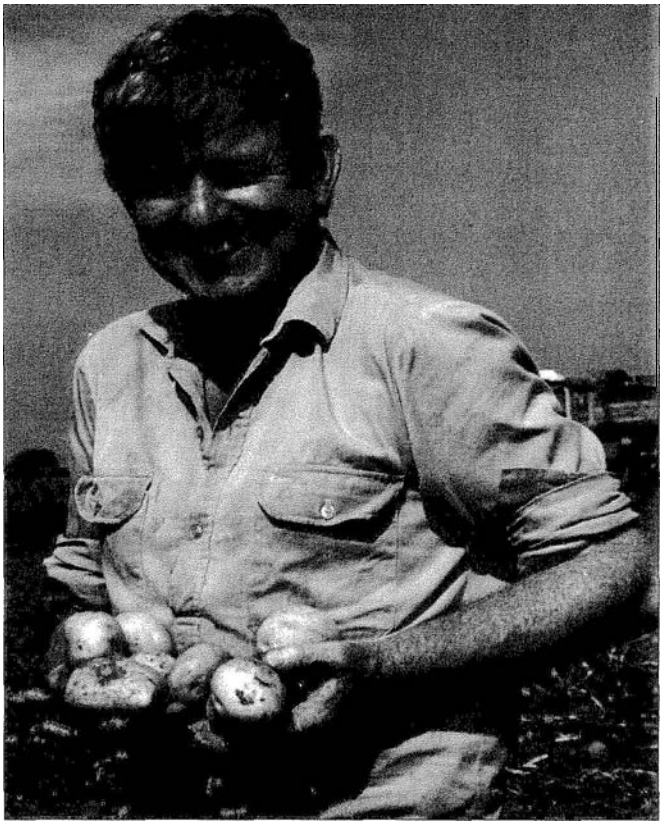
Evans is a new potato variety recommended for crisping after long term storage and has been produced by Australia's potato breeding program centred at Toolangi.

Forty percent of crisps in Australia are processed from potatoes grown in Victoria. Many of these potatoes are stored before processing to allow a continual supply of raw product to processing factories during May to October. The major production area in Victoria is Koo-Wee-Rup, and crisp potatoes are also grown at Thorpdale, Colac and Koroit. Kennebec is the main potato variety grown for long-term storage, and Atlantic is the main variety grown for direct delivery crisp processing.

Developing Evans

The potato variety Evans has been developed over the past nine years. The initial three year of selection were at the Institute of Plant Sciences, Toolangi followed by six years testing in variety trials in the main crisp potato production areas of Victoria. Evans was tested as the breeding line 85-34-6. Evans has been produced by hybridising the following varieties:





Tony Evans with the new potato variety

Denali is an American variety which is being grown commercially for crisp processing, particularly after storage, in Victoria. The breeding line 80-73-4 is a parent line used in the potato breeding program, which has high yield and light fry colour. 80-73-4 was produced by crossing Merrimack, an American variety, with Onka an Australian variety developed by the potato breeding program. Evans has been named after the Evans family who grow potatoes for crisp processing at Bayles, Victoria.

Crisp colour very light

Evans produces very light- coloured crisps when processed at harvest (Table 1). In trials in six districts in 1990-91, and in six districts in 1991-92, Evans produced an average crisp colour at harvest which was lighter than Kennebec and equal to Atlantic.

TABLE 1: Crisp quality at harvest

(A) Average of six trials, 1990-91			
Variety	Crisp Colour*	% Dry Matter	Specific Gravity**
Kennebec	4.4	19.8	1.078
Atlantic	3.7	22.0	1.089
Evans	3.7	22.0	1.089
(B) Average of six trials 1991/92			
Variety	Crisp Colour*	% Dry Matter	Specific Gravity**
Kennebec	5.4	20.1	1.079
Atlantic	3.7	22.7	1.092
Evans	3.6	22.6	1.091

* Crisp colour - Scored 1-10:
1 = lightest; 6 = borderline; 10 = darkest.

** Specific gravity measured by weight in air/weight in water method.

Evans produces light-coloured crisps after long-term storage (Table 2). During 1990, samples were stored from four trials for eight months. Average results showed Evans had light crisp colour throughout storage, but Kennebec had light crisps only at harvest and at the end of storage after eight months. During 1991, samples were stored from five trials for eight months. Average results showed Evans had light crisp colour throughout storage, except for tests during the third month when colour was borderline. Kennebec had light crisps only at harvest and had borderline colour at the end of the storage period.

Dry matter content high

Evans has high dry matter content. Results from, six trials during 1990-91, and six trials during 1991-92, showed Evans had dry matter content equal, and almost equal, to Atlantic. Both Evans and Atlantic had percentage dry matter contents more than two point higher than Kennebec (Table 1).

Roger Kirkham and Frank Rouse at new potato varieties display, Koo Wee Rup.

TABLE 2: Average crisp colour after storage at 10°C

(A) 1990 Results from Cora Lynn, Bayles, Tynong and Koroit									
Months stored:	Harvest	1	2	3	4	5	6	7	8
Kennebec	✓	x	x	x	x	?	?	?	✓
Evans	✓	✓	✓	✓	✓	✓	✓	✓	✓
(B) 1991 Results from Cora Lynn, Bayles, Tynong, Thorpdale and Koroit									
Months stored:	Harvest	1	2	3	4	5	6	7	8
Kennebec	✓	x	x	x	x	x	x	?	?
Evans	✓	✓	✓	✓	?	✓	✓	✓	✓

✓ Light crisp colour, suitable for processing ? Borderline crisp colour x Dark crisp colour, not suitable for processing

Yields higher

Evans produces about one tuber per plant more than Kennebec (Table 3). In six trials during each of 1990-91 and 1991-92, Evans produced about 10% less yield of No. 1 grade (80-450g) than Kennebec. In the smaller tuber size range (80-250g), which is the preferred crisp processing grade, Evans had higher yield than Kennebec (Table 3).

TABLE 3: Yield

(A) Average of six trials, 1990-91			
Variety	Tuber No./ Plant	Tonnes/hectare No. 1 Grade (80-450g)	Crisp Grade (80-250g)
Kennebec	5.2	46.7	27.9
Atlantic	6.7	44.0	32.8
Evans	6.1	41.7	30.9
(B) Average of six trials 1991/92			
Variety	Tuber No./ Plant	Tonnes/hectare No. 1 Grade (80-450g)	Crisp Grade (80-250g)
Kennebec	5.4	45.3	27.3
Atlantic	7.2	39.5	33.0
Evans	6.3	41.6	31.8

Needs to be treated differently

Evans plants produce tubers which can grow larger than the preferred crisping size. Seed spacing should be close and tuber size should be monitored during plant growth. Evans has long tuber dormancy, and seed tubers should be removed from storage early to allow dormancy to be broken before planting. Because Evans has long dormancy, it can be stored for mid-term without application of chemicals to inhibit sprouting. Evans tubers have high dry matter and are susceptible to mechanical damage. Therefore, care should be taken to avoid bruising at harvest and during handling.

ACKNOWLEDGEMENTS:
We wish to thank the support of:
- The Crisping Potato Research Group of Victoria;
- The Horticultural Research and Development Corporation;
- Smiths Snackfoods Company;
- Frito Lay Australia, and
- Contract crisp potato growers on whose properties trials were located.

24 GROWERS JOIN QA IN VICTORIA

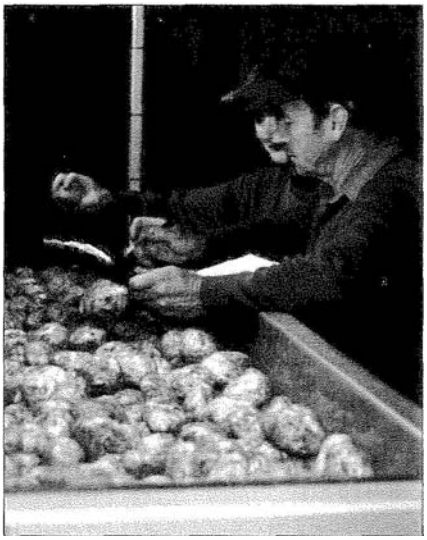
KEITH W BLACKMORE
is a Senior Certification Officer at the Institute for Horticultural Development, Toolangi with the Department of Agriculture, Victoria

The Victorian Certified Seed Potato Scheme has implemented a Quality Assurance (QA) program for Certified Seed Potatoes.

The program emphasises quality management by growers and aims for continual improvement by constant review.

QA recognises that quality cannot be inspected-in! It must be build in the whole way through the production system. The whole process must aim to get it right all the time.

QA growers will 'certify' their own produce, which will allow them greater freedom in movement of seed from the packing shed and provide opportunities to reduce inspection costs in the shed. The Department of Agriculture will continue to inspect the crop in the field. It will also audit growers to ensure they are following the agreed management procedures. The audits can be either announced or unannounced.



Quality cannot be inspected-in.

It must be built in the whole way through.

The process must aim to get it right all the time.

International standards

The QA program is based on international standard ISO.9002. All auditors have successfully completed the AQIS auditor's course.

What QA means for:

THE BUYER
- buy consistent quality seed
- flexible delivery (no waiting for inspection
- indicates that you are dealing with a professional

THE SEED GROWER
- produces consistent quality seed
- more staff involvement and training resulting in more staff dedication to the task
- more aware of the quality of his product
- more paperwork!
- more independence
- lower inspection costs

DEPARTMENT OF AGRICULTURE
- consistent quality of product
- staff savings
- need to provide trained auditors

To date, 24 growers have joined the QA program. These growers (from all Victorian districts) represent 17% of the total growers in the seed scheme, but account for 25% of the state's production of certified seed.

While there is no such product as the perfect seed potato, QA represents a planned and documented approach to quality management and assessment of quality before certification. If a complaint is made about seed from the QA program, it is possible to follow the history of the seed in question from seed cutting to planting, growing, top defoliation, harvesting, storage, grading, storage and transport. If a problem has occurred, it should be possible to identify the error and change practices to avoid it recurring.

Growers in the QA program are committed to comply with the rules of the seed scheme and their policies, procedures and specifications , as detailed in their manuals.The traditional tuber inspection and final certification will continue to be provided by the Department of Agriculture for all other growers.

COMMON SCAB

What progress?

LOIS RANSOM
is a Plant Pathologist at Devonport with the Tasmanian Department of Primary Industry and Fisheries.

The article on common scab research, published in last year's edition of Potato Australia, outlined our methods and some results in our search for options to manage the disease that continues to leave its mark too commonly on our processing potato crops.

Results from 1991-92 trials, which were not reported in last year's edition, proved that chemical seed treatment was not able to prevent tuber infection from infested soil and that tuber disease was more severe in crops grown in infested soil.

A large number of cultivars were assessed for their susceptibility to common scab. The trial was not replicated, but there were marked differences in the incidence and severity of scab in the cultivars tested. Some of the more tolerant cultivars were NemaRus, Russet Norkotah, Maris Piper, Morene and unnamed cultivars, A 8670-1, A 8602-3 and B 0220-14. Cultivars A 8670-4, Premier, Russet Burbank, British Colombia and Diamant were among the most susceptible. A replicated trial with some additional cultivars was planted in November, 1992. It is yet to be harvested and assessed for scab.

