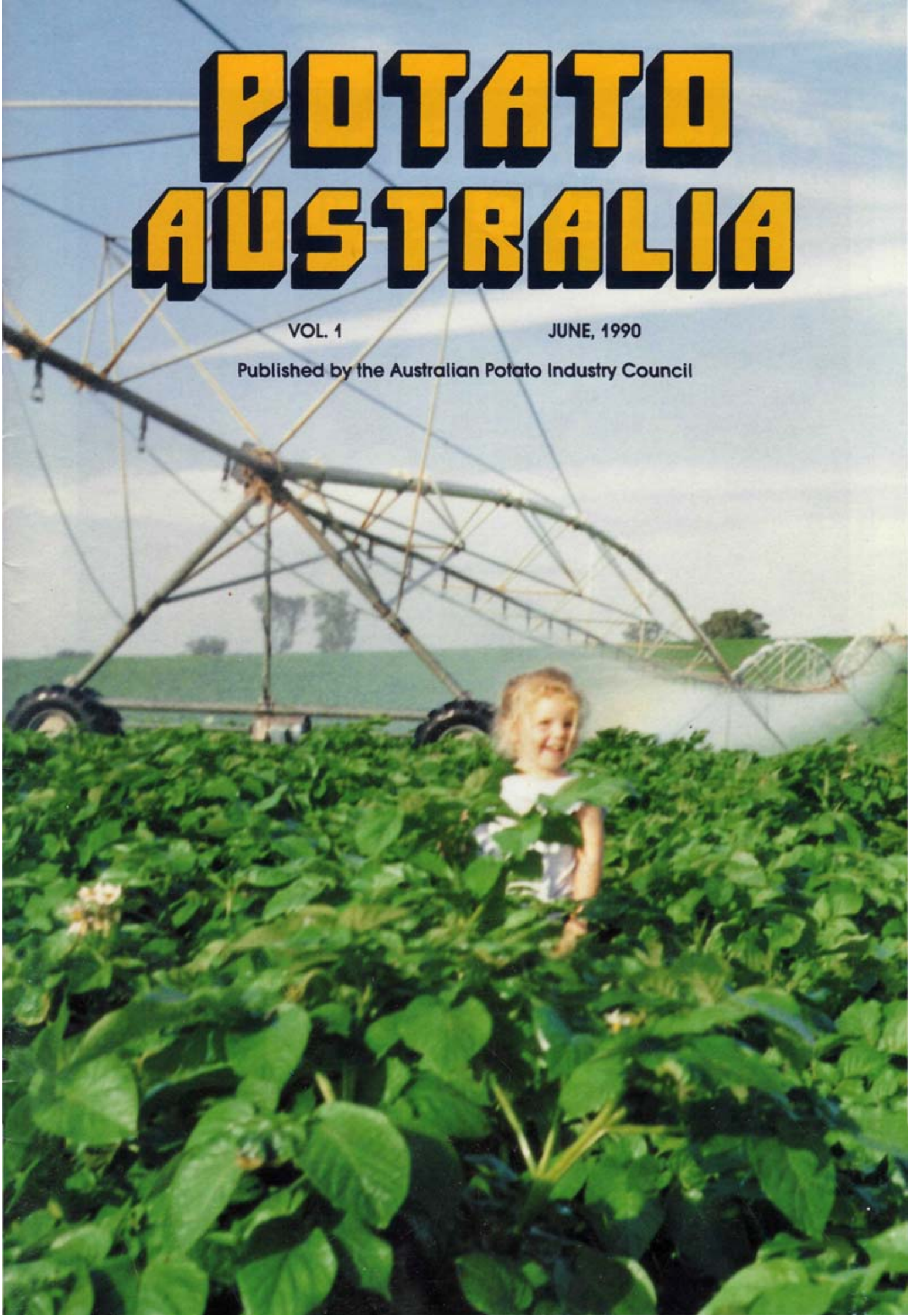
POTATO AUSTRALIA

VOL. 1 JUNE, 1990

Published by the Australian Potato Industry Council



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Published by the Australian Potato Industry Council **VOL.1 JUNE, 1990**

EDITORIAL

We extend a warm welcome to readers of this first edition of a magazine for everyone associated with the potato industry in Australia.

Production of the magazine is an initiative of the Australian Potato Industry Council (APIC) and an article from the chairman, Wayne Cornish, is included.

Staff from Departments of Agriculture, universities, consultancy agencies and a range of companies were asked to submit artilces while industries associated with potato production were invited to provide advertising.

At the onset the editorial panel comprised three officers from NSW Agriculture & Fisheries who agreed to co-ordinate the production of the first edition only on behalf of APIC.

We hope that you enjoy this edition and invite you to provide us with comments so that subsequent publications can provide a true reflection of your needs and ideas for an industry publication.

—Editorial Panel

EDITORIAL PANEL — Tony Biggs, Jonathan Eccles and John Salvestrin.

CONTENTS

FRONT COVER: Sacha Muratore from "Wingrove", Rennie in the southern Riverina area of NSW.

A.P.I.C. CHAIRMAN'S REPORT

Wayne Cornish is Chairman of the Australian Potato Industry Council.

'Potato Australia' is a direct result of the Australian Potato Industry Council (APIC) initiative. I know both will serve the Australian Industry well into the future.

APIC has been in existence for little more than twelve months. Since that inaugural meeting last May, many issues have been identified in industry. Focusing on industry needs and expectations requires the veil of parochial state and sector interests to be checked and a balanced overview adopted. Each sector of our industry has problems that impact on them and in turn on the wider industry and community. It is my hope APIC will, by opening up the lines of communication, bring a greater understanding between groups thus laying the foundation for industry advancement in the future.

The withdrawal of the National Potato Panel by Government left a complete void. APIC now provides that national forum for debate that is so important to facilitate understanding and progress.

Members of APIC are: Chairman: *Wayne Cornish,* grower of South Australia.
Vice Chairman: *John Smink,* grower of Tasmania.
Neil Dvorak, merchant representative of Western Australia.
Jim Croll, merchant representative of New South Wales.
Milton Rodda, processor of Victoria.
Peter O'Brien, processor of New South Wales.

Further to these voting members State Departments of Agriculture are represented by two advisors:
Max Walker, Primary Industry, Tasmania.
Tony Biggs, NSW Agriculture and Fisheries.

The APIC initiative is the first multi-sector industry based National Potato Organisation to be established. The objects of APIC are to enhance the future and improve the profile of the Australia Potato Industry by fostering, promoting and protecting its interests.

WAYNE CORNISH

APIC will—
- formulate and promote policies on issues affecting the industry.
- develop strategic plans for the industry.
- improve unity and encourage co-operation between all sections of the industry.
- facilitate the raising of funds which will allow the aims to be undertaken.
- monitor, plan, give priority to and document the research and development requirements of the industry.
- represent industry with all appropriate Government Departments and other organisations.
- actively lob Government on legislation and other measures which affect the industry.
- initiate and co-ordinate promotional and educational activities.
- convene regular industry forums.
- assist, co-operate and/or affiliate with any organisation or individual in the interests of the industry.
- undertake any other activities which are deemed necessary to further the interests of the industry.

As we look to the future we should reflect upon the size and importance of our industry. We must keep pace with our overseas counterparts by harnessing more effectively the research and development process. Unfortunately, State Government funding is drying up and the principle of user pays is being applied.

APIC is well placed to bring a new approach to co-ordination and new funding at a national level and to maximise Federal Government financial input through the Horticultural Research and Development Corporation. Debate of this issue is presently underway and I hope some direction may be forthcoming at the National Potato Conference at Warragul in June.

A host of issues and potential problems require addressing presently and this agenda will not diminish into the future. Issues of major importance such as chemical residue levels and threat of withdrawal will undoubtedly present much heartache. We live in an area of change and challenge. Management practices are under question by the community fuelled by single issue pressure groups who are long on emotion and short on fact. We must stand united, pool our considerable resources and make sure balance and reason prevails.

Vigilance is required to make sure our Industry's interests are not discounted by uncomplimentary Government Policies in areas such as trade and quarantine.

Finally, my thanks to those companies and advertisers who have allowed 'Potato Australia' to be financially viable. The launch of 'Potato Australia' is timed to coincide with the National Conference. I wish the organisers of the Conference every success and I look forward to participating in this event.

"What is APIC?"

Wayne Cornish is Chairman of the Australian Potato Industry Council.

This article explains the developments leading to the formation of APIC and also details the objectives of the Council. Progress to date is outlined along with plans for the future.

THE NEED

For some 17 years there were attempts to form a truly representative national organisation to represent the Australian Potato Industry. Individuals had different reasons for the establishment of such an industry body and the reasons often reflected the specific views and needs of particular industry sectors. However, a common thread ran through all the historical initiatives and this was the need for industry communication and cooperation.

Prior to 1987 the Federal Government did allow the various industry sectors to come together at National Potato Panel forums which were held in Canberra every six months. These Panel meetings, sponsored and hosted by the Department of Primary Industry, ceased in May, 1987, prior to the government releasing its new horticultural initiatives. The government view was, I believe, that its new financial commitment to the horticultural industries was sufficient and that if the potato industry was "fair dinkum" about a national body, then it should organise itself.

NATIONAL INITIATIVES

In May 1988 Potato Growers of Australia moved at its meeting to actively pursue the concept of a truly representative national forum or body.

Unbeknown to P.G. of A., and further demonstrating the broadly based need for a national body to be formed, a meeting was organised of interested people in Sydney in September, 1988.

A steering committee was elected at the Sydney meeting with a charter to examine various options for the formation of a national body and to prepare recommendations for presentation to a potato industry forum in December, 1988 in Canberra. The steering committee unanimously decided to establish an interim Potato Industry Council. The Interim Council's responsibility was to prepare a draft constitution, develop guidelines and objectives and generally facilitate discussions about the concepts of APIC.

In May, 1989 a further forum was held in Canberra following the normal Potato Growers of Australia half yearly meeting. This forum endorsed the work of the Interim Council and brought forward nominees from the various industry sectors for positions on the inaugural Australian Potato Industry Council Inc.

WHO IS APIC?

APIC's membership presently comprises representatives of growers, merchants, processors and State Departments of Agriculture. Each of the first three groups nominates two voting members while the Departments of Agriculture are represented by two non-voting advisors.

FUNDING

Funding is presently provided by an annual fee levied equally on each of the three sectors with voting members.

Future funding is being actively discussed by APIC and it is hoped that the matter will be resolved in the near future. Various long term options exist and future funding will clearly need to keep pace with industry expectations.

My personal view is that the Australian potato industry must become more responsible if it is to continue to grow, hold market share and develop into new areas.

Given that we are the largest horticultural industry by value and volume, our track record at financial self-help is less than ideal.

By way of illustration it may be helpful for me to make comparisons with other primary products which I sell in South Australia. The industry commitments for research, development and production of these products are about five to six percent of produce value (excluding selling costs) whereas potatoes only incur a commitment of 0.5 percent for processing potato research and development or 0.4 percent for fresh market potato promotion. It is also worth remembering that the potato levies are entirely voluntary.

WHAT IS APIC ABOUT?

The objects of APIC are to enhance the future and improve the profile of the Australian potato industry by fostering, promoting and protecting its interests.

It will:

- formulate and promote policies on issues affecting the industry,
- develop strategic plans for the industry,
- improve unity and encourage cooperation between all sections of the industry,
- facilitate the raising of funds which will allow the aims to be undertaken,
- monitor, plan, give priority to and document the research and development requirements of the industry,
- represent industry with all appropriate government departments and other organisations,
- actively lobby government on legislation and other measures which affect the industry,
- initiate and co-ordinate promotional and educational activities,
- convene regular industry forums,
- assist, co-operate and/or affiliate with any organisation or individual in the interests of the industry,
- undertake any other activities which are deemed necessary to further the interests of the industry.

ACHIEVEMENTS AND PRESENT AGENDA

Insufficient time has elapsed since the establishment of APIC for too many claims to be made but some progress can be reported. The necessity for all sectors to make nationally representative nominations to APIC has led to the formation of the Australian Potato Processing Association. This should improve communications within

that sector.

Matters of importance to the Australian industry are now being addressed by APIC. These matters include grade standards, export inspections and charges, chemical usage and aspects of chemical withdrawal.

Relationships between the potato industry and the Australian Horticultural Corporation, the Horticultural Research and Development Corporation and the Horticultural Policy Council are of major importance and will play a significant role in the future development of our industry. This question is receiving high priority and I am hopeful that APIC will soon be in a position to present policies which will provide leadership and coordinate the national agenda.

THE FUTURE

The Australian Potato Industry Council is now well placed to make concerted efforts to address the problems which have confronted us for many years.

The establishment of a National Register of Research and Development projects will allow better access to material and discourage duplication of effort. Improved coordination between State Departments and industry will allow resources and funds to be better utilised.

Standardising of handling and packaging, identification of quality factors and variety evaluations are issues which must be addressed continually if we are to keep our commodity profile high and maintain market share against our competitors.

Potato promotion and consumer education are required urgently on a nationally coordinated basis.

The very positive messages are that our product is low in fat, high in fibre, highly nutritious, easily and quickly prepared and tastes great. These need to be transmitted to the consumers along with supporting recipe leaflets and fact sheets.

This magazine which has free national circulation, will aid the information sharing processes and generally foster the industry.

Industry topics such as quarantine, imports, exports, seed production, shipping transport and many more also need attention from APIC.

All these issues are important but the single most important thing is simply the existence of an all embracing, truly representative industry body which not only has the ability to collect and exchange information but to represent the potato industry at trade and government levels. This is what APIC is setting out to do.

My hope is that APIC's limitations of infancy will gradually be shed. As we earn whole industry credibility it is to be hoped that parochialism and self preservation issues will not cloud the broader, more important objectives.

I believe that the present atmosphere of cooperation will enable the Australian Potato Industry Council to evolve rapidly into a body with significant industry and national relevance.

At the end of the day we will aim at the same goal — a vibrant, progressive, responsible and economically sound industry.

I commend this initiative to you.

Statistics from Australian Bureau of Agriculture and Resource Economics

Extracted from Agriculture and Resources Quarterly, Vol. 1, No. 3, Sept. 1989

		1984/85	85/86	86/87	87/88	88/89 *	89/90 **
1. AUSTRALIAN GROSS UNIT PRICES							
($/t)	Potatoes	164	213	267	244	315	265
2. AUSTRALIAN COMMODITY PRODUCTION							
('000t.)	Potatoes	992	965	1020	1106	1034	1069
	Other vegetables (for human consumption)	1206	1223	1330	1480	1470	1510
3. GROSS VALUE ($m).							
	Potatoes	162	206	272	270	325	293
	Other vegetables (for human consumption)	466	508	614	683	765	780
4. CROP AREAS ('000 ha.)							
	Potatoes	38	36	37	42	39	39
	Other vegetables (for human consumption)	73	75	78	80	80	84
5. AVERAGE YIELDS							
(t/ha)	Potatoes	25.8	26.8	27.6	26.8	26.7	27.7

* — ABARE estimates ** — ABARE forecasts

Strategically promoting your potatoes

Mark Chittick is a Director of Telaware Marketing in Sydney. He presented the following paper at a Potato Workshop in Finley, NSW on the 30th November 1989.

Potato producers will need to think and act strategically about how their produce is unique and its value to the buyer. The marketing techniques of differentiation of the product, segmenting the market and positioning the product strategically are powerful tools that can give potato producers a definite competitive edge in identifying consumer needs and meeting them in the 1990's.

It would be easy to list ideas that may help sell more potatoes in the short term. Generic programs that promote potatoes as a commodity and shift more product at a given time are well known and documented. Joint promotions with large retail chains, with advertising support in newspapers, radio or television and with substantial price reductions, are very useful at times of glut and at the start of a new season. They can move large volumes of product—but is that the way to sell more potatoes in the long term? I believe not!

The future in maintaining sales of potatoes in an increasingly competitive market place requires producers to think much harder about what they are going to do with the whole marketing issue. Marketing is all about the creation of consumer satisfying values—and in today's modern retail environment, the big trick that can work is the concept of branding.

Branding, properly used, can take your potatoes out of the commodity area into the product arena—a product that has a life of its own! Apart from just spuds, ideally your product can become something sought after—even demanded by consumers—and so pull the product through the marketing system by the sheer force of consumer demand.

How can this come about? We first need to look at the overall concept of marketing and not just promotion in isolation.

"IN MARKETING WE SHOULD BE CONCERNING OURSELVES NOT WITH CHANGING MAN, BUT WITH UNCHANGING MAN"

—Bill Bernbach

UNDERSTANDING CONSUMER ATTITUDES

The American advertising genius, Bill Bernbach, was fond of making the previous quote in the context of "the more things change, the more things stay the same".

I believe that knowing your customers and servicing them better is the key to successful marketing. Keeping in touch with the inate unchanging values of consumers is something that potato marketers must do if the potato is to increase and not lose its market share as we move towards the challenges of the 21st century.

The facts are that *we have not* all become the alfalfa sprouts or tofu devotees that the popular press has led us to believe.

What has become clear is that two distinct trends have emerged—but they are convergent—not divergent.

We are seeing the trends of the "healthies" and the "tasties" develop—not so much as different market segments, but as preferences within the same consumer.

The "healthies" eat muesli and designer yoghurt for breakfast but as "tasties" we are just as likely to finish off with a freshly microwaved croissant smothered in butter! We do like to reward ourselves for being good! Bill Bernbach understood that human nature does not change much!

So the essential issue in understanding today's consumers is that deep in our physche are some immutable desires and wants—we do not always act as the advertisers and promoters would wish us to act.

This is where the good news for potatoes comes in. Potatoes are still on the side of the plate in many main meal situations—the problem is that the main meal is being replaced by other eating alternatives such as take-away, eating out and pre-packaged convenience foods. The fight to keep the market share for potatoes means fighting on many fronts and keeping potatoes available on the consumer's terms.

POTATOES AS A COMMODITY

Potatoes occupy a unique and long held position at the centre of our western civilisation's tastes, wants and needs. But by and large potatoes are left to sell themselves and they do sell—last year has been a striking example of how people will buy even at extraordinary price levels.

Current consumer "hot buttons" regarding fresh food are flavour, freshness, healthfulness, variety, quickness of preparation, portion control and value for money.

Circumstances now require convenience, reliability and a consistent quality image—not something the potato industry has been able to provide satisfactorily to this point.

To meet these consumer requirements a substantially higher and professional level of marketing and merchandising potatoes will be essential if it is to compete successfully with other foods and indeed substitutes.

IMAGE

One must also understand that the image the consumer has of the product is usually vastly different to the one the producer of the product has—particularly as we are seeing the

marketplace split up dramatically into many different market segments.

OUR PRODUCT IS WHAT OUR CUSTOMER SAYS IT IS!

In our modern world perceptions are reality, image is all! Certainly there is a natural position for potatoes but it is not strong enough to compete naturally. We have to provide our product with the full advantages of all the modern techniques in advertising and promotion.

Potatoes have to be positioned advantageously against competitors, in a clear and defendable position in the market place. Potatoes as a commodity are in trouble in a marketing sense. Potatoes positioned as *branded products* with clear consumer benefits have a great future. However, the classic marketing techniques of differentiation of the product cannot be done in isolation from strong market segmentation. This requires thinking strategically in marketing terms.

STRATEGIC THINKING

To highlight some of the possibilities in potato promotion we need to think strategically about potatoes and in so doing, it can be useful to go through a process of analysis used by businesses today called Strategic Planning.

This process starts with the questions:

- Where are we now?
- Where do we want to be?
- How do we get there?

Simple questions but necessary if one is to get a clear vision of where one is going. Most importantly, it will require the examination of where our product is in relation to the Strategic three C's—customers, competitors and company.

HOW TO THINK STRATEGICALLY

Unfortunately, finding, getting and holding customers is not as easy as the success stories make it seem. To create excellence with strategic thinking you must master three aspects of the game: your customers, your competitors and your own company (or grower marketing group). This also highlights my long held conviction that in order to improve the marketing of horticultural products we need to develop a marketing vocabulary within industries.

SEGMENTATION AND PRODUCT POSITIONING

What this type of analysis shows is that there are few mass markets. What we have is a highly fragmented market place made up of various segments.

Retailing responds to these segments by making different product offerings in their merchandising style to cater for specific needs, consequently we see that the breakup of potato retailing outlets is segmented in itself as is the food service or catering areas.

Current figures show retail outlets in Australia are made up of a predominance of supermarket chains. But in the biggest market, Sydney, chain store sales of fruit and vegetables do not make up the bulk of sales, as shown in the table below.

Percentage of Tonnage of Fresh Fruit and Vegetables—By outlet Sydney Market

1.	Service fruit shops	25%
2.	Chains and buying groups —Self service —Woolworths, Coles, etc.	33%
3.	Self service suburban fruit markets	42%

The degree of this market segmentation will change over time and in order to track this it is necessary to examine each segment by its critical characteristics.

THE CONSUMER

- Australia's position of high inflation and interest rates and significant unemployment is dropping living standards for a large proportion of the community.
- In these circumstances the affected consumer focuses more and more on price. Food—always price sensitive—becomes even more price sensitive. The economic climate favours the discounter!
- The fresh produce retailer needs to work consistently for price credibility and that means providing lower prices for comparable products. Pressure is then on the producers!
- Consumers prefer the specialist food retailer. However, many shops are full range supermarkets because of the one-stop convenience factors. Some people find it difficult to equate freshness with supermarkets.
- We are entering the decade of the "uncommon" consumer where consumers are more sure of themselves. This requires uncommon thinking to service this new consumer.
- Dramatic increase in choice has inhibited demand for creation factors. In retailing non-price demand factors include:
  —display
  —promotion
  —information and service
  —the strength of core merchandise.

  Product *brands* are created in five areas:
  —design/differentiation
  —quality/characteristics
  —service
  —distribution
  —use of nutrition information as a selling tool.

IN SUMMARY

- The consumer will require security and assurance from the retailer as to the quality of produce he requires and this is where branding comes in with product origin, composition, nutritional value and absence of additives—all important concerns.
- The retailer, in order to satisfy the consumer apart from price, will need from the supplier consistency of quality and standards—a branded product supported by a professional fully integrated promotional program.
- For the packer to achieve this it will require a consistent and identifiable supply of raw material. That is why the potato producer holds the key to the efficient progression of the potato industry in the future.

It is not a question of producing standardised homogenised potato offerings but rather more variety and choice with absolute brand standards.

IN CONCLUSION

Knowing your customers and servicing them better is the key to successful potato marketing.

Producers can take advantage of the changes being wrought in the market place by forces external to their own business by:

—developing market power for their products —controlling and supporting their product further along the chain.
—by offering quality assurance.
—by branding their products
—with a district/area focus.
—through grower controlled marketing groups.
—by employing top marketing personnel
—rewarding them well.

The following is a check list for developing successful strategies:

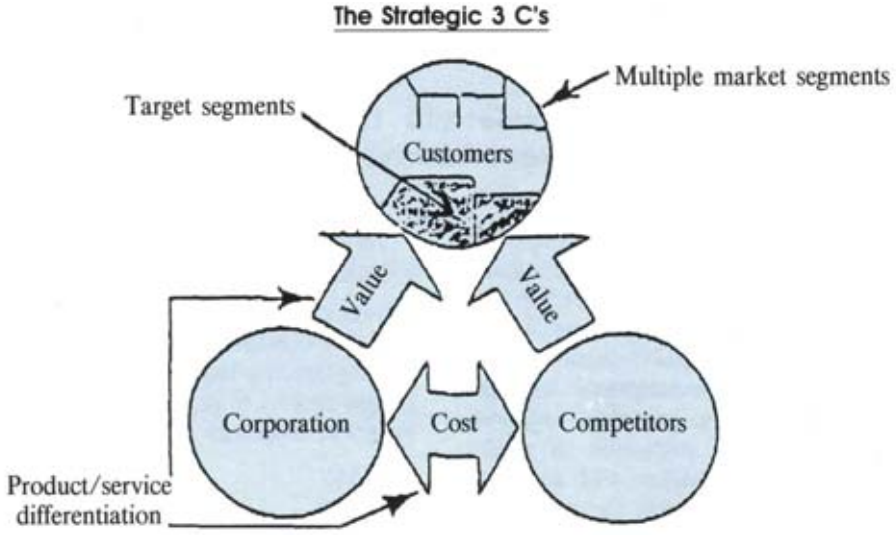
- Obtain a complete understanding of the demand and supply structure in the markets in which they operate. Segment the market with market research.
- Establish and rigidly enforce grading standards (to move from quality control to quality assurance) with correct product description.

- Apply a brand to the product to enable a strong differentiation in the market place.
- Apply sufficient control to the product to ensure that there is no fundamental change in its quality until it reaches the consumer (and beyond).
- Target the market strategically—who you want to service, where you want to be—treat the trade as a customer.
- Obtain retailer loyalty by establishing a trade franchise through creative in-store merchandising support. This will involve:
  —advertising and promotion
  —providing product information facts
  —provide recipes/tastings/demonstrations, etc.
  —offering nutritional information
  —educating retail personnel.
- Understand that excellent service is an integral part of a brand and be prepared to walk away from any proposition that will compromise the brand.

These are the essentials for successful strategic potato marketing. A brand image is a valuable asset to any marketing operation but if it is abused then it will be a massive liability.

REQUIREMENTS FOR SUCCESSFUL STRATEGIES

Strategy Components	Action you must take
Customers	Satisfy customer needs, recognising that different customers have different needs.
Competitors	Gain a sustainable competitive advantage, keeping product "differentiation" in mind.
Company	Capitalise on company strengths, remembering that it takes time to develop them.



This also highlights my long held conviction that in order to improve the marketing of horticultural products we need to develop a marketing vocabulary within industries.

Export potatoes - visit to Singapore, Hong Kong and Malaysia

Harry Gratte is a Vegetable Specialist with the Western Australian Department of Agriculture.