The effect of irrigation on development of scab was inconclusive, due to a lack of disease in the trial area. This was repeated in 1992-93, overlaid with soil lime treatments to assess the interaction Detween irrigation and calcium on scab development. This trial has not yet been harvested. Our research received a bonus this season in the form of severe scab infection in a liming trial undertaken by Dr Leigh Sparrow during cadmium investigations. Analysis of data will identify the interaction of heavy lime applications and scab development.

Morene is one of the more tolerant cultivars to common scab.

Where to from here?

Registration of the chemical ICIA0192, which showed promise as a treatment for seed-borne scab, is being pursued. It will not be available for some time, pending approval at a Federal level of toxicological and efficacy data.

A literature review has been funded by the Horticultural Research and Development Corporation during 1992-93. The review will focus on non-chemical options for disease management, with the aim to produce a multifaceted management plan to effectively reduce crop losses. Funding has been sought from the Corporation to begin developmental work in 1993-95 to successfully implement the management plan.

We will continue to evaluate the ELISA test arid assess other rapid identification options, such as nucleic, acid-based tests. The aim of a rapid test is to provide growers, whose crops are at risk from disease, with information on population levels so that cultural management options can best be implemented to prevent major losses. In addition, genes which can code short chain proteins with antibacterial properties have been identified in a collaborative research initiative with New Zealand researchers. This route to cultivar resistance will be taken further.

A summary of all research results was compiled last July and copies are available, from the Devonport office of the Department of Primary Industry and Fisheries, for a charge of $ 12 per copy. Requests for copies should be addressed to: Common Scab Research Summary, DPIF, PO Box 303, Devonport, Tasmania, 7310.

Right to left: Lois Ransom discusses disease control strategies with Trevor Wicks (Pathologist, SA), Rene de Jong (Development Officer, VIC) and Len Tesoriero (Pathologist, NSW whilst feasting on potatoes at the recent Potato Research Workshop.

POTATO CYST NEMATODE

Update...

JULIAN HINCH
is a Nematologist and
PETER MERRIMAN
is the Principal Scientist (Plant Protection), at Knoxfield Institute for Horticultural Development with the Victorian Department of Agriculture.

Potato cyst nematode was discovered in Victoria for the first time in early 1991 in several market gardens. Following these outbreaks further comprehensive surveys have been commissioned using prescribed sampling strategies in the 1991/92 and 1992/93 seasons. Soil samples are processed in a dedicated laboratory at the Institute for Horticultural Development Knoxfield. Fifteen outbreak properties have been identified. Most are relatively small market garden producers and the remainder comprise a few larger ware producers.

Jill Hinch (left) and Angela Mason (right) examine PCN resistant potato lines from the International Potato Centre, Peru which were propagated by Angela.

In response to these outbreaks research was undertaken in collaboration with scientists in the United Kingdom (Dr K. Evans, Rothamsted) and New Zealand, to identify the species and pathotype of the nematodes present at each outbreak site. Results so far have established that the nematode is *Globodera rostochiensis* Ro_1 rather than a mixture of *G. rostochiensis* and *Globodera pallida.* This has important implications for the potato industry because G. *rostochiensis* Ro1 can more easily be controlled by resistant cultivars of potato.

Additional research in the Department of Agriculture's Biotechnology Section at Burnley by Dr J. Woodward has further refined the methods of characterising the pathotypes of potato cyst nematode. It is now possible to use this technology to differentiate between G. *pallida* and G. *rostochiensis,* between pathotypes of G. *pallida,* and between certain pathotypes of G. *rostochiensis.* The information on species and pathotypes in Australia will be made available to the National Potato Plant Breeding Centre at Toolangi, where it will be used to plan breeding strategies for potato cyst nematode.

It is planned to use this technology to analyse the populations of Potato Cyst Nematode in soil sampled from outbreak sites to further check that there is no G. *pallida* in the population.

Once the species and pathotype component of the Australian population is understood then strategies can be developed to advise growers on suitable varieties for planting in areas which might be considered at risk from PCN.

In addition to this, further research work is proposed on the population dynamics of the nematode under Victorian conditions. Outcomes from this work should help to clarify the population changes under fallow, non-host, resistant and susceptible cultivars of potato. This information will form an important component of integrated pest management programs currently being developed at the Institute for Horticultural Development.

PCN Survey...

KEITH BLACKMORE
is a Senior Certification Officer at the Institute for Horticultural Development, Toolangi with the Department of Agriculture, Victoria

Victorian surveys have continued and new outbreaks have been found.

SUMMARY OF CURRENT OUTBREAKS IN VICTORIA

Districts	Number of Sites	When Found
Wandin/Silvan	5	January/March, 1991
Gembrook	2	December, 1991
Gembrook	1	December, 1992
Gembrook	4●	February, 1993
Emerald	1	January, 1992
Rosebud	1	January, 1992
Keysboroagh	1	December, 1991

(● Two of the Gembrook sites are in separate paddocks on the one property.)

In Summary:

- A total of 1,993 hectares of Victorian certified seed potato crops have now been sampled and tested for PCN this season, compared with 1,944 hectares in 1992.
- From August to the end of February, 1993 1,074 hectares of potato crops across Victoria have again been sampled and tested for the presence of PCN as part of the Commonwealth/States funded program, compared with 1,078 hectares in 1991-92.
- A further 564 hectares have been surveyed at Gembrook this season, in accordance with NSW Agriculture's requirements for interstate movement, compared with 510 hectares last year.

Current Outbreaks

In addition to the Keysborough infestation, and the new Gembrook infestations detected in December, an additional four infestations were found at Gembrook in late February. All infestations in Gembrook are within five kilometres of each other. The extent of the new infestations will be determined by further surveys.

Proposed regulations to control the movement of potatoes from PCN infested areas within Victoria have been drafted. It is anticipated that these draft regulations will be circulated for public comment.

There has been no change to date in the requirements for the interstate movement of potatoes. However, the new infected site at Keysborough will restrict the movement of potatoes and nursery stock within 20 kilometres of this outbreak.

7TH National POTATO RESEARCH WORKSHOP

JOHN SALVESTRIN attended the 7th National Potato Research Workshop held in Ulverstone, Tasmania between the 24th and 28th May, 1993. The workshop was hosted by the Tasmanian Department of Primary Industries.

Stephen Balcombe, Secretary for the Department of Primary Industries, Tasmania, opened the workshop. He wasted no time stressing the need for the Australian potato industry to become "internationally competitive" and to be involved in "bench-marking".

He went on to say, "Farm communities have to become smarter to remain in business. Research and development personnel have to see their research become adopted, be more closely involved with industry and in collaborative research."

The workshop took the form of a series of papers. The format was not designed to reach growers, but was an excellent opportunity for those involved in research and extension to hear the latest in new research and development projects.

Of the 170 who attended the workshop, there was only praise for the organisers, particularly John Fennell, Acting Chief, Vegetables and Allied Crops with DPI, Tasmania, who took the lion share of the organisation.

It was clear from the beginning that the potato industry and farming in general in the 21st century will be very different. It was also clear that those who do not improve their efficiency and show a consistent profit have a limited future.

The improvements in technology through R&D requires an evaluation and finally adoption by industry.

STEVEN BALCOMBE is a firm believer in Australia's need to be "internationally competitive".

The Conference had two guest speakers from the USA; one of whom was Robert E. Thornton, Extension/Research Horticulturist with Washington State University and the other was Dennis Corsini of the Aberdeen Research Station, Idaho.

Robert spoke about integrated management to optimise production. He said there was 17 individual factors identified as being important in potato production. (Table 1).

Robert said that the first eight factors are not controllable or strongly influenced by the grower. These are factors generally considered to be "climate". Although they are not controlled these factors must be integrated into the successful management of the crop.

Number nine (moisture) and number ten (variety) may not be grower controlled. Where supplemented or full season irrigation is available moisture is an integral part of grower management. Where irrigation is not available, management choices are limited but no less important.

The choice of variety may be a management variable but there are instances where market limits variety choice (i.e. French fry or chipping processing).

Factors 11 through 17 are the factors that growers control. Some of these, i.e. days grown, may also have limits posed due to market or other non-grower influenced factors. The first ten factors establish the potential yield and quality of any given variety under the natural occurring growing conditions. It is extremely important to recognise the limitations that are imposed by these factors. For example, if the frost-free period is 110 days there is little benefit from selecting a variety that

TABLE 1: Factors affecting potato yield

NOT GROWER INFLUENCED	
1. Frost Free Period	POTENTIAL YIELD FACTORS
2. Day Length	
3. Air Temperature	
4. Soil Type	
5. Light Intensity	
6. Humidity	
7. Soil Humidity	
8. Wind	
PARTIALLY GROWER INFLUENCED	
9. Moisture	
10. Variety	
GROWER INFLUENCED	
11. Days Grown	ACTUAL YIELD FACTORS
12. Seed Tuber Quality	
13. Seed Piece Quality	
15. Pests	
16. Plant Population	
17. Timely	

ROBERT THORTON
from Washington State University being interviewed by the ABC on how farmers can achieve higher yields and quality

requires 130 days to attain marketable tuber size. Also if the length of growing season limits the potential yield of a variety to 15 U.S. tons per acre.

The factors listed as yield potential determining factors are also those listed as not being grower controllable. Although listed as not being controllable by the grower this does not imply they are factors that are not important in terms of grower management decisions. Factors nine and ten may be variables that are manageable depending on specific circumstances.

The remaining seven factors are those which determine or influence actual yield. These are also those that are considered as grower controllable. A significant reason for this distinction, i.e. potential yield versus actual yield factors, is that those determining actual yield are those that growers control and therefore are those of which effort is expended will bring about desired pay-off. Conversely other than recognising the limits of the yield potential factors, i.e., those not grower controllable, there is little pay-off in devoting effort on these factors other than to relocate a production operation.

It is difficult to single out any particular papers for special emphasis without neglecting others. All were valuable. Many of the speakers have articles in this edition of "Potato Australia".

Research/Adoption gap needs narrowing

As I sat and listened I thought about the gap between research and adoption by industry; between what I was hearing at this workshop and what is being applied. How many in the potato industry really knew what "international competitiveness" and "bench-marking" was all about? *(Refer feature box page 27)*

RICHARD WOOD
from New Zealand takes a keen interest in Tasmanian Russett Burbanks

While many industries in Australia, including the Potato industry, are being told that we need to become internationally competitive, like our neighbour New Zealand, many farmers in Australia believe that there is little more that they can achieve by way of improvements on their own farm. Others, particularly some industry leaders, are saying the opposite.

It is easy to understand both points of view - potato growers in Australia have been struggling through a most difficult period. They are more committed, harder working and believe they are more efficient than ever before.

But most farmers rarely have the opportunity, resources or commitment to travel to other districts or states to study new growing techniques. Visits to major marketing outlets are rare by most. Attendances at National Industry workshops, conferences or field days are also rare. The reaction to an invitation is often "Why bother - nothing there for me. Besides that, I can't afford it, and haven't the time."