A grant was received by Donnybrook Exports from the Innovative Agricultural Marketing Program (Austrade) for two growers and I to visit South East Asia to assess potato export outturns and potential. This investigation included interviewing potato importers, reviewing market statistics, inspection of potato quality on the market and gathering information on the main suppliers. From this information it was hoped that market niches for Western Australian potatoes could be confirmed at profitable prices.

SINGAPORE

Current suppliers to this market are:

- Holland—August to February;
- Taiwan—fresh—January to April, cool store after April. Major variety is Cardinal.
- Indonesia—quality is variable, supply all year.
- China can supply all year, largest supply October to May.

Importers often gave conflicting information, however, the ideal potato appeared to be:

- yellow fleshed, smooth skin with shallow eyes, yellow or red skin colour,
- of size range 150 to 200 g,
- fresh and remain whole and firm during prolonged cooking,
- clean tubers from red soil or sand but not black soils.

The varieties Desiree and Spunta were acceptable but a yellow flesh would be preferred.

The highest price achieved in the previous twelve months was $A440/t.

A minimum return to the grower of $200/t is required to equal the contract prices to processors. Only 70 percent of a grower crop usually meets export standard. The balance of 30 percent must be sold on the local market. Australia's poor competitive position in Singapore is due to competition and high exchange rates. Best prices are for May to August.

To sell Australian potatoes in Singapore the costs involved are:

Grower	$A200/t
Exporters commission	$A 20/t
Packing/grading/bags/loading	$A 80/t
Freight country to port	$A 20/t
Freight to Singapore	$A120/t
TOTAL	$A440/t

HONG KONG

Suppliers to Hong Kong are:

- China—October to May, but can supply all year.
- Taiwan—major supplier, fresh from December to March, then from store,
- Holland—November and December.
- USA—supply in both Fantainers and reefers, small quantities but good quality and size grading. Reefer containers used during the hot months of June to September.

The ideal potato in Hong Kong appears to be:

- Yellow fleshed (small discount for white), long shape with smooth skin with shallow eyes. Skin colour is not important.
- of large size, 250 to 450 g,
- must be clean, store well until sale, and be firm after prolonged cooking,
- no internal disorders.

Prices varied from $A230/t for Chinese potatoes to $580/t for USA reefers. Most sold at around $A400/t. The best time of year for high prices is May to September. Again only 70 percent or less of a grower's crop will meet export standard.

To sell Australian potatoes in Hong Kong the costs are:

Grower	$A200/t
Exporters commission	$A 20/t
Packing/grading/bags/loading	$A 80/t
Freight country to port	$A 20/t
Freight to Hong Kong	$A127/t
TOTAL	$A447/t

MALAYSIA

Malaysia is a low price, lower quality market for potatoes. It is very close to Singapore and many similarities exist. Indonesia supplies about 85 percent (Singapore exporters estimates) of the Malaysian market. Australia should not attempt to export potatoes to Malaysia, as uneconomic returns will generally result.

CONCLUSIONS

- The markets have become very competitive with Hong Kong showing the best potential.
- Returns to growers often will not achieve the minimum Australian processing contract price of $200/t and will seldom exceed $240/t.
- A variety that is suitable for both processing and export would be an advantage.
- Small niche markets offer the best potential.
- Malaysia cannot be economically exploited at any time.
- Fantainers are the preferred type of containers.
- High temperature may cause problems between May and August.

RECOMMENDATIONS

- Potatoes only be exported between May and August.
- Hong Kong and Singapore be developed jointly with the larger size range going to Hong Kong.
- Reefer containers should be trialed.
- Only send suitable varieties, but not from black soils.
- Pack in 25 kg hessian bags.
- Mark bags with a clear logo.
- Grade to narrow size specification. Several size grades can be sent in the one container.
- Supply consistent quality to each importer.

South Australian growers face difficult markets in Asia

Barry Philp is a Senior Horticultural Officer at Lenswood Horticultural Centre, South Australia.

A recent review of South East Asian vegetable markets revealed that it is becoming increasingly difficult for Australian potato growers to compete in this market.

Reasons for this problem were identified by South Australian Department of Agriculture officers Tim Deer and Barry Philp in a recent investigation of vegetable markets throughout South East Asia.

Singapore, Malaysia and Hong Kong are major potato importers, with combined imports of approximately 100,000t in 1988. Singapore and Malyasian importers source potatoes from a wide range of countries.

However Taiwan, The Netherlands, Indonesia and the People's Republic of China have been the major suppliers in recent years. Potato quality from Indonesia and Taiwan is improving with adoption of improved technology and varieties, and is expected to match the quality of potatoes from Australia, USA and Holland within a few years.

Approximately 80 percent of imports by South East Asian countries are yellow fleshed varieties. They are favoured by the local population for their cooking qualities in curries and stews. White fleshed potatoes are used mainly in the hotel trade, fast food outlets, ship chandling, and airline catering.

Both markets prefer brown skinned potatoes, 45 to 65 mm diameter, clean brushed (not washed) and packed in 25 kg jute or mesh bags.

Indonesia has been expanding potato production in recent years and has acquired a much larger share of the Malaysian and Singapore potato market. Malaysian imports of Indonesian potatoes have increased from 12,815t to 29 percent market share in 1984 to 31,056t and a 66 percent share in 1987.

Importers expect Indonesia to completely dominate the market within the next few years. Equally dramatic has been the decline in significance of the Cutch in the Malaysian market, down from 11,772t in 1984 to l,150t in 1987.

Much of the expansion of Indonesian potato production has been fostered by Dutch interests. The quality of Indonesian potatoes has been inferior to that from the US, Netherlands or Australia.

However the influx of Dutch technology and seed material has resulted in rapid movement in quality over the past three seasons, and buyers consider that quality will not be an issue in the future.

Indonesian potatoes, although usually of a lower quality are one third cheaper than the Australian product. Shipping time from Indonesia to Singapore or Malaysia is only two to three days, reducing importers' exposure to risk from price fluctuations. These factors give Indonesian potato producers a significant advantage in Singapore and Malaysian markets.

The People's Republic of China is also becoming more important in the Singapore and Malaysian markets. Potatoes are largely sourced from northern China and shipped through Shanghai using cartons packed into 40 foot dry containers.

Although the quality of Chinese potatoes is variable and some regarding is needed by importers, they are very cheap.

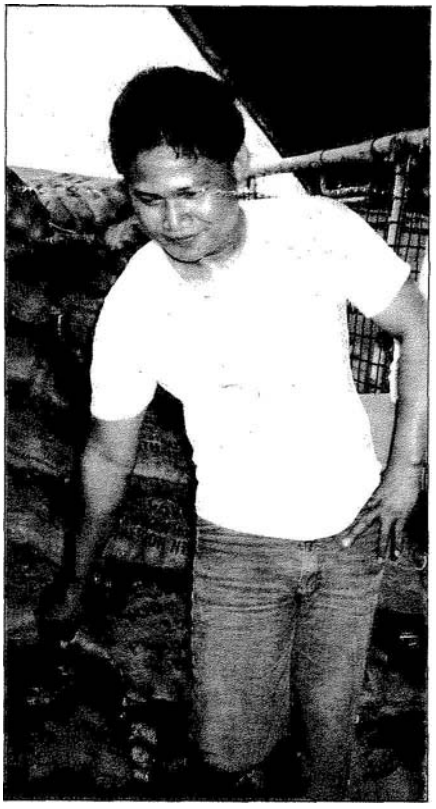
With increasing westernisation of South East Asian cultures, there are growing sales of fast foods and frozen potato products. Both the Hungry Jacks and McDonalds chains are being sourced entirely out of the USA, where prices for frozen potato products are approximately 20 to 30 percent below the Australian products, and also have the advantage of more reliable and cheaper shipping.

Despite the current difficulties, there are long term opportunities for frozen potato products in South East Asia if Australian producers can become price competitive.

Potatoes are a minor vegetable in Hong Kong, although it is still a significant market with 24,601t being imported in 1988. The People's Republic of China and Taiwan dominate supplying 88 percent of this market in 1988.

South Australian growers face shipping costs of almost $ 150/t to Singapore. With Indonesian potatoes returning prices of approximately $250/t, returns to South Australian growers would be well below production costs if they were to compete in the high volume yellow flesh potato market.

Consequently long term opportunities for export of South Australian potatoes to South East Asia are limited to specific small volume high quality niches that may appear in the hotel, restaurant, ship chandling or airline catering trades.



Developing exports from north Queensland

John Hardy is a District Experimentalist at the Kairi Research Station and Ken Jackson, a Senior Agronomist, at Gatton Research Station with the Department of Primary Industries, Queensland.

With the volatile prices of potatoes on the domestic market, the prospect of establishing a stable export market to South East Asia would, at first glance, appear to be attractive. However, many pitfalls await the unwary as has been discovered by the Atherton Tableland Potato Growers Co-operative.

Freight costs, high exchange rates and a limited period of supply presently outweigh any benefits to be gained from the venture. Continuity of supply to these markets is also difficult when domestic prices are high, such as during 1989 when they reached $58 per 50 kg bag.

THE ATHERTON TABLELAND POTATO INDUSTRY

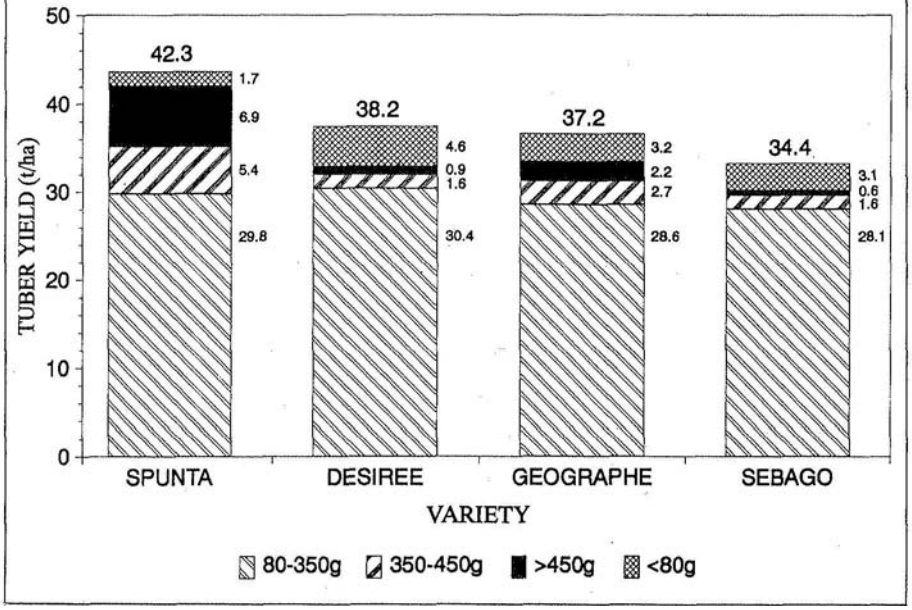
Atherton Tableland production represents 12 percent of total Queensland production with 1989 a season of high yields and high prices. During that year, all the potatoes were sold on the domestic market, with most selling as ware potatoes and the remainder for processing. With a total of 80 growers, production was 30,000t, mainly from the variety Sebago, with a gross value of $20 million. In an average year, 22,000t are produced, valued at $8 million.

The proximity of the Atherton Tableland to South East Asia, in relation to the other main growing areas of Australia, would seem to be an advantage for exporting. However, the area traditionally supplies out of season potatoes at a time when Australian ware potato supplies are low. The crop is marketed principally in Sydney, 2,700 km away. Because production is out of season with limited competition from other growing areas, and quality is generally good, the crop regularly attracts high prices. Consequently there are difficulties in justifying a stable export market at often reduced prices.

YELLOW FLESHED POTATO TRIALS

In anticipation of this export market developing, the Queensland DPI undertook variety testing of yellow fleshed potato varieties, firstly during the winter of 1986, and again in 1988 and 1989. The varieties, Spunta, Desiree and Geographe produced high yields. (See figure 1). The higher yields of these varieties over the white fleshed types were an added bonus for the export market.

FIGURE 1
Comparison of 3 Yellow Fleshed Potato Varieties with Sebago over 3 years.
Mean tuber yield (t/ha)



ESTABLISHING AN EXPORT MARKET

With the prospect of yellow fleshed varieties able to be grown satisfactorily on the Atherton Tableland, the local Potato Growers Co-operative sent a Director, Ian Allen, and the Manager, Laurie Whitmore, to Singapore in May 1987. They were to ascertain if there was a place in the export market for the supply of white and yellow fleshed potatoes from the Atherton Tableland.

They found that the supply of white fleshed potatoes was limited to the western style outlets (McDonald's, Kentucky Fried), while 90 percent of the population consumes the yellow fleshed varieties. The yellow fleshed varieties suit their style of cooking, and do not disintegrate with prolonged cooking.

The size of potatoes required for the market was 45 to 65 mm in diameter (100 to 200g), and needed to be packed into 20 to 25 kg bags for ease of handling.

Ten tonnes of certified Desiree seed was produced from Kinglake, Victoria and grown by five growers spread throughout the main potato areas of the Atherton Tableland. These potatoes were road transported to Brisbane, then sent in containers by sea to Singapore in December 1987.