Even though the workshop in Ulverstone was not designed for growers, a brief look at the program and papers soon indicates that there is considerable activity, a lot of unanswered questions and considerable room to examine and develop new technologies.

Research needs to be market driven

However as Craig Wilson, Chairman of the Potato Growers of Australia in his paper at the end of the Workshop said that there is a need for research to become more market driven.

"After two years of funding we are reaching the cross-roads in research and development. As long as the research is relevant and that it is done by the most appropriate person and the most appropriate location and that the cost/benefit be proven and promoted, R & D will receive a positive hearing.

The most critical issue is technology transfer/extension of research and development. Without it is a waste."

DENNIS CORSINI (L) of Idaho, sharing his findings with MILTON RODDA (R) of McCain Foods, Ballarat.

Craig said that the Research Staff have two options:

- To be pro-active in marketing research and development and the cost benefit issues that arise; or
- To be reactive or sit back and wait for industry to come to the research staff. He said "If you want the business of research, go out and see what the business wants."

Peter O'Brien, Regional Agronomy Manager for the Asian Pacific Region for Pepsico International, supported Craig and added that in the future there is a need to realise:

- Changes will be rapid and will need permanent emphasis.
- Researchers need to know their industry and have industry alliances.
- We have the talent to do research and development.
- We need "visionaries" to forecast the issues important to the industry.
- We need scouts to monitor crops.
- We need to remember that R & D is an investment that pays dividends.
- We need to be accountable.
- We need to realise that risks need to be taken.

Again Peter said that technology was a major concern. "Research'" to a grower is all risk. "There is no guarantee that he will get anything out of it."

Chris Rigney, Chairman of the Horticultural Research & Development Corporation, told the workshop that we are seeing a major cultural shift in research and development. He described it as being similar to turning an aircraft carrier around. "It may take a day to turn it around but once pointed in the right direction it will travel at 40 knots per hour for days."

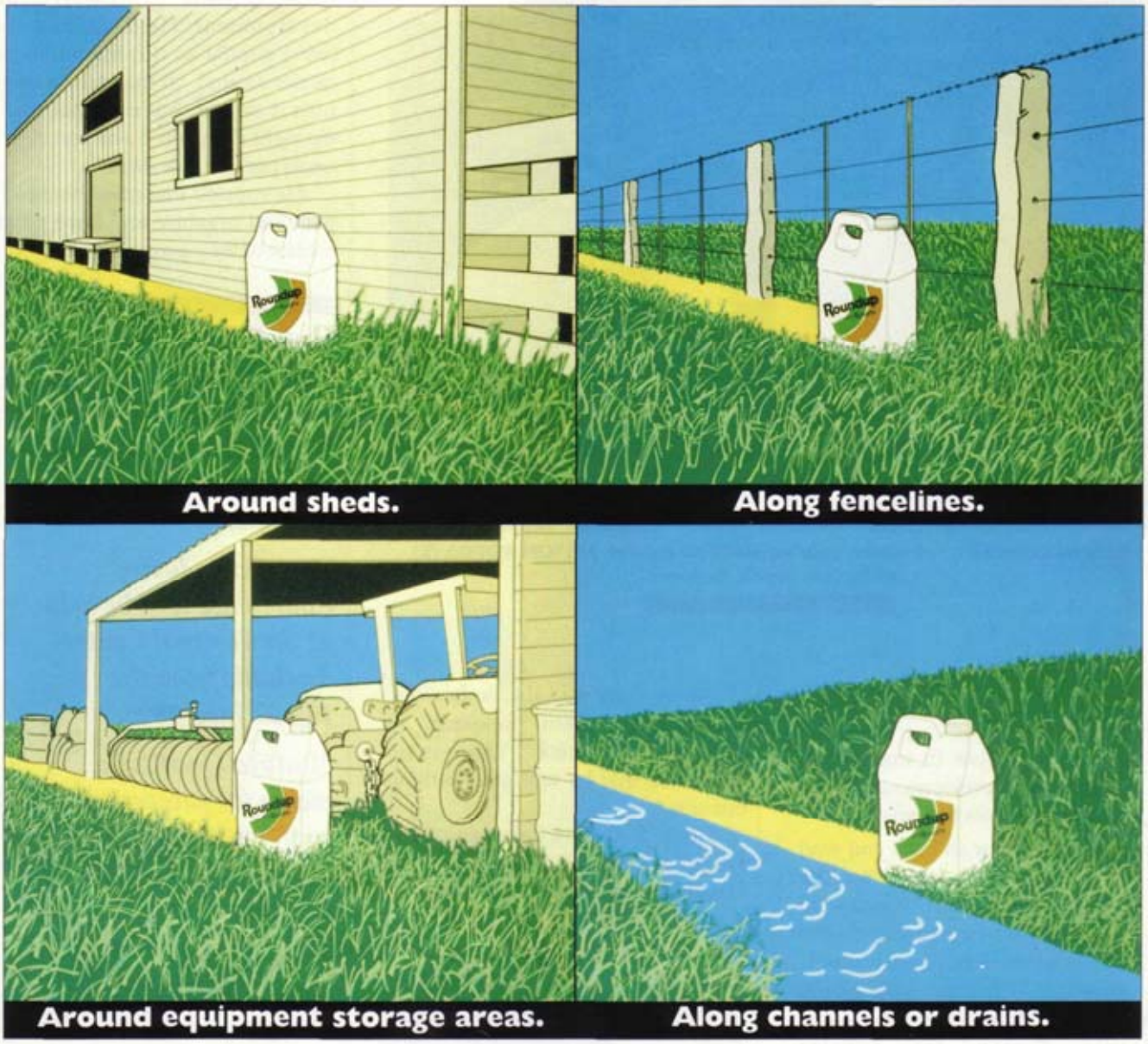
He stressed that scientists need to plan and organise and have greater control of their programs.

Overall the workshop was a great success. Copies of the papers are available from the D.P.I., Stoney Point Rise, Devonport, Tasmania.

The next Industry Conference will be held at the Festival Centre, Adelaide from the 18 - 22 July, 1993.

"Potato Quality, a recipe for success" is the conference theme.

PETER WATERHOUSE (L) and MICHAEL GRAHAM (R), CSIRO Canberra are working on genetic engineering of virus resistant potatoes. The work has resulted in the development of an efficient potation transformation system and the successful production and testing of transgenic potatoes resistant to PLRV.



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CLIFTON COURT SMYTH HON (A)

Bench-marking is a term often used but not always understood...

It is a technique that is used to analyse the performance data of an activity (such as business, enterprise or service). The purpose is to identify its strengths and weaknesses. It is then used as an input to the planning of improved performance in the future.

The technique is based on a comparison of data. The performance of an activity in one time period may be compared to:

- itself in a previous period;
- to a similar activity in the same area over the same period;
- to a similar activity in a different area; or
- to an apparently different activity that has similar performance characteristics.

Bench-marking is often used in a context of pursuing "international competitiveness". This identifies the "lowest cost" or "most efficient" practiced worldwide.

The data compared does not itself necessarily and directly identify the important strengths and weaknesses. The differences in compared data lead to questions such as "why the difference?" and "what might I do to move the difference in my favour?" This secondary analytical step is as important to the technique as the initial data itself.

The technique involves two (or more) sets of data. From the point of view of gaining benefit from the technique, four issues are all important:

(i) the numbers in each set of data must be reliable or accurate.

(ii) the performance measures that are the basis of comparison must be capable of leading you to an identification of the important strengths and weaknesses.

(iii) the analytical thinking that follows data tabulation ("why is this so?", "what can be done to make things better?") must be properly targeted.

(iv) the planning that is built on data analysis must also be effective in its implementation.

An example, in brief, is to look at the cost of producing french fries in Tasmania and New Zealand. In summary they are:

	Tasmania $A	New Zealand $A
VARIABLE COSTS:		
per ha	$4,319	$3,739
per tonne	$86	$74
FIXED COSTS:		
per ha	$2,827	$1,133
per tonne	$57	$23
TOTAL COSTS:		
per ha	$7,146	$4,872
per tonne	$143	$97

The biggest difference between Tasmania and New Zealand are the fixed costs of production. The important questions are why, where and what can be done to bring this in Tasmania's favour.

It appears the main reason for these differences are economies of scale. The average New Zealand producer grows 32 hectares annually compared to only 12 hectares in Tasmania.

Land in New Zealand was also half the value of Tasmania, while the cost of machinery in New Zealand (with no import duties and full GST rebate) was 20 per cent below Australian prices.

-(G. Bugge NSW Agriculture, Orange)

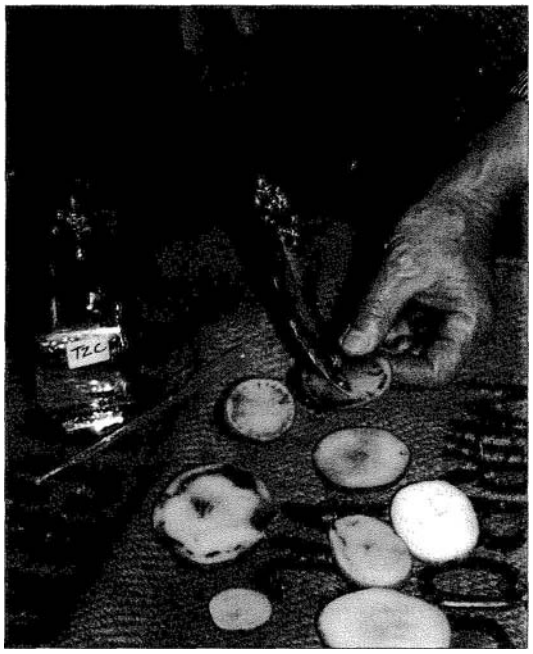
Quick field test for bacterial wilt in tubers

LEX DIATLOFF
is a Principal Plant Pathologist with the Queensland DPI Division of Plant Protection and is based at Indooroopilly.

The Problem

Bacterial wilt is easily spread from infected planting material during cutting. Periodically, there are outbreaks of wilt throughout Australia from various seed sources, both certified and non-certified. There can be heavy field losses, post-harvest spoilage and quality downgrading of potatoes destined for French fries and crisps.

There are no chemical controls. The use of certified, disease-free planting material is the main strategy. However, when seed crops are grown under cool temperature conditions, wilting of stems does not occur. The tubers can carry a latent infection of bacterial wilt without visible symptoms. Once an outbreak occurs on the farm, it is difficult to control and may put valuable land out of potato production for 2-4 years. Experiments were undertaken to develop a simple, quick on-farm test to detect *Pseudomonas solanacearum* bacteria in tubers.



ABOVE: Bacterial wilt infected tubers give a crimson coloration when tested with a tetrazolium solution.

BELOW: Unacceptable browning in crisps on frying of bacterial wilt affected tubers.

Results

The most successful rapid test for dectecting infected tubers was the tetrazolium test (TZC). A 1% tetra-zolium chloride solution was spotted onto freshly cut tubers and allowed to stand for 10-15 minutes. Infected tubers showed a bright crimson coloration of the vascular ring.

It was important to determine if any other potato disease or condition would interfere with the reaction. The Compendium of Potato Diseases lists four other causes of vascular browning similar to bacterial wilt. These include bacterial ring rot (not present in Australia), low temperature injury, *Fusarium* and *Verticillium* wilts, calcium deficiency and chemical injury (Hooker, 1981). As many of these as possible were cross-checked in a survey of five varieties from wilt infected crops in Queensland

The test worked well on both biovar 2 (upland wilt) and biovar 3 (lowland wilt). However, *Fusarium* wilt, leaf roll virus, frost and heat injury, and Reglone herbicide and fertiliser damage did not react to TZC. *Verticillium* wilt-infected tubers gave a pink coloration of the vascular tissue in 30% of the tubers tested. Slight reddish coloration of bruised tissue, and tubers stored at low temperatures of 5°C was also observed. Such tubers are known to darken on frying, as do wilt-infected tubers, so the test also proved useful in showing up sub-standard tubers destined for processing.

The test is simple to perform and easy to read. The highly contagious nature of the disease, and an absence of resistant cultivars, makes close management of new and infected crops important. Growers need to be able to recognise the disease readily, in boih planting material and in the growing crop, without resorting to diagnostic laboratories. This test should help in the early on-farm diagnosis of bacterial wilt:

The Test

1. Dissolve lg of triphenyl tetrazolium chloride in 100 mL of clean drinking water,

2. Agitate and let stand for five minutes before use.

3. Apply 2 drops of TZC solution to freshly cut potatoes and allow to stand for 10-15 minutes before viewing, and

4. A bright crimson coloration of the vascular strands indicates a bacterial wilt infected tuber. Light pink coloration is indicative of *Verticillium* infected tubers.

Integrated Pest Management in South Australia

PAMELA STRANGE
is a consultant with Scholefield Robinson Horticultural Services in Kingswood, South Australia

The crisping potato growers of South Australia have undertaken an integrated pest management (IPM) program for the past twelve months.

Growers are counting pests and finding that they do not have to spray because the population is not high enough to cause an economic loss.

The group initiated the program with the support of the Smiths Snackfood Company and the Horticultural Research and Development Corporation.

Chemicals are not a major input of crisping potato growing, but the growers say they need to be accountable to the consumer, the environment, their next-door neighbour and themselves.

Growers at a farm walk familiarise themselves with using a sweep net to catch insects in a potato crop

What is IPM

IPM is based upon five major management practices.

1. *Improving Crop Hygiene*
   Crop refuse should be properly disposed of and buried, volunteer potato plants removed and weeds around the farm cleaned up
2. *Preserving natural predators*
   Avoiding insecticidal applications, particularly in the early stages of the crop to enable the population of natural predators to build up is important. Natural predators include ladybird beetles, and hover flies that feed on aphids and wasps that parasitise the potato tuber grub.
3. *Pest monitoring*
   Effective pest monitoring requires regular crop inspections for pest damage and disease symptoms. Accurate records of the pest population in relation to the growth stage of the crop is essential.
4. *Using soft chemicals and better chemical usage*
   There is no such thing as a soft chemical in reality, but Endosulfan is heralded as less toxic to some of the beneficial insects. Soil applied granular systemic insecticides offer early protection and are a softer choice. Using the correct rates and using chemicals from different families, will help to avoid resistance build up.
5. *Improving spray management and chemical safety*
   Spraying with a well calibrated and maintained sprayer and replacing worn nozzles are essential. Handle and spray chemicals in a manner that is safe to the operator.

Major pests and diseases

The major pests and diseases of concern to the group were identified in a survey. The pests included aphids, red legged earth mite, potato tuber moth, rutherglen bug, leaf hoppers, eelworm and the white fringed weevil. The diseases included target spot, Rhizoctonia, powdery scab, late blight, seed decay and leaf roll virus.

Group activities

Growers in the group have attended a one-day technical seminar where they were briefed on pests, biological control, diseases and the environment, chemicals, nozzle

types and wear. During the growing season, growers have met in small groups to discuss practical issues and inspect farming operations. A spray record book has been developed to record details for each spray that goes on the potato crop.

Seed handling

Well treated seed can be the foundation to a clean crop. The first topic for a farm walk was seed handling and hygiene. Certified seed, gentle seed handling, cutting, disinfection of equipment, adequate ventilation around cut seed, dusting and planting were discussed before inspections of farmers establishments.

Pest monitoring

Pest trapping and counting is relatively new to potato growers. Sweep nets, water pan traps and pheromone lures were all introduced to the growers and used to catch insects in their crops. Leaf inspections are also important to observe insect populations. Accurate records are kept of the pest numbers in relation to the growth stage of the crop.

An insecticide is not applied until the pest population reaches an economic threshold where economic damage would be done if the pest was not controlled. Several growers based their pesticide application program on the pest monitoring information and did not have to use an insecticide all season.

In the past, these growers would have put some insecticide on just to be sure but by basing their decision on actual hard data, they saved themselves money, the worry and still had a perfectly acceptable potato crop.

Disease forecasting

Monitoring the weather conditions including temperature, rainfall, irrigation and humidity, can identify conditions conductive to the infection by either the target spot or late blight fungi. If growers were warned of such conditions, they could apply a protective fungicide early enough for good control at these potentially devastating diseases. Disease forecasting will be a major activity this coming season.

Integrated crop management

For the 1993-94 cropping season, the group has expanded from IPM to Integrated Crop Management (ICM) to encompass all aspects of crop production.

This includes:

- SOIL MANAGEMENT
- PLANT NUTRITION
- SEED HANDLING
- CROP HYGIENE
- WEED CONTROL
- PEST AND DISEASE MONITORING
- A BRUISE FREE HARVEST

Soil Insect Pests

DIGGING DEEP REVEALS SECRETS

The only effective way to sample soil insects and their damaging effects in potatoes is to get down to their level

JOHN MATTHIESSEN
is a Senior Research Scientist with CSIRO Division of Entomology in Perth

STEWART UARMONTH
is an Entomologist with the Western Australian Department of Agriculture in Manjimup

The soil-dwelling insects African black beetle and white fringed weevil are pests of potatoes, with a particularly big impact in Western Australia. Recent studies of the characteristics of the two species in potato crops are helping in the development of new strategies for managing a difficult problem.

African black beetle white fringed weevil are accidentally introduced insects that are pests of potatoes, and other crops in various regions of Australia and other parts of the world. They can also be pests of the pastures that are their usual habitat. All stages of African black beetle live in the soil, with the adult being most damaging. They attack stems, which can reduce yield, and feed on tubers, resulting in their rejection. In white fringed weevil, it is the feeding of the soil-dwelling larvae that causes rejection of tubers.

Wherever soil insects occur as agricultural pests, there are major difficulties for both farmers and entomologists in finding out the risk they pose to production, assessing the size of populations and accurately measuring the success of control methods. This is because the insects, and usually much of their damaging effects, are hidden within the soil.

In the past, residual chemical insecticides, such as dieldrin and heptachlor, were used as an effective control. Because of the realisation that such chemicals would not be available in the long term, the search had been on for more acceptable, but equally effective chemicals. Alternatives, the best of which was chlorpyrifos, unfortunately gave inconsistent control. The reasons for this were obscure. As is typical for work on soil insects, the assessment of control methods was made indirectly from product damage. Such evaluations do not, however, provide sufficient information to explain why an insecticide or application method fails to give consistent protection.

Distribution in the soil

It was the inconsistency in performance of chlorpyrifos, which has become the recommended non-residual insecticide, that was important to try to understand in the hope that it would lead to better use of it and similar alternatives. To do this, we devised a method for sampling in detail the soil insects and the effects they have on potatoes through the life of a potato crop. The aim was to obtain direct measures of the insect populations, the type and timing of the damage they cause and the effect of control methods. Sampling was carried out in both untreated potato crops and in ones using chlorpyrifos in the recommended way: 3 litres AI/ha incorporated with a rotary hoe pre-plant and 0.5 litres AI/ha at hilling-up.

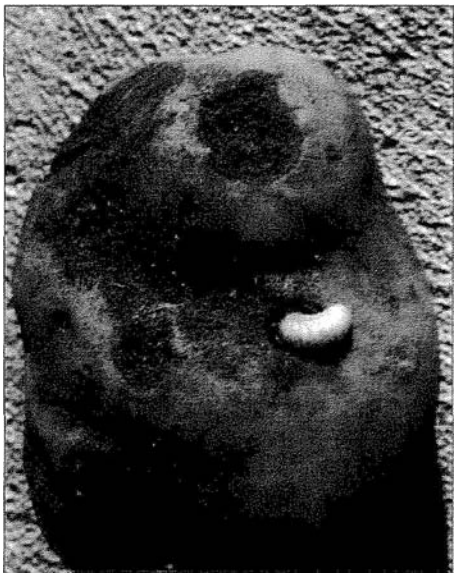
The results of the sampling programme, summarised in Table 1, show that application of insecticide was effective at reducing the number of African black beetle, and associated stem and tuber damage. It was less effective on white fringed weevil. This confirmed the earlier insecticide trial results where chlorpyrifos more consistently reduced losses from African black beetle than white fringed weevil.

TABLE 1: Total number of potato plant parts, soil insects and soil insect attacks in untreated and chlorpyrifos-treated potato crops.

	Untreated	Insecticide
STEMS		
No.	7,888	7,493
% attacked	23	7
TUBERS		
No. tubers	23,524	24,334
No. African black beetle	1,090	308
No. ABB attacks	1,912	856
No. White fringed weevil	912	739
No. WFW attacks	1,910	1,337

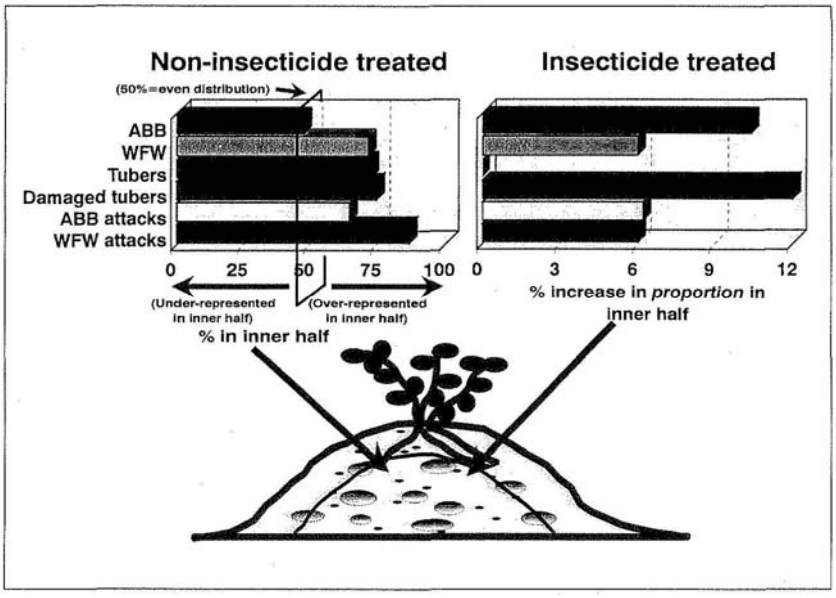
The percentage of the tubers, insects and damage that occurred in the inner and outer halves of the potato hill are shown in Fig. 1. If the insects, plant parts or damage records were distributed uniformly in the soil, then 50% would occur in each of the two sections. Results from the untreated crops (Fig. 1) show that almost everything measured was over-presented in the inner half. The only exception was African black beetle, slightly more occurring in the outer half of the soil profile. While the distribution of damaged tubers matched the general distribution of tubers, the percentage of both insects' attacks was greater in the inner half than the percentage of the insects that occurred there (Fig. 1). It appears that both species cause more multiple attacks in the inner parts of the potato hills.