Harvesting a crop of Desiree on the Atherton Tableland.

The quality of the product reaching the market was good, however buyers requested to see the product arriving by sea before their outright acceptance. Size grading was 100 to 200 g and 200 to 300 g with brushing essential.

The prices realised per tonne to the shipment are as follows:

Net Sale Proceeds	$303
Less expenses	$232
NET PROCEEDS	$ 71

The reason for the low return was a market oversupply and an unfavourable exchange rate (A$1 = S$1.65).

It was established that June-August was the optimum period to supply this market. Because of high domestic prices, no potatoes have since been exported from the Atherton Tableland to this market.

CONCLUSION

Aggressive competition, high exchange rates and increased packaging and freight costs limit Australia's viability to export to these South East Asian markets.

For the local industry, in addition to the Australian ware markets, it is currently more viable to grow Atlantic for the processors for a contract price than to grow for an export market full of uncertainity. Only time will tell!

Hilling up a crop of Desiree potatoes at Tolga.

The Potato Industry in Tasmania — past, present and future

Paddy Regel is a potato specialist and John Fennell is the Deputy Chief with the Vegetables and Allied Crops Branch of the Department of Primary Industry, Tasmania. They are based at Burnie and Devonport respectively.

The first record of potato growing in Van Diemen's Land was for production of the cultivar Redskin in 1803. This was grown around Kingston and was the premier potato of the Nineteenth Century. Potatoes were shipped from Hobart Town to mainland Australia.

It was soon discovered that the krasnozem soils of north and north west Tasmania were favourable for potato growing. The industry expanded and regular trade in quality Tasmanian potatoes started in the 1870's, Late blight was officially recorded in 1909 and two years later Redskin was obliterated, leading to a change to the cultivar Brownell which had blight tolerance and better storage and cooking attributes.

In the 1920's the annual harvest was about 69,000t but with average yields of only 5t/ha. These rose to 15t/ha towards the end of the decade through better growing techniques. By the late 20's, virus diseases reduced yields forcing the Department of Agriculture to introduce an improved seed scheme. In 1933 the Tewkesbury Potato Station was founded giving Tasmania a Seed Potato Certification Scheme.

An early photograph of Edgells Potato processing plant at Ulverstone, Tasmania.

During the war years of 1944 and 1945 potato production peaked at 350,755 tonnes and food processing plants were established at Scottsdale, Devonport, Ulverstone and Smithton. At this time the market for potatoes changed from export to processing, either as canned or dehydrated product.

Potatoes being loaded for export at Burnie Wharf at the turn of the century.

The industry declined during the early 60's but was then revitalised with the production of frozen french fries at Ulverstone and Scottsdale. In 1963 Edgells produced 1,200 tonnes of frozen french fries at Ulverstone with further increases annually. In 1970 a potato granule plant was added. By the mid 70's the dual purpose cultivar Kennebec had taken the top position although Russet Burbank had been introduced in the 1964-65 season. After many years of evaluation Russet Burbank production increased and has now largely replaced Kennebec as the top cultivar.

In 1987-88 over 248,000 tonnes of potatoes were harvested with an average yield of 39t/ha. 64 percent of the crop was Russet Burbank and 31 percent was Kennebec, the remainder being fresh market cultivars such as Bismark, Brownell, Tasman and Pink Eye.

Tasmania is likely to be producing in excess of 300,000t per annum for the production of french fries and other processed products and to satisfy the increasing export demand for

A7411-2 is a new high yielding potato breeding line from the U.S.DA breeding program in Idaho. It is reported to have resistance to hollow-heart. This line, amongst others, has been recently introduced to Australia for evaluation.

Russet Burbank is the major potato cultivar grown in Tasmania. It has long tubers, high specific gravity and low levels of reducing sugars that are necessary for the production of quality french fries.

processing seed potatoes.

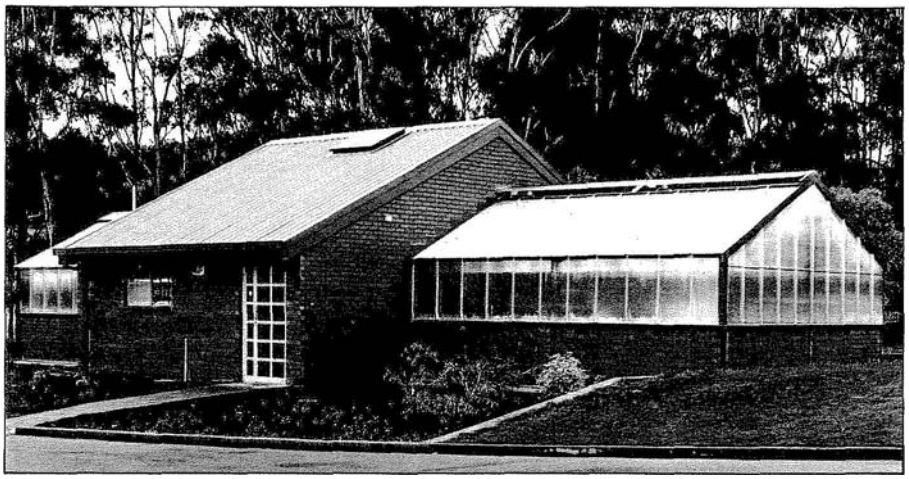
Despite Russet Burbank growing relatively well in Tasmania and producing quality french fries it does have many drawbacks. Hollow heart can be a problem under cool growing conditions, but occurs seasonally. Irregular plant densities and climatic variation can also result in the development of malformed tubers. The cultivar is also susceptible to nematodes and common scab and has an open canopy of foliage which is prone to wind damage.

Kennebec is earlier in maturity but shows extreme susceptibility to powdery scab disease.

With the present cultivars, further progress towards increasing yields will occur with improved crop management. Ways to achieve this will be through improved uniformity of seed tuber size and better seed cutting and by achieving greater accuracy of plant spacing. Irrigation programs are available but good management depends upon timely application and even distribution of water.

The introduction of new cultivars may also improve the reliability of production by overcoming hollow heart and some of the disease problems. The Tasmanian Department of Primary Industry has initiated a cultivar introduction and testing program with these aims. New cultivars and breeding lines are being sources from the Potato Research Station at Toolangi, Victoria and also from major breeding programs in the USA and other countries. Priority is being given to russet skinned cultivars with long tubers suitable for processing as french fries. The establishment of additional quarantine facilities at Kingston and a micropropagation unit at Devonport has allowed for up to 30 new potato cultivars/breeding lines to be imported annually. The costs associated with this are borne by Edgells, McCains, the Horticultural Research and Development Corporation and the Department of Primary Industry, Tasmania. More new cultivars are now being introduced to Australia each year than has ever been achieved before and should increase our opportunities to find superior lines for commercial use.

The anticipated growth of Tasmania's potato industry will put increasing pressures on the availability of suitable land which is also sought by other expanding agricultural enterprises. Good land management practices to avoid land abuse by overcropping and inadequate rotation, will be essential for the sustainability of the industry.



The newly constructed potato micropropagation unit at the Department of Primary Industry Stoney Rise Centre in Devonport, Tasmania. Pathogen tested stock is multiplied here to produce minitubers for the start of each cycle in the seed production program.

Potatoes and plant variety rights

Roger Kirkham and Graham Wilson are at the Toolangi Potato Research Station with the Department of Agriculture and Rural Affairs, Victoria.

Plant Variety Rights (PVR) were legislated in Australia in mid 1987 and potatoes were included in the species covered from mid 1988.

WHAT IS PVR?

PVR is a limited form of proprietary ownership which allows the grantee to collect royalties as the variety is propagated, and can be compared to patent or copyright legislation.

The rights do not extend to the use of the crop produced or to the propagation by the grower for production of another crop, that is royalties are only charged once (when buying seed) and if the seed is held over to plant in the next season there is no royalty charge.

This ownership provides the grantee with a legal right to exclude others producing (except for their own use) or trading in the variety without the owners agreement.

APPLICATION FOR PVR

For plants to be covered by PVR they must be Distinct, Uniform and Stable. As potatoes are vegetatively propagated from tubers they are uniform and stable but the new variety must be distinguishable from all other potato varieties.

CONDITIONS FOR PVR

New varieties will only be covered by PVR if they are originated by a person. Selections from the wild or discoveries are not eligible.

PVR in Australia will only be granted to overseas potato varieties that have been traded for six years or less overseas; and will only be granted to potato varieties bred in Australia that have not been traded prior to application, ie only to new varieties.

Applications for PVR can only be made by the breeder or an agent appointed by the breeder.

The cost of PVR is $1700 before certification and a continuing annual fee of $235. PVR protects varieties for 20 years after which they become public or free varieties.

ROYALTIES

Royalties may be collected each time potato seed is sold. It is anticipated that in Victoria royalties will be paid when foundation seed is sold to the certified seed growers and again when certified seed is sold to commercial growers. The amount of royalty will be decided by the applicant but will probably be less than 10 percent of the cost of certified seed. These royalties will probably be collected by an agent appointed by the breeder who will also be responsible for promotion of the variety.

Two years after granting rights a 'reasonable quantity' at a 'reasonable price' of the new variety must be made available on request.

D.A.R.A. is presently preparing an application for PVR to cover the potato variety 78-26-7 bred at the Potato Research Station, Healesville which we hope to release in conjunction with DPI Queensland and called Winlock. This will be the first potato variety to be grown under PVR in Australia.

CONSEQUENCES OF PVR IN AUSTRALIA

Plant breeding in the past has been mainly in the public (or government) sector. PVR will stimulate plant breeding in the private sector, particularly in native ornamentals but may also extend to potatoes and other horticultural crops. It is hoped that at least part of the royalty payment would be returned to the generating project and this would mean increased public breeding and part of the royalty would be put towards the promotion and marketing of the new variety.

An immportant consequence of PVR to the Australian potato industry will be greater access to varieties grown under PVR overseas; particularly Dutch and German potato varieties. Some European breeding companies have appointed agents in Australia and are now importing and testing their varieties in Australia and would promote these varieties if released in the near future. These companies would release qualifying varieties under PVR in Australia or would contract any overseas protected varieties until the period of protection overseas is passed. In the Cutch PVR system potatoes are protected for 25 years and the royalty paid is about $A20/tonne.

An example of the application of PVR in Australia is the variety Desiree. This is a Dutch variety that was released almost 25 years ago. However if this was a more recent variety the Dutch seed company or agent responsible for this variety could release Desiree under our PVR system (if eligible) or could arrange contract growing of seed of the variety to allow collection of royalties of about $A20/t each time seed of Desiree is sold.

With regard to American varieties, (recent USA varieties imported and being grown in Australia include Atlantic, Denali, Norchip, Bison) these have been made freely available to Australia in the past. However the USA does have PVR and is a member of the International Convention of PVR Countries (UPOV) and in the future we might expect that, if recently released USA varieties are to be grown in Australia, these may be released under PVR in Australia.

Membership of UPOV gives Australian plant breeders the opportunity to apply for rights in other UPOV countries, ie USA, Japan and Western Europe, in fact most developed countries have plant variety rights.

SUMMARY

A scheme of Plant Variety Rights which includes potatoes was recently legislated in Australia. This gives the breeder or his agent a limited form of ownership of new varieties and allows him to collect royalties as the variety is propagated. It is hoped the PVR will increase potato breeding in the public sector and new protected varieties will be promoted from the royalties collected. Introduction of PVR has meant increased access to protected potato varieties grown overseas.

Benefits of round potato seed

Pam Strange is a Scientific Officer and Keith Blackmore a Senior Seed Potato Certification Officer, both with the Victorian Department of Agriculture and Rural Affairs at the Potato Research Station, Healesville, Victoria.

Crops planted with round, uncut potato seed produce higher yields of marketable produce, less oversized tubers and a more evenly sized sample than those planted with a run grade of mostly cut seed pieces. Planting round seed establishes the crop quickly. It helps avoid seed piece breakdown and the subsequent wilts and rots often seen with cut seed pieces. Seed preparation is quicker and no unpleasant dusts are required when using round seed.

While round seed is used extensively in Europe and the local potato industry has long recognised the low risk of disease from round seed, the practice has not been widely adopted. Until now there has been a lack of local knowledge of the yield and economic advantages of round seed.

Research trials conducted in Victorian potato districts have shown round seed to produce six percent higher total yields of even size tubers than a run grade of mostly cut seed pieces. Yield benefits were higher when the crop was planted early and irrigated adequately. The extra yield was in the small and medium size range (35 to 250g) while the run grade produced high yields of larger tubers.

Many growers of seed, ware and processing crops in Victoria and elsewhere have already tried planting round seed and have all commented on the high yields of tubers per plant or are susceptible to seed piece breakdown, such as Sebago, Norchip, Atlantic, Coliban, Sequoia and Tarago, are suitable for planting with round seed.

The round seed size can be as large as 150g depending upon the capabilities of the planter. Cup planters are preferred as inserts can be used for the different seed sizes and the round seed remains whole and intact. Needles puncture the skin allowing access to soil borne fungi and bacteria and they spread disease between seed sets.