Although there were generally fewer insects and less damage in the chlorpyrifos-treated crops, it was found that the *proportion* of insects and damage that occurred in the inner half of the soil profile with insecticide treatment actually increased over what it had been without any insecticide. This suggested that more of the insects were killed in the outer half, or even perhaps that there was movement of some insects deeper into the soil in response to the insecticide. Whatever the cause, the more desirable effect would have been to obtain the greatest control of insects in the inner half, because that is where almost three quarters of tubers occur (Fig. 1).



Whitefringed weevil larva attacking potato tuber.

FIGURE 1: The distribution of soil insects, tubers and insect damage in potato hills not treated with insecticide. (If they were evenly distributed between the inner and outer halves of the hill, then each bar would reach 50%). Also shown is the percentage increase in the proportion of each character measured in the inner half of the hill in crops treated with insecticide, compared with their distribution in untreated crops. This reflects the greater effect of the insecticide on insects and their associated damage in the outer half of the hill.



Impact in crops

Besides the general distribution patterns, sampling each crop at intervals revealed changes in insect populations and damage to tubers during crop growth. In all crops, the soil insects began to damage tubers when they formed, and the percentage damaged increased steadily as crop growth continued.

African black beetle density in winter-sown crops was consistently low, whereas summer-grown crops showed either of two patterns. Sometimes the African black beetle population was high to begin and caused extreme stem damage and death of plants, resulting in a severe reduction in yield. In other cases, the initial population was low, but increased gradually as the crop grew. These population increases were the result of adult beetles flying into crops during the late summer/early autumn. Importantly, this pattern also occurred in insecticide-treated crops that may have had an initially high population reduced by the spray treatment. Consequently, while the insecticide treatment reduced the level of tuber damage by African black beetle in summer crops, they all showed an increasing percentage of tubers damaged with time.

In none of the instances studied was there a massive invasion of beetles in single events. Immigration took the form of a slow, and only slight buildup of beetles, with their density in crops remaining less than much of the surrounding dry pasture where African black beetle is widespread. While it is fortunate that lush irrigated potato crops do not appear to attract beetles as it was once thought might be the case, these low numbers caused substantial damage. Winter crops remained generally well-protected by the insecticide treatment as few, if any, African black beetles migrated into the crops during their growth. Most likely cold winter weather prevented flight activity.

White fringed weevil larvae are mainly a problem in spring-sown crops. Although white fringed weevil lays its eggs early in the year, spring is the time when the larvae grow to sizes that are easily visible with the naked eye. This coincides with the period of potato crop growth. As with African black beetle, the density of white fringed weevil in potato crops is generally very low compared to that in pastures where they breed, but severe damage to tubers can still result. Damage to tubers by white fringed weevil began slowly, but speeded up as larvae grew faster in the hotter summer weather because larger larvae cause greater damage.

Irrespective of whether the population density of the two soil insects increased during crop growth, the evidence gathered indicated that, on average, individual insects damage several tubers. When the average insect damage was looked at on a seasonal basis, a surprising result emerged. While each insect in spring and summer crops damaged on average about two tubers by the end of crop growth, each African black beetle in winter crops accounted for damage to about ten tubers. Most of this damage occurred late in the growth of the group, suggesting an association between feeding and increasing activity of the resident beetles as they commence breeding in the spring - probably attacking tubers as they move around in search of mates. Because of this heavy impact of individual African black beetle in winter crops, a high level of tuber rejection can occur when the insect population is very small.

The location of attacks on individual tubers by African black beetle and white fringed weevil is given in Table 2. The top was the least commonly attached part of the tuber by both species, while white fringed weevil showed a stronger tendency than African black beetle to concentrate attacks on the underside of tubers. It would appear that white fringed weevil larvae are either moving upwards from deeper in the soil or are behaving in a shelter-seeking way.

TABLE 2: The percentage of soil insect attacks on the top, sidles and bottom of tubers.

	% top	% sides	% bottom
African black beetle	23	40	37
White fringed weevil	10	30	60

Conclusions

This is an overview of a detailed programme of sampling for soil insects and their effects in the three main seasonal potato cropping periods of the major producing regions in Western Australia. An obvious conclusion is that rotary hoe-incorporated chlorpyrifos is less effective in the deeper parts of the soil profile. Since this is the zone where most tubers occur, it is important to consider methods that would place the insecticide deeply. Some growers are already using blade plough-style applicators and we have carried out trials to develop methods for injecting insecticide deeper into the soil at planting. Both methods show some promise in increasing the performance of insecticides against soil insects. Some growers are also using metham sodium soil fumigant for white fringed weevil control. This seems generally effective, but it is an expensive option and must be correctly applied.

Close-up of African black beetle damage to stems of potato plant

The greatest problem with both African black beetle and white fringed weevil is that they are highly damaging at very low densities, a characteristic that was especially evident with African black beetle in winter crops. This places enormous demands on control methods to be very effective, yet remain within the bounds of environmental and economic acceptability. While current commercial control relies on soil-incorporated insecticides, we are seeking ways to use them sparingly and efficiently, and to augment control through other approaches to reducing pest abundance such as disinfestation of pasture before cropping potatoes using chemical, cultural and biological methods.

This work is part of a joint Western Australian Department of Agriculture/CSIRO Division of Entomology research programme on soil insect pests of potatoes, with financial support from the Potato Growing Industry Trust Fund of Western Australia and the Horticultural Research and Development Corporation.

The severe damage to potato stems by African black beetle that can occur in crops where no control measures are used (left), compared to successful insecticidal control (right)

New technology for handling assessment

GRAEME THOMSON (Scientist), DANNY COTTER (Engineer), and PAUL DALY (Technical Assistant) are based at the Institute for Horticultural Development, Knoxfield, Department of Agriculture, Victoria.

FIGURE 1: Instrumented sphere, often called a pseudo-fruit/vegetable, is proving to be a useful tool in identifying handling problems.

Large losses in the potato industry are occurring due to physical damage during harvest, transport and associated handling. Although estimated at around 30 percent, there is little information to indicate how and where damage is occurring.

The technology now exists which can accurately determine the key factors necessary to minimise damage.

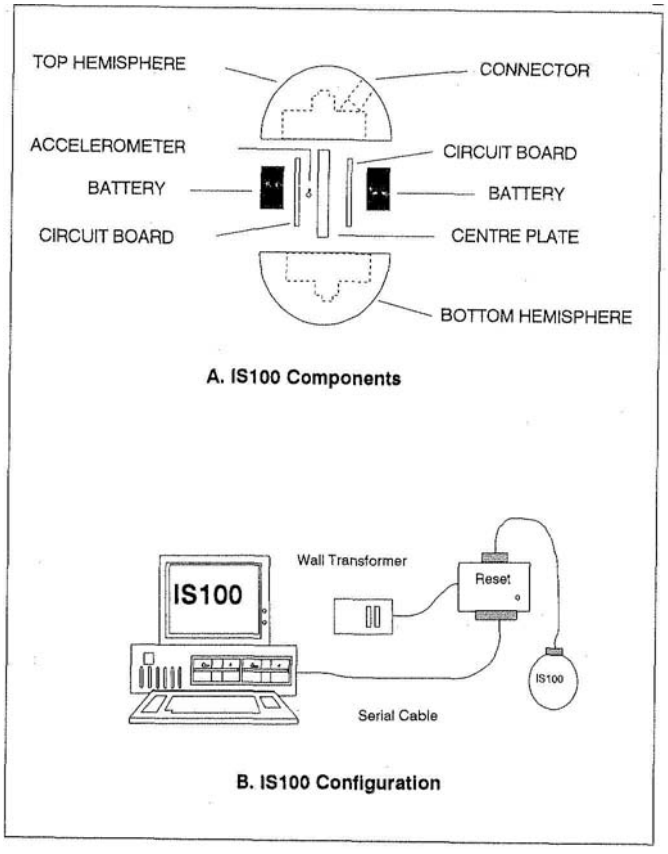
Instrumented sphere (IS) technology was developed in Michigan, USA in 1989 and, since that time, has proved to be a useful tool for identifying handling problems of apples, peaches, onions and similar crops. The sphere itself is 90 mm in diameter, and is sometimes described as a "pseudo-fruit/ vegetable" (Fig. 1). It consists of an accelerometer, microprocessing unit, memory and rechargeable battery, all of which are enclosed in a beeswax shell (Fig. 2A).

Assessment involves passing the IS with potatoes through the normal handling procedure (such as harvest or grading) and video-filming its progress. After the IS is operated, accumulated data is loaded into a computer for analysis (Fig. 2B). Communication between the computer and IS is through a miniature plug.

By co-ordinating the sphere's internal timing mechanism with the camera's stopwatch, it is usually possible on replay of the footage to determine where a particular impact has occurred.

When the IS strikes another object during a fall or collison, there is a change in its acceleration which is

FIGURE 2: INSTRUMENTED SPHERE 100



registered by the accelerometer, and then sent to memory. The sphere's analysis software gives the peak impact acceleration (measured in G's) and velocity change for each recorded impact.

The instrumented sphere has been used over the past year to assess potato handling equipment in Victoria's main production areas, and also Finley (NSW) and Manjimup (WA).

A range of harvester models and designs has been investigated, but web to elevator transfers, and drops into hoppers were identified as high impact locations common to most equipment. The next stage of the potato handling chain was also assessed using the IS. Filling of half tonne field bins was potentially a more damaging process than loading bulk trailers. More impacts were recorded into bins and they were larger in magnitude. Loading trucks for bulk transport of processing potatoes is typically achieved either with conveyors/elevators or by bin tipping. Compared to conveyors /elevators, bin tipping was found to result in fewer impact numbers but larger impact sizes.

While the IS is ideally suited to measurement of short, sudden "shock type" impacts, it has not been designed to effectively record the types of vibrational and compressive forces that occur during transport. To assess the transport component of potato handling, the research team will use sampling procedures in conjunction with a second piece of equipment called an environmental data recorder (or EDR) which collects and stores a vibratory acceleration profile for journeys.

Grading line assessment using the sphere revealed that longer lines caused more impacts, but every line examined so far has caused at least one large impact greater than 100G. On most lines, the drops of sizers and transfers into bags/bins registered large impacts.

The next stage in the research program involves the correlation of impact levels registered by the IS to parameters of real potato damage. For example, it would be valuable to know what height of drop and associated G levels caused blackspot or shatter bruising of known dimensions. These sorts of tests are undertaken in the laboratory using a pendulum impact rig and take into account factors like tuber variety, specific gravity, size and temperature. Once this information is generate, and the damage potential of impacts recorded by the IS is known, it will be possible to develop systems for regulating handling procedures so that quality loss brought about by poor handling is minimised.

Need for new peak national horticultural body

The need for a strong, professionally resourced, national horticultural industry peak body was unanimously agreed upon at a meeting of horticultural industry leaders in mid June.

The meeting was organised by the Horticultural Policy Council (HPC) in response to the recommendation of its report *The Way Forward: Future Directions for Horticulture.*

Mr John Pendrigh, Chairman of HPC, said that horticulture was worth almost $4.5 billion, making it the third most important agricultural industry in Australia.

'It is the industry with the greatest future potential in agriculture', Mr Pendrigh said.

'Horticulture covers a vast variety of products, including fresh and processed fruit and vegetables, nuts, ornamental and nursery products. Unfortunately it is hampered by fragmentation, geographical dispersion and a lack of strong industry organisations.'

He cited as an example the fact that at the local, regional, state and national levels, horticulture was represented by more than 350 industry groups.

'If horticulture is to achieve its potential, an increased national focus, greater rationalisation and improved coordination of activities are essential', Mr Pendrigh said.

The meeting elected a working group to develop the concept further and to decide on ways and means to implement the decision.

Mr Pendrigh announced that the HPC will provide the necessary resources to ensure the successful conclusion of the working group's deliberations.

'I expect that the first report of the working group will be available for distribution to members of today's meeting for their further input within the next two months', Mr Pendrigh said.

The outcome of the meeting indicates the very strong resolve of horticultural producer leaders to organise their industry. Such a national peak industry body should project the mportance of horticulture to the Australian economy and provide the mechanism necessary to achieve the enormous potential which was identified in *Future Directions.*

ATTENTION GROWERS...

Waste Potato Survey

What are you doing with your waste potatoes and more importantly what are they costing you? Help us, to help you, determine the size and cost of the potato waste problem to your industry. Your assistance is needed to obtain a reliable estimate of the potato waste problem. Take part in a national mail survey of all potato growers during August, asking for details about waste potatoes.

The main sources of potato waste are: unmarketable tubers due to defects or oversupply and waste from potato processing.

To find solutions to the problem of potato waste the potato industry needs to know: how much there is, the form its in and its cost. This information is being gathered as part of a HRDC project being undertaken by the National Potato Improvement Centre, Toolangi, Victoria.

We need your response to make this survey a reliable measure of potato waste for your industry.

Have You Heard?

□ Digging one frosty morning my husband was fascinated with one of our female pickers. She had arrived in a jean jacket and long trousers. As he dug past he noticed her removing her sleeves by unzipping each at the shoulder. Next he noted her doing the same with each leg of her trousers. He wondered what could happen later, but as the wind cooled, never found out.

□ During World War 2, a bright young farmer serving overseas received a letter from his wife. She gave him some general news and concluded with what she called an urgent request for information. How was she going to plant the potatoes in "the big paddock" without help? .....He wrote a reply, "Don't, whatever you do, DON'T dig up the big paddock. That's where the guns are buried." ..... As the young farmer was well aware, all outgoing mail was subject to scrutiny by the Army censors. It wasn't long before he had another letter from his excited wife saying, "A lot of soldiers came and swarmed all over the big paddock and dug it all up. What shall I do? ..... He wrote back, "PLANT POTATOES"!

Farmers can profit from TWO STAGE HARVESTING

The need to maintain and improve potato quality is at the heart of the two stage system. The crop is lifted and placed in a windrow. Then, after it has dried, it is harvested using a conventional harvester.

The gentle digging action, followed by immediate drying in the field with an increase in tuber temperature, results in less damage and better storage properties.

Two stage harvesting enables farmers to profit in a number of ways:

- Less discolouration and less danger of infection.
- A dried skin helps prevent damage during subsequent handling.
- Dried soil will be more easily sieved after lifting by the harvester.
- There is less danger of compaction damage in the soil.
- There is less risk of deterioration in storage.

With less need for artificial drying in storage and less requirement to wash the crop, there will be considerable savings in energy and labour costs.

As consumer demand for better quality potatoes increases, the many advantages of two stage harvesting will be accentuated.

TATO TALK

with Barbara Carter...

BAKED POTATOES MAKE AN ATTRACTIVE MAIN COURSE...

Scrub, pierce and place in a hot oven for 1 to 1-1/2 hours, or until crisp and the inside tender. Cut in half, cut an "X" across the top and fill generously with one of these scrumptious toppings:

Bacon and Onion

125g chopped shallots; 200g cream cheese; 500g bacon, grilled and diced; 1 teaspoon lemon juice; 3 tablespoons cream; 3 tablespoons grated cheese; Salt and pepper.

Mix all ingredients with scooped out and mashed potato. Pile back into the potato shells and heat for 10 minutes. This mixture fills two large potatoes and it can also be used over split potato.

Quick Mexican

1 small tin Chilli Con Carne; 1 small tin Hot Refried Beans; 4 tablespoons grated Parmesan cheese

Heat Chilli Con Carne and Refried Beans. Pour over split potato. Sprinkle with cheese, then brown under the grill. Fills two large potatoes - delicious

Bachelor's Delight

2 cups left-over cooked mince; 1 cup coleslaw; 2 tablespoons sour cream; 2 tablespoons chopped chives

Heat mince, spoon over hot halved potato. Add coleslaw, sour cream and chives - yum!

Spud Trivia:

McDonald's uses Australian primary produce supplied by businesses such as Edgell-Birds Eye, FJ Walker Foods, Buttercup, Kraft Foods, Ingham and McCormicks.

The amount of produce used by McDonald's in 1992 is summarised below:

Buns	200 million
POTATOES	**41 million kg**
Eggs	17 million
Milk	13 million ltrs
Beef	12 million kg
Orange Juice	5 million ltrs
Chicken	4 million kg
Lettuce	3 million kg
Tomatoes	570,000 kg

YOU SAY...WE PAY!

We would like you to send us favourite menus, a short quip or comments on the lighter side of growing, harvesting or grading potatoes. If your item is accepted and published, you will receive $25.

To arouse discussion, my "mere male" prefers women to grade his potatoes... They have a keen eye, are nibble fingered and are meticulous at their job!

Following the feature about the Riverina District in last year's issue of Potato Australia, this edition looks at the Atherton Tableland of Far North Queensland.

The Atherton Tableland

JOHN KILPATRICK
is a Senior District Adviser with the Department of Primary Industries at Kairi, Queensland.

The potato growing areas of the tropical Atherton Tableland are situated between the 17°S and 17° 45'S parallels, and the 145° 15'E and 145° 45'E meridians.

They *are* between 50-90 km south-west of Cairns, which is on the north-east Queensland coast about 1,800 km north of Brisbane.

Other parts of the world at similar distances from the equator include Jamaica and the Hawaiian Islands in the northern hemisphere, and Zimbabwe and Northern Madagascar in the south.

A brief history

Small areas of potatoes were grown in the Atherton Tableland district prior to WW II. However, it was not until 1949 that any attempt was made to organise a local industry, and six growers banded together to pool ideas. At this time potatoes were controlled by the Queensland Potato Marketing Board. This Board folded up in 1952.

Until 1963, an increasing number of growers managed to sell what was produced on the local market. They used the services of a broker in Cairns. However, in 1963 it was obvious that the steady increase of growers was going to oversupply the local demand and wider markets were going to have to be sought.

In November, 1963, the Atherton Tableland Potato Growers' Co-operative Association Limited was registered. It had an initial membership of 30 growers. In the first year of operation, approximately 3,000 tons of potatoes were sold.

Almost thirty years later, this co-operative is still trading but, with a total district planting of up to 600 hectares, there are two other major selling outlets now established. Currently, the number of growers is about 70.

The average farm size is about 80 hectares. The average annual potato crop is then eight hectares per farm. During 1992, some farms planted only four hectares of potatoes, with two or three of the largest producers planting up to 40 hectares for the year.

Climate

The climate of the Atherton Tableland is typically tropical, with well-defined wet and dry seasons. Approximately 75% of the total rainfall is between the end of November and the beginning of April. Table 1 gives more details.

Potato growing districts

The Atherton Tableland can be divided into three main potato growing areas. These are defined by differences in topography, altitude and climate. There are also some slight differences in soil type, but all areas have deep and free-draining red to brown basalt soils.

Table 1 lists the variations between the three districts.

Production periods

Even though it is possible to find potatoes growing at any time of the year on the Atherton Tableland, the major plantings are made with the aim of a spring harvest. Plantings take place during the April to August period, with harvesting being at its peak during August, September and October.

During this main harvest period, the Queensland market north of Rockhampton is supplied, with the majority of the crop going all the way to Sydney. (The 1991 census counted 538,080 people in Queensland, north of Rockhampton, but this is not many when compared to 3,538,970 in the Sydney statistical area.)

Varieties

Over the years that the Tableland industry has evolved, many "new" varieties have been grown as a possible replacement for Sebago but, do date, nothing has managed to topple the "old reliable" from its most favoured position.

Many varieties have outyielded Sebago, and many have not suffered the seedpiece decay and other diseases that are a constant Sebago problem. However, market preference for Sebago has dictated that a new number one variety is yet to be found and established.

The most recent contender was the Victorian bred variety Winlock.

This consistently outyielded Sebago in all Tableland potato growing areas, but a skin that soon lost "fresh market bloom", and an occasional problem with some internal brown fleck has caused a rapid loss of the initial commercial appeal.

Currently, the only other varieties grown are about 55 hectares of Atlantic, grown on a crisping contract by four growers, and a developing move towards small areas of Pontiacs, with the aim of filling an apparent gap in the high quality, washed and pre-packed market. If we do not include the contracted Atlantics then over 90% of total Tableland plantings for 1993 will be the Sebago variety.

General agronomy

Nearly the whole of the Tableland potato crop is grown from certified seed brought north from Victoria and NSW. A small summer planting of once-off certified seed is the only exception. Most of this is planted on the Upper Tableland in the cooler climate. (Summer potatoes are not an option in the Lower and Middle Tableland areas. The hot and wet conditions make it a very risky proposal.)

Seed is usually cut no more than a couple of days before planting. Some is cut just hours prior to planting. The combination of the Sebago variety variable cutting and planting conditions, and the lack of a reliable chemical to combat seed decay has prompted a move towards whole, round seed. An increasing number of growers is prepared to pay the premium price that is asked. Hopefully, the use of whole, round seed will continue to increase with a corresponding decrease in crop establishment problems.

The Tableland soils require heavy applications of fertiliser to produce profitable crops. The soils are hungry for phosphorus, and nitrogen is always needed due to heavy losses in the tropical climate. Potatoes also respond to added potassium.