Some 15 percent more seed is required if 35 to 150g round seed is planted. This can be reduced if 101 to 150g seed is graded out separately and planted at a wider spacing of 30 to 40 cm. The wider spacing maximises the number of tubers per plant and the multiplication rate (total yield/seed planting rate). Economic analysis of the research trial results showed that the high yields of marketable produce compensated for the slightly higher seed planting rates when planting round seed. Before embarking on planting round seed estimate the proportion of round seed in the sample you purchase and then calculate the extra seed required.

Seed potato production in New South Wales

Ben Dowling is Technical Officer (Potatoes) with NSW Agriculture and Fisheries, at Yanco Agricultural Institute, and David Carter is a Foundation Seed Grower from Crookwell, New South Wales.

New South Wales is striving to produce high quality certified seed potatoes. Favourable climatic conditions, control of soil-borne diseases and the major role given to new technology is encouraging growers to strengthen and expand the local certified seed potato scheme.

Seed growing in the State is limited to three centres—Crookwell in the Southern Tablelands, Orange in the Central West, and Guyra in the Northern Tablelands. In these Tablelands districts, temperatures are relatively low during the potato growing period, which helps minimise infection from aphid transmitted virus diseases. The seed growing areas are protected by the Powdery Scab Proclamation (1988), which helps prevent disease organisms being carried into the Local Government Shires. The proclamation prohibits seed potatoes from outside sources being planted in these Shires, and requires all machinery and potato handling equipment to be sterilised before entry.

In 1989, New South Wales produced approximately 1,780 tonnes of certified seed. The areas submitted were Crookwell (150 ha), Orange (31 ha) and Guyra (15 ha). Orange and Crookwell have both grown considerably in 1990. Seed is supplied to most States, but primarily New South Wales and Queensland. A small amount is exported.

TISSUE CULTURE BASED SCHEME

Quality, rather than quantity, is the highest consideration for the seed potato industry in New South Wales. To this end the seed scheme has been reconstructed in recent years to gain the most advantage from tissue culture based programs. Such a program was introduced in 1983/84 when NSW Agriculture and Fisheries assumed responsibility for seed potato certification in the State. The scheme, based on pathogen-tested (p.t.) plantlets was modelled on one already existing in Victoria and the Victorian Department of Agriculture and Rural Affairs supplied initial stocks of p.t. material. These plantlets were received at Yanco Agricultural Institute where a p.t. collection is now maintained.

Tissue culture based programs work in the following way (Figure 1).

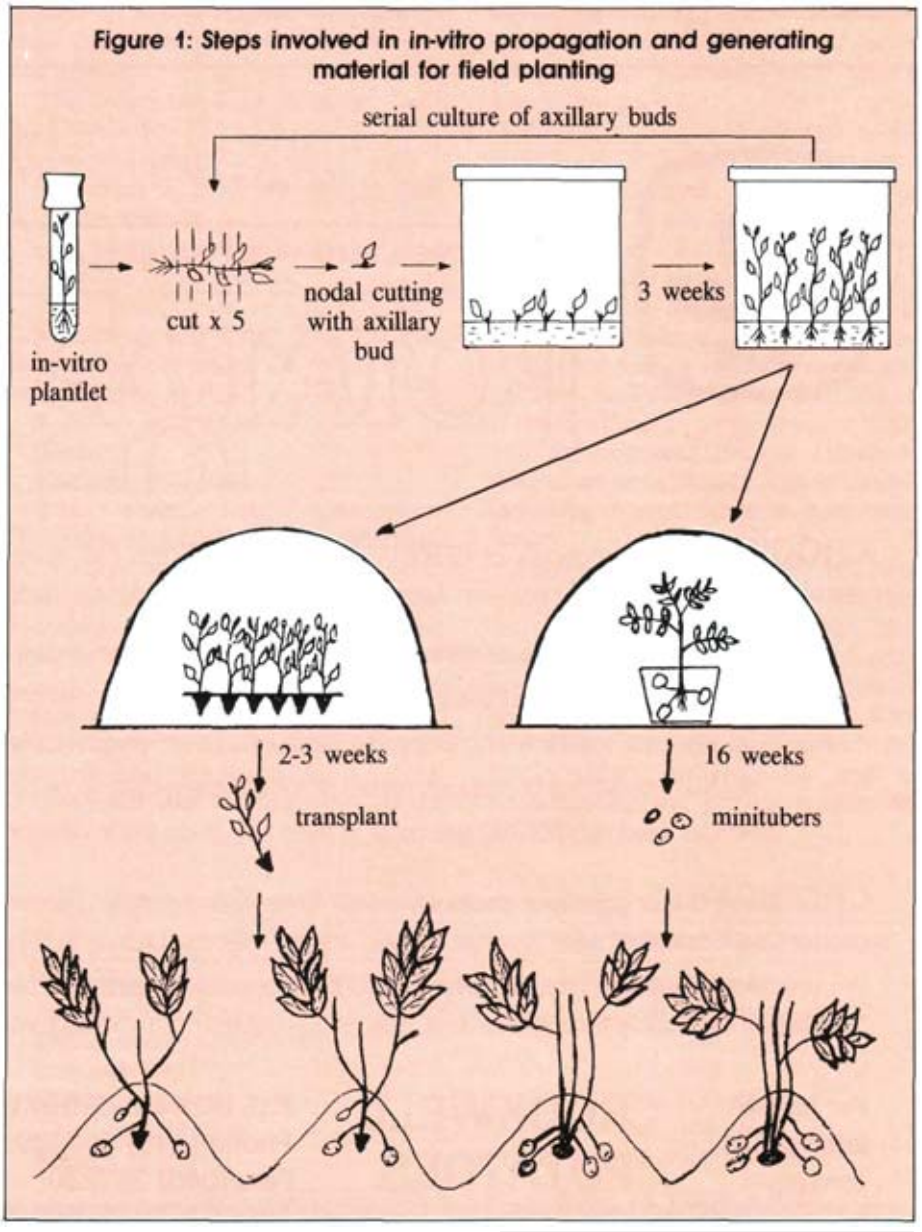


Figure 1: Steps involved in in-vitro propagation and generating material for field planting

Plantlets from the p.t. collection undergo rapid multiplication in-vitro. This involves aseptically dissecting each plantlet into about five nodal segments. Each segment contains an axillary bud which grows into a new plantlet in three to four weeks. This micro-propagation cycle is repeated until a final cutting results in the desired number of plantlets. They then enter the seed certification scheme in either of the following ways—

(1) Plantlets may be de-flasked into seedling trays and hardened off for two to three weeks ready for field planting—"transplants"; or
(2) Plantlets may be grown for about 15 weeks in steam pasteurised potting mix in insect proof screenhouses to yield "minitubers".

The "transplants" or "minitubers" are then planted in the field to produce the first batch of field grown seed potatoes.

The scheme as introduced by NSW Agriculture and Fisheries was based on production of minitubers in screenhouses at Yanco Agricultural Institute. Approximately 30,000 minitubers were produced each year and supplied to selected foundation seed growers in the Crookwell district. This arrangement continued for the next four years. It was terminated in 1988 and efforts were made to privatise what was then a routine service operated by the Department.

PRIVATISATION

The first step towards privatisation was to appoint the NSW Seed Potato Advisory Committee (SPAC) as the governing body of the NSW Seed Potato Certification Scheme. The members and numbers of SPAC are—

Seed grower representatives from each area (4)

Representatives from each potato processing company (2)

A representative from the fresh market trade (1)

Advisors from NSW Agriculture and Fisheries (4)

SPAC's immediate task was to determine a new source of planting material for the scheme. Guidelines were established for screening private tissue culture laboratories and in September, 1988, Bioflora Pty Ltd at Marulan (near Crookwell) was accepted for in-vitro propagation of potato plantlets. Recently, Kingham Plant Propagation Pty Ltd at Milthorpe (near Orange) was also inspected and accepted for both its laboratory work and screenhouse production on minitubers.

Privatising the production side of this work was complemented by the local seed potato grower organisations assuming responsibility for financing and administering the scheme in their area. Each organisation complies with the standards, guidelines and rules for the NSW Seed Potato Certification Scheme as determined by SPAC. Privatisation has meant the industry now bears the full costs of the tissue culture based programs, and of the administration of the scheme. In return

the Seed Certification Scheme has become "industry driven", with seed growers having more say in the decision making process.

ON-FARM PROGRAMS

An in-vitro collection of p.t. cultivars is held at Yanco Agricultural Institute. The two tissue culture laboratories (Bioflora and Kinghams) receive plantlets from this collection and multiply them in-vitro to the required number of plantlets. Kinghams then grow the plantlets in potting mix in polyhouses to produce minitubers. Bioflora send tubs of in-vitro plantlets to an on-farm polyhouse facility at Crookwell. Here the plantlets are de-flasked to transplants or minituber production.

Both on-farm facilities are inspected by a pathologist from NSW Agriculture and Fisheries. The growers must manage their facilities according to strict hygienic practices, since they are producing high value planting material on which the rest of the Scheme is based. Running the facilities requires strict attention to detail and adoption of a "nursery philosophy" as opposed to the normal open ground production approach. The rest of the seed industry is dependent on the skills and success of these operators.

For transplant production, plantlets are de-flasked into 200 cell "Polyform"® trays filled with potting mix. For the first two weeks the plantlets are kept inside the polyhouses in a high humidity environment, where they rapidly produce a new root system and more top growth. They are then "hardened off" for one week under shade cloth outside the polyhouse and are then ready for field planting. For minituber production, plantlets are grown in the polyhouses in either polystyrene boxes, plastic pots or polythene tree bags filled with potting mix. Before use, the potting mix is either steam pasteurised (Crookwell) or treated with methyl bromide (Orange). At Crookwell, the minituber grower is experimenting with a hydroponic system using Growool blocks or perlite for minituber production. For the last two years mainly transplants have been used—due to lack of leadup time for minituber production. In future, the aim is to use 60 to 80 percent minitubers, with transplants making up the remaining requirement. Transplants are used for "fast-tracking" new varieties.

Clonal selection is being practised by selected seed growers for the main varieties grown in the scheme. Emphasis is placed on type, vigour, number of stems and desirable tuber characteristics. So far several lines of Sebago have been sent to the Biological and Chemical Research Institute (Rydalmere) for disease eradication and pathogen testing. These lines are now being multiplied in the field and will enter trials next season. The superior clones selected from this work will provide a new source of propagating material for the tissue culture laboratories.

FIELD PLANTINGS

The planting material leaving tissue culture based programs must obviously undergo a succession of multiplications before large amounts of certified seed are available for sale. In order to minimise disease reinfection in the field, certification agencies limit the number of field generations. Such limited generation schemes work like a pipeline. There is an annual infusion of transplants or minitubers into the "top end" of the scheme and after a limited number of field multiplications, certified seed passes out the "bottom end" of the scheme.

The advantages of minimal field generations are:

Disease Reduction:

—reduction in seed exposure to field borne diseases;

—reduction in accumulated expression of tuber borne diseases;

—rapid introduction of new varieties.

In New South Wales there are four field generations which are called:

Foundation	(G1)
Basic	(G2)
Mother	(G3)
Certified	(G4)

The first field generation (Foundation) is derived from plantings of transplants or minitubers. Transplants are hand planted by the Foundation seed growers and require quite a lot of land cultivation. In Crookwell, four to six tubers per transplant, depending on variety. Minitubers by comparison can be planted and managed in a more conventional manner and yield six to ten tubers per plant.

This first field generation is grown by two or three selected Foundation seed growers and is inspected by a pathologist three times during the growing season.

The next field generation (Basic) is grown by four to five selected growers and the Basic seed produced is distributed to all certified seed growers for them to produce Mother and Certified seed. All Basic, Mother and Certified seed crops are inspected in the field by NSW Agriculture and Fisheries Inspectors at both flowering and maturity. All seed tubers are then inspected after grading. For crops to pass as Certified they must comply with the tolerances as shown in Table 1.

Seed is not allowed to be cut in any of the field generations without special application to SPAC. Such applications are only forwarded to SPAC if the relevent grower organisation finds reason to back the proposal, for instance if there is a shortage of seed of a particular variety. Since seed cannot be cut, emphasis is placed on setting the maximum number of tubers per plant and controlling tuber size by killing tops early.

With only four field generations the New South Wales scheme is very short by world standards. This means that New South Wales seed growers have very little room for absorbing the high cost of early generation planting material. Thus, the industry is keen to develop methods of reducing the cost of material leaving the laboratories and on farm facilities. To this end, Biflora is undertaking a world class research and development project aimed at simultaneously reducing unit costs and increasing output numbers from their facility.

Looking ahead, we see the -New South Wales Certified Seed industry working increasingly closely with their buying outlets. Already some districts are beginning jointly funded research with seed potato buying groups. Such co-operation between seed growers and buyers should strengthen the level of understanding and provide benefits for both groups into the future.