Most fertiliser is applied as a band at planting, with additional side-dressings of nitrogen within three weeks of emergence. Except for some phosphorus, farmer experience with pre-plant broadcasting and incorporation of fertiliser has proved inferior to banding.

Rows are 92 cm apart. This is the same as the major summer cash crops, maize and peanuts.

Pest control

Insects, diseases and weeds just love the Atherton Tableland climate. There is a constant, heavy pest pressure. Potato crops are sprayed up to 15 times, depending on the conditions. Very few are sprayed less than 10 times.

The major insects are the potato tuber moth and aphids. Some problems are also caused by the white fringed weevil larvae.

The main disease is target spot, with seedpiece decay, sclerotinia, blackleg and rhizoctonia also causing significant problems at

TABLE 1: Differences between the three potato growing districts on the Atherton Tableland.

	(1) Lower Tableland		(1) Mid Tableland		(1) Upper Tableland	
AREAS INCLUDED	North of the Tolga to Kairi Road. Includes Willows Road., Northey Road, Rockey Creek and Walkamin.		South of the Tolga from Kairi Road. Includes Upper Barron, East Barron, Picnic Crossing, Atherton & Yungaburra.		South-west Tableland. Includes Ravenshoe, Tumoulin, Kaban and Evelyn.	
ELEVATION	650m to 720m		720m to 800m		900m to 1050m	
TOPOGRAPHY	Slight slopes (0-3%)		Slight to moderate slopes (0-8%)		Moderate to steep slopes (3-20%)	
FROSTS	Unlikely		Possible		Probable	
SOILS	Euchrozem/Krasnozem forest basalts (Soils that supported open eucalypt forest).		Krasnozen Scrub basalts (Soils that supported tropical rain forest).		Krasnozen. Both forest and scrub soils.	
IRRIGATION SOURCE	Permanent creeks, bores, Tinaroo Irrigation Scheme.		Permanent creeks, bores.		Mainly creeks, not all permanent. Some dams in west.	
FARMING PRACTICES	Mainly cropping. Very little grazing. Maize, peanut and potato rotations. Some vegetables and pasture seeds and hay.		Mixed farming. Mainly pastures with dairying and beef to the south. Some peanuts and maize to the north.		Pasture-potato rotation. Little maize or peanuts except for Kaban. Beef on the pastures.	
RAINFALL (mm)	900		1030		890	
Wet season (Dec-Mar)	270		400		340	
Dry season (Apr-Nov)	1170		1430		1230	
Total						
AV MONTHLY TEMP	Max°C	Min°C	Max°C	Min°C	Max°C	Min°C
Jan (warmest)	29.0	19.5	28.0	19.0	28.0	18.0
July (coolest)	22.0	11.5	21.0	10.5	21.0	9.0

Centre pivot irrigation systems are slowly increasing in number on the Atherton Tableland. This unit is working on Graham Jonssons Farm, at Evelyn, on the upper Tableland.

The potatoes shown are the Winlock variety, growing in the first few days of October.

Nearly the whole of the Atherton potato crop is graded on the harvester and bagged into 50kg sacks. These are placed on pallets, onto semis, and onto market on the same day if possible. This two row machine is harvesting table potatoes at Serra Brothers Farm, Tolga.

Because of very heavy insect and disease pressure, potatoes grown in the tropics need an expensive control programme. Most Tableland crops are sprayed at least ten times during the season.

On the Knowles Family Farm at East Barron, in the middle Tableland, this crop of sebago potatoes is growing from whole small Victorian certified seed.

The "Seven Sisters" in the background are a constant reminder of the volcanic origins of the Atherton Tableland.

various times. Leaf roll virus and other roll syndromes can cause very expensive losses.

At times, weed control is difficult. Both herbicides and mechanical cultivation are used but, if potatoes are grown in a continuous cropping rotation as is usual in the Lower Tableland, then late weeds can cause some harvesting difficulties.

Chemicals are applied by boom, or from the air. Most crops are sprayed by boom until the tractor wheels cause plant damage problems, and the plane takes over from there.

Crop protection is responsible for over 20% of the total growing costs of Tableland potatoes.

Irrigation

All Tableland potatoes are irrigated. Some crops, especially in the northern "Lower Tableland" area, can go from planting to harvest without receiving any useful rain.

Farmers are recognising the importance of correct irrigation. Scheduling is on the increase, and the results are promising.

A few years ago, there was a tendency to overwater, during early crop growth and underwater, during the periods of peak water use as maximum tuber bulking was taking place.

It is possible to have wateruse of over 8 ml/day during certain weather conditions at full crop canopy. Careful water management is essential.

Future

The cost of potato growing on the Atherton Tableland is higher than in any other established potato district in Australia.

Freight charges for seed, fertiliser and chemicals are an additional expense, and the cost of getting the potatoes down to southern markets increasing. As a result, only top quality potatoes that can attract a fair premium on the fresh market will provide a possible profitable return.

The other alternative is to try and increase the contract plantings. Some initial export contracts to SE Asia are being investigated and supplied, with the possibility of increased orders in the near future if all goes well.

The Atherton Tableland has all the necessary inputs to produce excellent potatoes. There are good farmers with years of experience in the business. However, it is only particular care in maintaining and improving quality, coupled with a strong marketing policy, that will see the district continue to look up on potatoes as a significant part of the cropping scene. Unfortunately, there are no alternative crops, either at the moment or in the foreseeable future. The "tyranny of distance" is a difficult handicap to carry.

STATE ROUNDUP

Queensland

JOHN KERR
is a Senior District Adviser at Gatton with the Queensland Department of Primary Industries.

Prices were generally higher for Ware potatoes produced from the 1992 winter crop.

However, the anticipated area of potatoes to be planted in Queensland for the 1993 winter crop is now expected to be down by 20% on the previous five year average with a similar fall in the number of growers.

This will occur in the traditional growing areas of SE Queensland, due to disillusionment in the future prospects of the industry, further emphasised this year by water quantity and quality problems. Small increases in area have occurred on the Darling Downs and Central coast, with North Queensland and South coast areas not expected to change.

On the Atherton Tableland, yields and quantity of the 1992 crop were satisfactory, but the high production costs and significant freight component made margins unsatisfactory. Attempts to find contracted markets in preference to the unpredictable and widely fluctuating fresh market are being made. Initially, a contract with a Malaysian crisps manufacturer has been made for regular shipments of suitable potatoes to Singapore. Potatoes are still the major winter irrigated crop on the Atherton Tableland red soils, with Sebago the main variety (80% in 1993). Winlock has lost ground, due to market resistance, small size and fleck. Pontiacs are now being grown for the washed and pre-pack market and Atlantic grown for crisping contracts.

Yields (20-30 t/ha), and quality from the 1992 Lockyer crop which was grown in dry conditions, were average with some heavy frosts and wind damage reducing yield potential. February, 1993 planted crops now in the ground are under stress, due to windy conditions, falling water supplies and poor quality will seriously reduce yields in the main growing areas. Purple top wilt, which is always a problem in dry seasons, is again prevalent in most Lockyer Valley crops. Few early winter plantings will be made in the Lockyer Valley this year, due to lack of irrigation water.

The need for a better red skin potato for the washed trade is due to the poor skin colour from early planted Pontiacs. Growers have been using Red la Soda, Desiree and Bison as alternatives ,with only limited success.

Processing

At least 20,000 tonnes of potatoes, mainly Atlantics, are now supplied to processors for crisping, with at least another 7,000 tonnes, mainly Segago, sold for mostly French fries.

The need for year round supply has resulted in the development and extension of new production areas in Queensland, with less emphasis on supplies from the Lockyer Valley. Atlantic is the only suitable variety to date, but varietal testing of a range of new material is under way to develop a variety with short-term storage potential and resistance to bruising.

Tasmania

BRUCE BEATTIE
is the Potato Specialist (Vegetable and Allied Crops Branch) with the Department of Primary Industry & Fisheries in Tasmania.

Every season has its problem and 1991-92 was no exception

The 1991-92 season showed a small increase in tonnage harvested in Tasmania, almost 250,000 tonnes with an overall average of 41.8 t/ha.

Both processing companies operated a bruise-free program, which resulted in a general improvement in quality. The most disheartening aspect of the season was the wet conditions during April, which continued throughout the remainder of the season. Scheduling intake became very difficult at times, and, to cap this, a period of low temperature resulted in high sugars. For some growers in cooler districts, this meant rejection of loads. The continue damp conditions also disrupted planting for the 1992-93 season.

The further discovery of Potato Cyst Nematode in Victoria prompted the first local survey for this pest. So far, over 20% of the crop, which included all seed crops, were fork or soil tested - no cysts were detected. This program will be continued in the coming season.

Following the takeover of Edgell- BirdsEye by Pacific Dunlop, many changes have occurred at the Ulverstone plant. Rebuilding of the processing line was commenced and, at the end of the last processing season, further rebuilding took place in preparation for a late start to the 1992-93 season. About $26 million was to be spent in the upgrade.

These changes and the constant threat of imports, the continual media talk of becoming "internationally competitive" and the adoption of "world's best practices" continues to put pressure on growers and processors as we move towards the year 2,000.

New South Wales

STEPHEN WADE
is the District Horticulturist at Finley with NSW Agriculture

The 1992-93 season was another very difficult year for NSW growers.

Despite a drop in areas, the fresh market remained oversupplied for most of the year. There was a small increase in processing production, while seed growing areas remained stable. Returns for the fresh market remained poor, with prices often falling below growers' costs of production.

New South Wales grows 11% of the Australian potato crop. About 128,000 tonnes of potatoes were produced from 6,640 hectares in 1992-93.

Potato production in New South Wales is located in three main areas: the Riverina, the Tablelands and the Coast. Fresh and processing production occurs in all areas, while certified seed production is confined to the higher elevation Tableland districts.

Fresh Market

Planting of the spring crop was delayed by rain and late frosts. Spring crop areas in the Riverina, lower Tablelands and the Coast were the same as 1991. Crop yields were down, due to cool weather. Prices dropped from $220/tonne (in bulk, on farm) in December to $80/tonne over January.

Summer crop areas in the higher Tablelands were the same as last year. An excellent start to the season was followed by a dry finish. Disease and pest incidence was low. Crop yields ranged from 27 tonnes/hectare at Guyra to 45 tonnes/hectare in the Crookwell district.

Autumn crop areas in the Riverina, lower Tablelands and the Coast have dropped by 260 hectares this year. Growing conditions have been very dry. Some crops had to be replanted in the Riverina, due to breakdown losses. Only average autumn crop yields are expected, due to late planting, cooler temperatures and early frosts.

Processing

About 22,000 tonnes of potatoes were supplied to Frito-Lay, Smiths Snackfood Company and Kettle Fry for crisp production. Contract prices ranged from $205-$220/tonne. Processors increased bonuses for tuber size in the 1992-93 contracts.

Around 6,000 tonnes of potatoes were delivered to McCains for French fry production. Contract prices ranged from $198-$233/tonne. These prices were $20/tonne lower on the 1991-92 contract prices.