TABLE 1: Accepted tolerances for crops to pass as Certified

DISEASE	TOLERANCE AT INSPECTION
Leafrolling virus	1 in 100 plants
Mosaic other viruses	1 in 100 plants
Potato spindle tuber viroid	Nil
Bacterial Wilt	Nil
Other diseases	2 in 100 plants
Total diseased plants	2 in 100 plants
Foreign varieties	1 in 10000 plants

Note: At tuber inspection there is a nil tolerance for Powdery Scab.

What's new in Victorian certified seed

Tony Pitt is the Executive Officer of the Victorian Certified Seed Potato Growers Committee

Victorian certified seed potato growers celebrated their first fifty years of certified seed production last year.

In view of the other changes that have come and gone in the potato industry in this period, fifty years is a major achievement. But it is also an opportune time to reflect where seed potato production has come from, and where the future might lie.

HI-TECH COMES TO SEED POTATOES

It's significant that of the seven seed potato inspectors operating in Victoria at present, four of them have a Diploma in Agriculture and one has a Bachelor's Degree. In days gone by, the prerequisite for a potato inspector was good solid industry experience and a skin as thick as a good potato. The change to inspectors with tertiary qualifications reflects the greater complexity involved in seed potato production today.

Behind numerous footbaths, locked doors and other disease security measures, a small nucleus of highly tested potato tubers are kept at the Plant Research Institute, Burnley. These nucleus tubers are used to provide the meristematic tissue for tissue culture of potatoes. Meristematic tissue is plant tissue that is active in cell multiplication. After appropriate chemical stimulus and lots of cutting, small tubers, referred to as minitubers, are produced in a glasshouse for distribution to foundation seed growers around Victoria.

Initially there were just two foundation seed growers for multiplication of minitubers to foundation seed. Now there are ten. Their role is to take minitubers from the glasshouse and, using a one year in six rotation, multiply this material for three generations to produce foundation seed. The task is highly skilled, as the disease tolerances in foundation seed production are extremely low. The ten foundation seed growers share the

work load by specialising in certain varieties, and attempt to refine production methods to achieve the highest multiplication rates possible.

Most foundation seed growers multiply about six or seven different varieties. Keeping these varieties separate for three generations requires a certain amount of care, as well as ensuring that each variety has the optimal conditions for growth. But foundation seed growers also endeavour to keep the clones separate! That is, all the minitubers and subsequent field produced tubers which came from a single nucleus tuber are kept separate from another clone of the same variety which came from another nucleus tuber. The purpose is to see if the clones are different. If they are, the weaker clone is discarded.

In the past few years there have been no instances where any clones have ever been discarded. But it's comforting to know that someone is checking. It is possible that a slight genetic change may occur in one of the nucleus tubers, and without this clonal separation on the foundation seed farm, a slight change might not be detected.

The foundation seed grower's job is important and it is essential that he has the confidence of other certified seed growers. They take foundation seed from him to plant for a further two generations to produce certified seed. But the foundation seed grower's skill is able supported by another small group of certified seed growers who have decided to undertake some positive clonal selection work of their own.

Clonal selection involves planting up to 1,000 randomly selected tubers into family groups of three plants. Each family comes from the one tuber. A highly skilled observer examines the family groups for differences during the growing season and selects between twenty and fifty of the best clones for replanting. Most growers and technicians working with potatoes would be lucky to spot any differences at all, but these skilled growers seem to be able to select a line within a line that has some particular attribute or attributes that they desire. After a number of field generations and further observations, the eventual aim is to select just one new clone out of the original 1,000.

When definite improvements have been made, the newly selected clone is returned to the tissue culture unit at Burnley and included in the minituber program. A further five generations must elapse before the new improved clone becomes available as certified seed. Over the past few years, new clones of Tarago and Coliban have become available as certified seed. An improved clone of Sebago will be available as certified seed in 1991 and other new clones of Bison, Sequoia, Cariboo and Exton are at present on their way through the system.

SELF MANAGEMENT

Of course clonal selection is not new. It's been used for many years as a method of reducing or eliminating viral and bacterial diseases from potatoes. What is new is the acknowledgement that there are gains to be made in clonal selection over and above those due to elimination of diseases alone. There are small genetic changes in potatoes occurring all the time and clonal selection capitalises on those changes for improving the variety.

As well as an increase in clonal selection work within the Victorian certified seed industry, there is also an increase in the industry's involvement in the management of the seed scheme. Initially the scheme was established and managed by the Victorian Department of Agriculture and Rural Affairs (DARA). An advisory committee was formed to provide a formal communication between DARA and the growers, but the decisions were made by DARA. Over time, the responsibility of this committee has increased, and, through grower levies, it now supports its own executive officer to manage many of the affairs involved in ensuring smooth operations of the certification scheme.

While DARA's management of the scheme in Victoria is contracting, the same may not be true of the certification fees. A recent internal study by DARA has shown that it costs the Government several times more money to run the inspection and other services of the scheme than is recouped by way of certification fees and royalty payments. In the era of

fee-for-service from Government departments, it is likely that certification fees may rise in the near future. This will be an extra cost which will in turn be borne by the whole of the potato industry.

With the appointment of an executive officer, Victorian seed growers have become much more active in promotion and marketing, and sponsoring key areas of research.

BUYER LED SEED INDUSTRY

Seed potatoes used to be a take it or leave it option. Most buyers used to take it because there wasn't much else offering. One of the natural results of recent grower involvement in marketing of seed potatoes is that seed growers have started to become more informed as to what their customers want.

Seed contracting has been one result of this increased involvement. Growers who are locked into a fixed price for their own product do not want to be confronted with a variable price for one of their major inputs. And for some varieties, the standard seed size of 35 to 250 grams is not appropriate; a contract grade of 35 to 350 grams allows a greater productivity for the seed producer, while still providing suitable planting for the buyer.

Interstate buyers of seed are asking for a round seed sample. If planting conditions are unfavourable, varieties like Sebago and Sequoia can be badly affected by seed piece breakdown on Cut seed lines. While round seed may be more expensive, the extra returns more than justify the higher planting cost in winter and early spring plantings. The production systems for producing a 35 to 150 gram sample have been established by DARA, and several growers are now attempting to put this into practice.

A final aspect of the buyer led seed sales from Victoria is the grower awareness of several small but defined niches for specialtv varieties within the industry as a whole. In 1978, there were just eight varieties of potatoes available as certified seed. Now there are twenty-eight. Some of the new varieties such as Denali, Norchip and Snowchip have been introduced for long term storage in the processing industry. Toolangi delight is a purple skinned variety which is highly distinctive in appearance and flavour and has a special appeal for home gardeners. Patrones and Bintje are yellow fleshed varieties which are popular with some consumers, and the variety Desiree appeared at one stage to have significant export potential. Lemni Russett and Spunta are alternative french fry processing varieties, the former being less exacting to grow but very similar to Russett Burbank.

THE WAY AHEAD

Recently registered under Plant Variety Rights is the variety Winlock. This is the first Australian bred potato variety to be registered under PVR and is an important step for the future of the industry. Reduced Government expenditure on programs such as potato breeding is a present reality, and unless funds can be generated from PVR and redirected into the breeding program, Australia has the very real threat of losing its only potato breeding program at the Potato Research Station in Victoria.

Seed potato inspection services will remain the domain of Government departments, as buyers want a truly independent assessment of the health standard of seed crops that they are purchasing. But the Victorian Government has joined its State counterparts in attempting to shed the responsibility of management of the certified seed potato scheme. It is probable that in the future it will contract for providing inspection services only, and all the organisatin behind the scheme and the supply of minitubers will be provided by the industry itself.

There will undoubtedly be further gains in technology in seed production. Another form of minitubers, called microtubers, has already been the subject of research and a modified version of these may become the future planting material for foundation seed. Genetic engineering and somacloning opens up a vast array of improvements which may replace some of the clonal selection work at present being undertaken by growers.

At present Victoria produces around 27,000 tonnes of certified seed potatoes. This is by far the dominant seed potato scheme in Australia, and production is increasing at an average of three percent per year. However, less than 25 percent of crops planted in Victoria alone are planted from certified seed. With the present economic climate declining returns from potato growing, it is possible that only highly efficient producers will remain in the industry over the next five to ten years. These will be the growers who are using certified seed and benefit from the yield improvements inherent in the technology and professionalism behind its production.

Growing Atlantic Potatoes

Geoff Lomman was a Senior Vegetable Advisor at the Lenswood Horticultural Centre in South Australia. He is now the Principal Horticulturist (Vegetables) in Orange, New South Wales.

The potato variety Atlantic is widely grown in North America and in central eastern Australia. It was produced from the cross of B5141-6 (Lenape) x Wauseon by the United States Department of Agriculture in 1969. It was subsequently released in 1976 and although it is primarily a crisping potato, it can also be used to supply the fresh market.

Atlantic has become increasingly popular in Australia due to its superior crisping qualities. Despite crops producing reasonably well, little information has been written applicable to Australian conditions.

SEED TREATMENT

Atlantic sometimes has an uneven distribution of 'eyes'. More and larger sprouts are sometimes found on the stem end of the tuber than elsewhere.

In states where the chemical Quicksprout® is registered, it is possible to promote even sprouting by treating the tubers at one litre for every 2.5 tonnes of seed. Care must be taken to ensure even application of the chemical so that plants will consistently emerge.

SPACING

In ideal conditions, Atlantic produces a vigorous vine with a large root system. Oversized tubers can therefore be a problem if plants are spaced widely. Hollow heart can also be a problem when sets are widely spaced or when conditions are hot.

The ideal plant density is between 44,000 to 48,000 stems per hectare. To achieve this, sets should be planted 23 to 25 cm apart within the row using a standard tractor width of 1.8 m. A set size of around 55 g will plant 2.5 t/ha.

Round seed will produce more stems than cut seed at the same spacing, but the larger the round seed, the more stems are produced. Large round seed (greater than 65 g) is usually spaced wider than smaller seed, but the amount planted per hectare remains the same.

With large round seed, spacing between sets can increase to 35 cm with the amount of seed per hectare remaining the same. This will result in approximately 1.5 stems produced per set.

SEED PIECE BREAKDOWN

Atlantic is susceptible to seed piece breakdown when cut. Seed piece breakdown will affect plant density and result in large tubers and increased susceptibility to hollow heart. Tubers in excess of 350g are undesirable for processing.

Planting seed directly after cutting is dangerous. Cut tubers should be 'cured'. Curing is the formation of would tissue on damaged areas of the tuber. The greater the depth of wound tissue, the better the curing. Thick wound tissue helps to prevent seed piece breakdown.

HERBICIDES

Atlantic is sensitive to the herbicide metribuzin (Lexone®, Sencor®) particularly in cool weather. In South Australia, rates can be reduced from 0.5 to 0.8 kg/ha to 0.25 to 0.3 kg/ha but permits may be required to do this in other States. Irrigation should be applied immediately after spraying.

SOIL MOISTURE

Soil moisture should be sufficient to maintain even growth. Uneven growth can cause hollow heart. Tensiometers can be used to monitor soil moisture levels.

Many South Australian growers, by monitoring soil moisture using neutron and pan evaporation, have increased irrigations. Using pan evaporation seems to work very effectively.

FERTILISER USE

Any fertiliser program that causes uneven growth can induce hollow heart. Heavy applications of nitrogen during growth should be avoided.

TOP KILLING

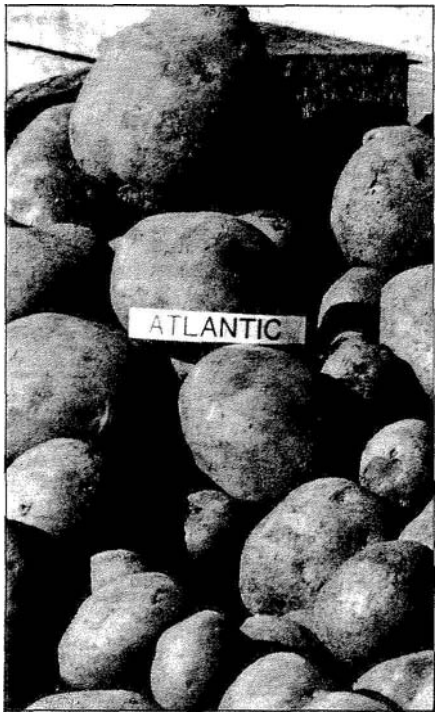
Tuber size can be controlled by monitoring the size of tubers in the field. Kill tops when the desired tuber size is reached. Eighty (80) to 250 g tubers are required for processing. Gramoxone®, Reglone® or Agraquat® applied seven (7) to fourteen (14) days before harvest will prevent tubers growing too large. Top killing helps to firm the immature tuber skin.

HANDLING

Atlantic is susceptible to bruising at harvest and black areas can result on the cooked crisp. Careful harvest and handling is essential particularly when harvesting immature tubers.

TOP COVER

North American experience indicates that internal heart necrosis develops when top cover diminishes. This is a brown pigment that appears in internal flesh. Symptoms can develop in storage.



Efficient irrigation — a high priority in W.A.

Murray Hegney is a Vegetable Research Officer at the Horticultural Research Centre, Manijump in Western Australia.

Most potato growers realise that high yields of quality tubers are very dependent upon an adequate supply of soil moisture. The importance of good irrigation management has become particularly apparent to Western Australian producers in recent years. This is the result of some major changes which have occurred in the W.A. potato industry in the last three years.

In 1987, Edgell-Birds Eye opened a 50,000 tonne capacity french fry processing factory in Manjimup. Local growers, who had previously grown mostly fresh market potatoes, initially found that achieving high yields of large tubers with a high dry matter content was a difficult task when using their conventional management practices.

At about the same time, the W.A. Potato Marketing Authority, which controls the marketing of ware potatoes in W.A., introduced a payment scheme based on tuber quality (eg size, shape, presence or absence of tuber defects and blemishes). Also, APD Snackfoods Pty. Ltd. have introduced an incentive scheme whereby crisping potato producers are paid an extra $7 per tonne for each percentage increase in tuber dry matter above the minimum of 18 percent. Finally, the availability of water is an ever increasing problem, especially for growers on the Swan Coastal Plain.

The combination of all these factors has forced growers to carefully examine their production methods for areas where improvements can be made in order to improve the quality of potatoes they are. producing and to increase yields. Irrigation management is one area that has been identified as providing significant scope for management.

EARLY WORK

• *YIELD*

An irrigation trial conducted at the Manjimup Horticultural Research Centre in 1988/89 examined the effect of total water application rate on the yield and specific gravity of three potato varieties—Kennebec, Russet Burbank and Cadima. Processing yield (tubers weighing more than 100g) increased as total water applied increased up to 457mm. Water application levels higher than 475mm did not result in increased yield in this season.

TABLE 1

Seasonal crop factors for Kennebec, Cadima and Russet Burbank potato varieties — Manjimup WA

Weeks after Emergence	Kennebec	Cadima	Russet Burbank
0—2	0.5	0.5	0.5
2—3	0.7	0.7	0.7
3—4	0.8	0.7	0.8
4—5	1.0	0.9	0.9
5—8	1.0	1.0	1.0
8—10	0.9	0.9	1.0
10—12	0.7	0.8	0.8
12—15	0.6	0.7	0.7
15—17	0.4	0.6	0.6
18—20	—	0.5	0.5

The yield increases observed were due partly to an increase in the number of tubers per plant and partly to increases in average tuber weight. The decline in average tuber weight at high water application rates could indicate that these plants became nitrogen deficient late in their growth period, due to leaching, and so did not reach their full yield potential. This serves as an indicator of the possible effects of over watering.

• *SPECIFIC GRAVITY*

The overall trend in this experiment was for the specific gravity of tubers to decline as the water application rate increased. Notable however, was that the specific gravity of Russet Burbank tubers was unaffected by water application rate. Growers have found, with this variety in particular, that if adequate irrigation is combined with good nutrition and disease control, very high yields of high dry matter potatoes can be produced. This general principle applies to all varieties but, as illustrated in this experiment, some varieties are more sensitive to poor irrigation management than others.

• *CROP FACTORS*

Daily crop water use was also monitored in this initial experiment using a neutron probe. This allowed seasonal crop factors to be determined for each variety (Table 1). A crop factor here is defined as the ratio between daily water use and daily evaporation. The most noticeable difference between the varieties is that Kennebec reached its peak crop factor earlier than Cadima and Russet Burbank. Also, the longer growth period of Cadima and Russet Burbank resulted in the crop factors for these varieties remaining higher for longer than the crop factors, for Kennebec.

FUTURE WORK

While this initial experiment provided a clear indication of the

effects of over or under watering on potato yield and quality, further work is required to clearly define the optimum irrigation parameters for different varieties on different soil types. Efficient irrigation management requires that growers know:

1. The rooting depth of the crop in their soil;
2. The total available water content within the active root zone;
3. How much of this available water the plants can use before they experience a stress;
4. How to determine crop water use and so schedule each irrigation;
5. The output and accuracy of their irrigation system.

To help answer some of these questions, a three year research project has been jointly funded by the W.A. Potato Growing Industry Trust Fund and the Horticultural Research and Development Corporation. The project is currently in its first year of operation.

As part of the project, a survey aimed at monitoring current irrigation practices within commercial crops is being undertaken. The survey is providing an opportunity to assess the magnitude of under or over irrigation that is occurring within commercial crops in the Manjimup/Pemberton area of W.A. A neutron probe is being used in the survey and hence, it will be possible to take preliminary measurements of the moisture holding characteristics of the soils within the survey area. This important information will be made available to growers upon completion of the survey.

Two field experiments are also being conducted in this first year of the project. The first experiment is examining the effect of irrigation at different soil moisture deficits on the growth and yield of two potato varieties—Cadima and White Rose. The aim here is to establish, for the soils of the Manjimup/Pemberton area, how much of the available soil moisture can be depleted between irrigations without the crop experiencing a moisture stress.

The second experiment is assessing the effect of the interaction between irrigation rate and nitrogen rate on nitrate levels within the plant at various growth stages and yield.

In the second and third years of the project further commercial crop surveys will be carried out. Experimentally, the aim will be to refine the optimum soil moisture conditions in relation to crop growth stage and to further examine varietal differences in response to irrigation. It is our aim that by this combination of grower surveys and experimental work that a comprehensive set of irrigation guidelines can be formulated by which growers can confidently and efficiently water their crops. Such guidelines are vital to an industry which is now faced with demands for quality potatoes and which in time could be faced with water shortages due to demands for other uses.

Irrigation management of potatoes

Brian Chung is a Senior Vegetable Horticulturist and Peter Jolly a Vegetable Horticulturist with the Department of Primary Industry at Devonport, Tasmania.

IRRIGATION FREQUENCY AND POTATO YIELD

Skilful management of irrigation results in improved crop yields and economic use of resources. Detailed research by the Department of Primary Industry, Tasmania, has found that the irrigation frequency for the best marketable yield and quality of Russet Burbank potatoes was dependent on soil type (Table 1).

On well structured krasnozem soils, 50mm of irrigation every nine to ten days gave similar yields to more frequent irrigation intervals. On sandy soils, about 30mm of irrigation every six days gave better yield compared with less frequent irrigation. These irrigation guidelines can be refined for individual crops by using various irrigation scheduling techniques.

CURRENT IRRIGATION SCHEDULING TECHNIQUES

Techniques currently available for making irrigation scheduling decisions include in-field evaporation tanks, budgeting with evapotransporation values, tensiometers and neutron moisture meters. All of these methods provide valuable information for irrigation decisions, but none gives direct measurements of the actual plant water status. Various techniques to directly determine plant water status have been available for many years but most are more suited to laboratory than field use.

Peter Jolly testing the infra-red thermometer on a potato crop.

TABLE 1

Irrigation frequency and Russet Burbank potato yield on a well structured krasnozem soil and a sandy soil in Tasmania.

	Krasnozem Soil Rocky Cape N.W. Tasmania		Sandy Soil Cressy Midlands Tasmania	
	Frequent	Infrequent	Frequent	Infrequent
Total water applied (mm)	420	400	343	310
No. of irrigations	12	8	11	6
Average intervals between irrigation (days)	6	9	6	10
Marketable yield (t/ha)	56	58	78	70

FIELD USE OF INFRA RED THERMOMETERS TO AVOID "HOT" POTATOES

Recent developments in infra-red thermometry have led to the manufacture and availability in Australia of an easy to use infra-red thermometer (IRT) for irrigation scheduling. The IRT is a hand-held electronic 'gun', similar in appearance to a police radar gun. The IRT determines foliage

temperature by measuring the infra-red radiation emitted by the crop. From this, it calculates the amount of water stress the crop is experiencing. Irrigation is needed when crop water stress passes beyond a threshold value. The uniform ground cover developed by potato crops makes them a target ideally suited to IRT scheduling of irrigations, as exposed soil can interfere with measurements.

The IRT provides a rapid and accurate method of directly measuring plant water status Using an IRT is deceptively easy—you simply point it at the crop and press the button to take a reading. However, correct use requires allowance for environmental factors, in particular humidity and sunlight.

Preliminary work by the Department of Primary Industry Tasmania during the 1988/89 season with commercial crops of Russet Burbank potatoes indicated that the IRT has potential as an accurate, easy to use irrigation scheduling tool for Tasmanian conditions. Detailed experiments are being carried out in 1989/90 at Forthside Vegetable Research Station to further calibrate the IRT for potatoes. This research will allow the fine-tuning of current irrigation recommendations.

Other crops being tested during 1989/90 season are bulb onions, green beans, poppies and pyrethrum. This study is one of the first in Australia using IRT as an irrigation scheduling tool for vegetable crops.

Irrigation uniformity essential for high yields

Geoff Lomman was formerly a Senior Vegetable Advisor in South Australia. He is now the Principal Horticulturist (Vegetables) at Orange in New South Wales.

CRITICAL WATERING TIMES

Even application of optimum quantities of water is critical during the tuber initiation and yield formation stages of potato growth.

Tuber initiation is the setting of tubers and occurs two to three weeks after emergence or four to seven weeks after planting. Soil moisture should be adequate at this time because the number of tubers that set will determine the ultimate yield.

For many South Australian potato crops, tuber initiation occurs at the hottest time of the year and moisture stress can easily occur at this time.

In an article on potato irrigation from Victoria, Pitt (1983) says that "Australian potato varieties do not naturally set large numbers of tubers and that in order to encourage tuber set, it is important not to allow soil temperatures to rise much above 25°C. At higher temperatures, many of the small, newly initiated tubers are re-absorbed and the plant may be left with only two or three tubers. Irrigation water applied at this stage will keep soil temperatures down".

Tuber bulking occurs at 60 to 80 days after planting and adequate soil moisture is critical at this time to size the tubers.

Also, when irrigating:

- avoid watering to get the crop up. If the soil is dry before planting, consider pre-irrigating. If the crop is watered heavily either just before or just after emergence, seed piece breakdown and fungal wilt diseases can occur.

- if tubers of high specific gravity are required, try to finish the crop dry. Obviously this can be a problem if heavy rainfall is received late in the season.

Harvesting in very dry conditions can cause significant tuber damage so light irrigation prior to harvest can be beneficial in some years.

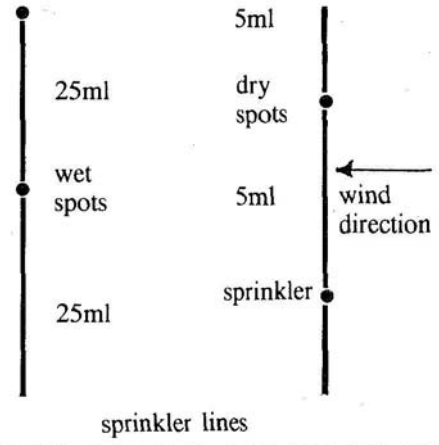
IRRIGATION SURVEY

Potato yields in excess of 90 t/ha have been achieved on some properties in South Australia but only when attention is given to irrigation and nutrition. High yields can only be achieved when optimum quantities of water are applied evenly across the paddock.

An irrigation survey carried out in the Adelaide Hills during 1984-85 showed that five times as much water was applied to the wettest part of the paddock compared to the driest.

Figure 1 shows one system that had consistently dry patterns alongside the sprinkler line. More even distribution of water was achieved by a minor modification to the sprinkler spacing and installation of a tail jet on each sprinkler.

FIGURE 1
Uneven water patterns observed on a potato paddock in the Adelaide Hills during 1984/85 (water caught in cans over one hour of irrigation).



In this example, dry spots covered 10% of the planting. With a 20 ha crop, we can assum 2ha of the planting would be under watered. Some growers cope with this by placing more water over the entire paddock, thereby applying optimum quantities of water to the driest spots. This significantly over waters a large percentage of the paddock which will reduce yields.

The Tasmanian Department of Primary Industry demonstrated that yield losses on the dry areas of a paddock could be up to 7 t/ha depending on how low soil moisture levels were allowed to drop. Yield losses were mainly caused by small tuber size.

CAUSES OF POOR UNIFORMITY

The most common causes of poor irrigation uniformity are a variation of discharge through the irrigation line, uneven sprinkler pattern or extremely variable wind conditions.

The most common cause of variable discharge is pressure variation. Pressure variation for sprinklers throughout the system should be between plus or minus 10% of average pressure. Running sub-mains up hills or incorrect sub-main size is the most common cause of the problem. Changing nozzle sizes to reduce this variation is a solution, but this will result in uneven sprinkler patterns because sprinklers produce different water patterns with different nozzle sites at the same pressure.

The operating pressure of sprinklers can be checked by attaching a small metal tube to a pressure gauge and placing the end of the tube into the nozzle of the operating sprinkler.