Seed

Certified seed sales continued to be slow. 224 hectares of certified seed was planted in 1992-93. The 1993 Crookwell certified seed price for Sebago potatoes was $340/tonne, a drop of $20/tonne on the 1992 price.

Victoria

KEITH BLACKMORE
is a Senior Certification Officer at the Institute for Horticultural Development, Toolangi with the Department of Agriculture, Victoria.

Despite several difficult years, overall production has been maintained at about 375,000 tonnes, which includes a certified seed production of about 30,000 tonnes in the 1991-92 season.

Certified Seed Production

The last few years has seen a number of improvements to the Victorian Certified Seed Potato Scheme. They include:

(i) Formal accreditation has enabled production of mini tubers from tested stocks in private laboratories. The accreditation program specifies minimum standards for facilities and procedures for producing mini tubers. The introduction of additional laboratores has enabled larger quantities of mini tubers to be produced at more competitive prices. This "fast tracking" of mini tuber production will rapidly multiply new varieties and prevent shortfalls in foundation seed, and will result in more early generation stock being sold as certified seed.

(ii) A computer program has been developed to improve the efficiency of administering the seed scheme which has 140 growers, five classes of seed and about 50 varieties. This program is available to other seed schemes.

(iii) A Quality Assurance (QA) program has been developed. Growers who join the QA program still have their crops field inspected by the Department of Agriculture, but undertake full responsibility for all other aspects of quality of their product.

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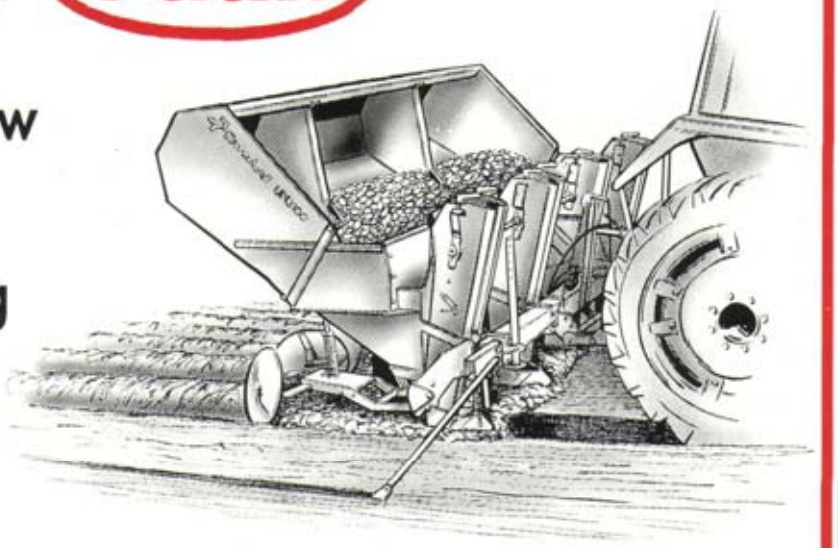

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French fry processing

French fry processing in Victoria has decreased by about 5% in the last three years, due to lower demand of French fries and the purchase by McCain Foods (Aust) Pty Ltd of Safries in South Australia in April, 1992. The current contract price for processing potatoes is $190/tonne.

McCain Foods at Ballarat have upgraded storage capacity and improved production line efficiencies to world competitive standards. In line with changes at the factory, McCains will take delivery of all contracted potatoes before June this year. In the past, potatoes have been delivered to the factory from April to the end of September, resulting in the harvest of potatoes during winter which increases labour, fuel and environmental costs, particularly to soil. Average yields for processing in the Central Highlands are around 38 tonnes/hectare. Rhizoctonia, target spot and Irish blight are still major concerns for those growing Russet Burbank potatoes. There have been serious, widespread outbreaks of both the leaf blights in the last two seasons, due to highly favourable weather conditions.

Fresh market

The fresh potato industry has endured low returns for the past three seasons, often below the cost of production. This has put enormous financial pressure on growers, but only small numbers of growers are leaving the industry. However, there is an expectation that more growers will leave the industry. An extreme example is the decline in the number of growers at Koroit, where three years ago there were 34 growers and currently there are about 14. Previously, this area had significant fresh market production, but it is now primarily a processing area for French fry and crisping supply.

Crisp processing

Victorian crisping growers have now moved away from Kennebec as the main crisping variety, in response to incentives from the processors. The main varieties now being grown are Atlantic for fresh delivery, with Denali, Tarago, Norchip and some Kennebec for storage. This season will see the first factory runs of the three new processing varieties Wilcrisp, Wilstore and Wontscab. These varieties have grown well this season.

Late Blight and Early Blight have been problems in most areas this year, due to later plantings and wet growing conditions.

Koo-Wee-Rup - some crops destined for storage were planted up to six weeks later than normal, due to the wet conditions. Target Spot has been a problem in some paddocks associated with wet conditions and poor emergence. Early planted crops in the Swamp have dug up to 37.5 tonnes/hectare, with SG's ranging from 1.080-1.093 depending on drainage and crop management.

Thorpdale - crops have been fairly good with the earlier crisping crops yielding up to 40 tonnes/hectare, with SG's of 1.089-1.094.

Koroit - there were some excellent early planted crops in this area that yielded up to 37.5 tonnes/hectare, with SG's of 1.090-1.095. Later planted storage crops are excellent.

Colac - some of the early planted crops were affected by Late Blight which was previously virtually unknown in this area. These crops yielded 25-30 tonnes/hectare, with SG's around 1.088.

In general, later planted crops have grown rapidly and made excellent growth. Overall tonnage and dry matter (SG) of crisping crops is expected to be lower this year in all crops.

South Australia

CHRIS WILLIAMS
is the Senior Research Officer (Potatoes) based at the Lenswood Horticultural Centre with the South Australian Research and Development Institute.

Increased production and quality for processing and fresh markets is occurring, despite strong competition from other districts.

Trends in potato production during recent years are presented in Table 1 for the statistical divisions in South Australia.

Production has increased by approximately 23%, with the area planted up by 17% over the period 1989-90 to 1991-92 (Table 1). Yields per hectare improved from 31.7 t/ha in 1989-90 up to 33.4 t/ha in 1991-92. This is due to both improved crop management and favourable growing conditions. The number of establishments has remained stable.

Washed Ware potatoes have increased significantly in Murray Lands recently, due to the availability of suitable sandy soils and transfer of water licences for potato production. Growers planting onto new land have expressed concern about the high incidence of soil-borne diseases, such as *Rhizoctonia,* black dot, silver scurf, common and powdery scab on seed.

Most of the potatoes grown in the South East are Russet Burbank, Kennebec and Shepody cultivars for frozen French fry processing. A large, modern factory operates at Penola with capacity for processing some 50,000 tonnes plus per annum of fresh potato equivalents into French fries. Availability of flat land and abundant supplies of good quality water and cool, temperate conditions make the South East of SA a region very suitable for potato production. Problems of stem end browning and hollow heart occur periodically, especially

in the Russet Burbank cultivar grown on the low-fertility sandy soils where temperature extremes occur and where effective irrigation is difficult due to variability of soil types.

A new, high technology crisp factory in Adelaide is seeking to increase supply of good quality SA grown potatoes year round, by expanding production into the Murraylands region. The cultivar Atlantic has performed well in the Mount Lofty Ranges and Northern Adelaide Plains (provided it was processed soon after harvest). Cultivars suitable for processing, either fresh dug in the winter months or for other months of the year, are being sought. The production of kettle crisps started in July, 1992 at a small factory at Lonsdale, SA. Problems of bacterial wilt at five sites, introduced from a seed source, disrupted fresh potato exports to Western Australia.

Intense rainfall in mid-December (over 100 mm/day in places) created problems for growers across the state. Seed piece decay, crop damage and soil erosion occurred in the Mount Lofty Ranges. Harvest has begun and yield losses of 20-40% are estimated for crops in the Mount Lofty Ranges. Many tubers are discoloured, or green or marked, due to waterlogged soil conditions or erosion of soil banks. The December rain delayed plantings by three to five weeks in the South East and dry autumn conditions are needed to facilitate a late harvest. Overall, SA crops are expected to be below a verge in yield. However, the extent will depend on conditions in the next few months.

The market situation has been variable in the past 12 months. Periods of oversupply have led to low prices during certain months. However, top of the range, premium quality potatoes have commanded acceptable returns for growers of washed potatoes in most months.

Western Australia

PETER DAWSON
is a Vegetable Adviser at Bunbury with the WA Department of Agriculture.

The past year has seen much political action in the potato industry.

A review of operations of the Edgell-BirdsEye's Manjimup plant led the Minister of State Development to call for deregulation of the fresh potato market, which is controlled by the Potato Marketing authority.

Abolition of the Marketing Authority was necessary, it was argued, because the orderly marketing of fresh potatoes reduced the efficiency of processing growers who have no alternative market for processing rejects.

This call created much controversy, not the least because it came during the five-yearly review of the Authority by the Minister of Agriculture. An emotional street meeting was held at Manjimup in support of the PMA.

A compromise was negotiated between the processors and the Potato Growers' Association by government. The fresh market growers agreed to subsidise the proposed export portion of Edgell-BirdsEye production at $50/tonne for three years (1992-93 to 1994-95), then at $30 and $20/tonne over the next two years (Anon, 1992c). It was estimated that the subsidy would cost growers 3% of net income over the period (98,000 tonnes at an average subsidy of $36.84/tonne). This cost would be offset by the Marketing Authority reducing the surplus of fresh market potatoes, which is often exported for low returns. This cost estimate does not include subsidies to other WA exporting processors.

A change of government in February, 1993 saw the release of the Agriculture Ministry review of the fresh industry and the compromise deal between fresh growers and processors put on hold. The review recommended that orderly marketing remain. The Government and Edgell-BirdsEye are continuing discussions.

Fresh production

Production in WA has remained static over the past two years. Fresh production remains at about 55,000 tonnes. It is produced all year round - from Gin Gin, 100 km north of Perth to Albany, 400 km south-east of Perth. Prices were low, especially over the winter of 1991 at $250/tonne, but have since improved to an average of $350/tonne. The value of the industry is estimated to be $19 million. Delaware comprises 80% of the market, the remainder being made up of Coliban, Sebago, a little Spunta for September sales, and assorted red varieties in very low volume.

Crisp processing

Crisp processing has increased to about 15,000 tonnes, with two new, small operations adding to production which is dominated by Smiths Snackfoods. A new storage variety is required as Cadima has inconsistent cooking quality. Atlantic remains the fresh processing variety. Production occurs most of the year, but acceptable fresh product cannot be supplied from September to October. The industry is worth $4 million.

French fries

French fry production was 17,000 tonnes in 1991-92 and 25,000 tonnes is expected in 1992-93. The industry is dominated by Edgell-BirdsEye at Manjimup. The major variety is Russet Burbank (76% of production), with Nooksack and Kennebec at 12% each. The industry is worth $5 million to growers. Production is expected to increase to 30,000 tonnes in 1993-94, including exports of 5,000 tonnes. Later, domestic production may be 50,000 tonnes, with additional exports of 25,000 tonnes.

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for protection against downy mildew in lettuce and late blight in potatoes

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