ASSESSING UNIFORMITY

Sprinkler uniformity can be determined by laying out between 20 to 30 straight sided identical cans in a grid between sprinklers. Figure 2 shows the layout of the cans for easily assessing sprinkler patterns. Water caught in the cans is measured and the following formula can be used to assess the distribition uniformity of the sprinklers.

$$\text{Distribution uniformity} = \frac{\text{Average volume of water caught in 25\% of the cans which have the least depth of water}}{\text{(\%) average volume of water caught in all cans}} \times 100\%$$

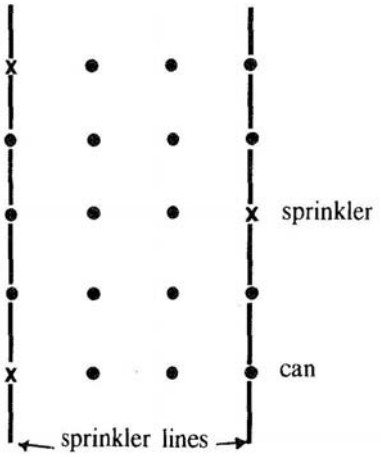
A distribution uniformity greater than 75 percent is quite satisfactory.

Uneven sprinkler pattern can largely be corrected by:

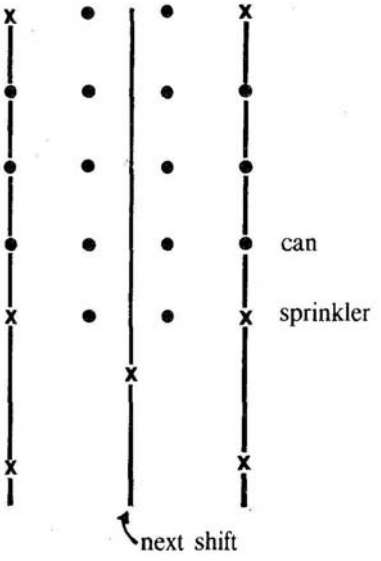
- designing the irrigation system according to manufacturer's recom mendations which will usually include spacing sprinklers at 60 percent of the diameter of throw of the sprinkler.
- avoiding running sprinklers parallel to prevailing winds.
- irrigating during calm conditions, for example, at night.

FIGURE 2
Can layout for various irrigation systems

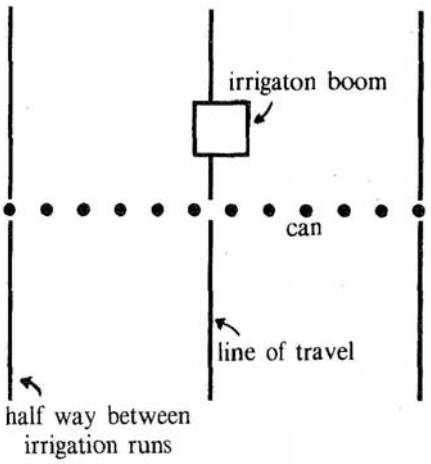
(1) Solid Set



(2) Handshift Lines



(3) Irrigation Boom or Gun Sprayer



Leave 50% of cans in place to record the remainder if irrigation in a subsequent shift.

Soil erosion study shows tillage gain

Giles Forward is at the Lenswood Horticulture Centre, with the Department of Agriculture, South Australia.

Soil erosion can be a problem in vegetable crops grown in sensitive water catchment areas such as those found in the Adelaide Hills.

Structures such as grassed waterways and contour furrows can reduce soil loss following harvest, but more information is needed on how erosion can be reduced during growth.

A tillage experiment has been carried out to assess methods of reducing erosion in potato crops during growth.

Kennebec cultivar was used in the experiment, with the following tillage treatments:

- Mouldabard plough, disc cultivate (twice), scarify, rotary hoe.
- Rotary hoe, scarify
- Rotary hoe
- Disc cultivate (twice), scarify.

A base fertiliser was banded alongside tubers in all plots and nitrogen was side-dressed during growth according to plant sap nitrate levels.

The first treatment is representative of conventional tillage practices where the soil is broken down to a moderately fine tilth.

The other treatments are reduced tillage combinations that produce less soil disturbance.

In addition to the above treatments, half of the trials plots were deep ripped (to 35 cm) with an Agrowplow®.

Pasture at the trial site was killed with knockdown herbicide to prevent 'transplanting' of weeds.

Tillage treatments did not significantly affect the vegetative growth of plants.

Further trial work will clarify the effects of tillage on the release of soil nitrate from plant residues in different soil types.

There were no significant differences between yield, tuber quality and tuber size for all tillage treatments. Yields averaged 63.5 t/ha.

The 'plough-pan' that is common in some intensively cultivated soils was not apparent at the trial site and deep ripping had no effect on total yield.

Clods present in the last treatment resulted in the production of 3.4 t/ha of green tubers.

Tillage costs are small compared with total costs of production.

The overall returns for conventional tillage was almost the same as reduced tillage, although market returns for the last treatment was slightly reduced because of green tubers.

The single rotary hoe operation in the second and third treatments enabled good workability of the soil, which was at least as good as conventional tillage.

Disc cultivation and scarifying in the last treatment produced clods that built up in front of the planter blades and made banking of rows difficult.

Soils and paddock history at the trial site are not the same as in the main potato growing areas.

The minimum amount of tillage necessary to produce a successful crop may vary between paddocks and even within paddocks.

This trial has shown that economic yields are possible when tillage is reduced to one or two passes on some soil types.

Potato grub control with sting

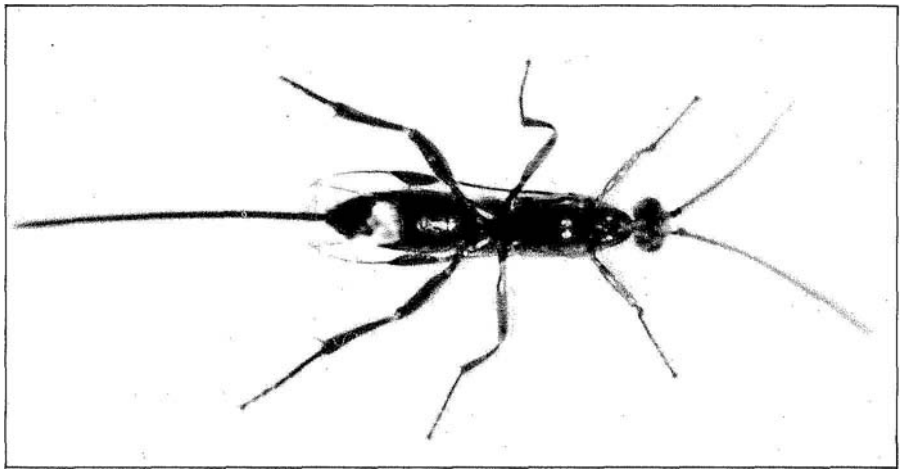
Tony Pitt is an Executive Officer with the Victorian Certified Seed Potato Growers Committee.

Spraying only once for grub control is probably the worst decision you can make, according to Dr Paul Horne of the Plant Research Institute (PRI), Burnley. A single insecticide spray usually results in potato grub increasing in a crop rather than decreasing.

Dr Horne is the leader of a research team investigating integrated pest management at the Plant Research Institute. Victorian Certified Seed Potato Growers are sponsoring research into integrated pest management of potato grub (or potato tuber moth) through their Gippsland branch.

The research program is now in its third season and has turned up some particularly valuable information for potato growers. It seems that three species of parasitic wasps that were released almost 25 years ago by the CSIRO have been widely established and are big contributors toward controlling potato tuber moth without pesticides.

These wasps are only very small. The largest and most important of the three species is *Orgillus lepidus* and is about 5mm long. This wasp has a long tail, called the ovipositor, which it uses to penetrate the leaf where the grubs are tunnelling, and lays an egg into the body of the grub. The grub dies and a new wasp emerges in place of an adult potato tuber moth.



For the wasps to become active, there firstly has to be a build-up of potato tuber moth. After about two to three weeks lag, the wasps start to become very active and can have a major impact on the pest.

One of the problems with the wasps is that they are far more sensitive to most insecticides than the potato grub. The first spray of the season only really succeeds in wiping out the wasps, leaving enough potato tuber moths behind to result in a population explosion of the grub. If a spray program is necessary for potato grub control, don't leave it until the tops have almost finished and applying only a single insecticide spray. This will only increase the risk of grub damage.

The research team at PRI Burnley is presently investigating how to best manipulate the potato crop environment to assist the wasp in its parasitism. Manually spreading large numbers of wasps through a crop is being considered as an alternative to pesticide spraying. Also carefully monitor the potato tuber moth population to determine when insecticides can be applied with maximum effect. This is less likely to disrupt beneficial parasites.

If Dr Horne's team can come up with an effective grub control program which relies on less pesticide use, the benefits will not only be to the Victorian Certified Seed Potato Growers of Gippsland. The image of the whole potato industry would be improved if it were seen that less chemicals were used.

Variety tolerance to Powdery Scab

Robert Floyd is Plant Pathologist and Margaret Graham is Horticultural Advisor with the Western Australian Department of Agriculture.

Seven potato cultivars were evaluated for tolerance to Powdery Scab *(Spongospora subterranea)* and yield. Three similar experiments were planted on sandy soils in the Perth metropolitan area over a three day period from June 18 to 20, 1988 on growers properties and at the Vegetable Research Station in Medina.

Crops were allowed to mature as late as possible before digging to encourage development of any infection. After digging, tubers larger than 80g were sorted into four infection classes, nil, light, medium and heavy, and weighed separately. An infection index was calculated using the formula—

$$I = \frac{(\text{light} + \text{medium} \times 2 + \text{heavy} \times 3) \times 100}{(\text{total} \times 3)}$$

The index indicates the proportion of tubers that were scabbed but it is weighted for the severity of the disease. A high index indicates that there was a large percentage of heavily scabbed potatoes.

Locations 1 and 3 produced tubers heavily infected with powdery scab. On these properties the standard of cultivar Delaware (also known as White Rose) was the most severely affected by powdery scab and had the lowest yield of clean tubers. Katahdin and Exton produced the highest yields of clean (unseabbed) tubers.

With low scab pressure (in location 2), all cultivars produced similar marketable yields apart from Kennebec. Kennebec's emergence and maturity lagged behind the other cultivars at all sites and yielded poorly.

Kennebec, Bremer, Geographe and Atlantic were intermediate or variable in their reaction to scab.

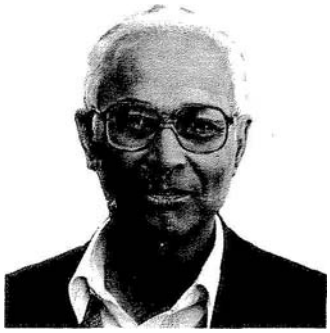
The low scab index shown by Katahdin and Exton confirmed the reported resistance to powdery scab of these two varieties. Their high yields in these experiments makes them worthy of further industry evaluation.

Kennebec tuber affected by Powdery Scab *Spongospora subterranea*.

STATE ROUNDUP

TASMANIA

Paddy Regel is a potato specialist with the Department of Primary Industries, Burnie, Tasmania.



The potato industry is most significant in Tasmanian horticulture. Potatoes are now grown on more than 7,000 hectares annually with production over 300,000 tonnes and a farm gate value in excess of $55 million.

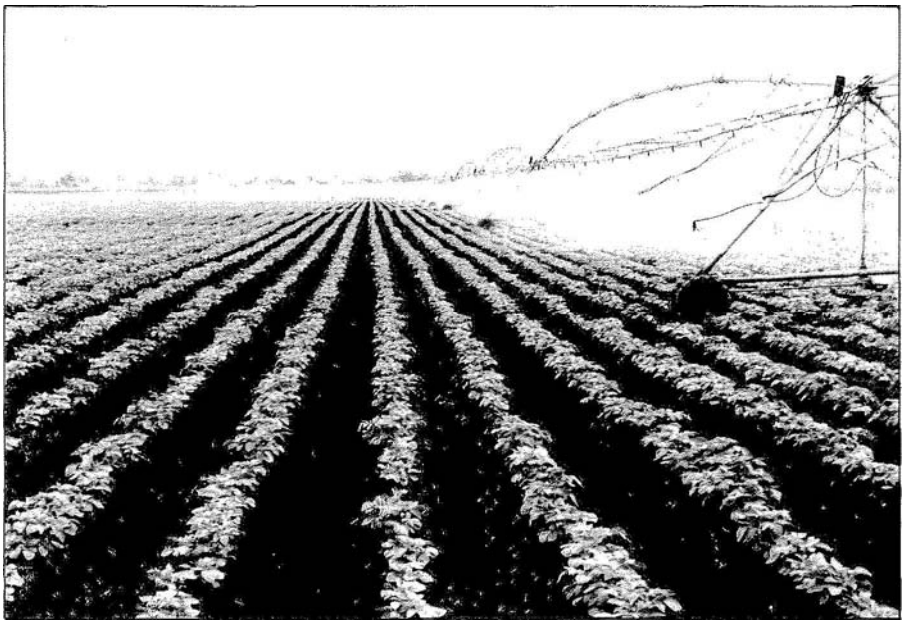
Approximately 90 percent of the produce is processed, five percent consumed on the fresh market and five percent used for seed production.

About 75 percent of production is on the North West Coast and 20 percent in the North East, but production in many other areas of Tasmania is expanding.

The main cultivars grown are Russett Burbank and Kellebec but other cultivars including Bismarke, Brownells, Tasman, Up-to-Date, Bintje, Pontiac, Sebago, King Edward and Pink Eyes are also grown for fresh domestic consumption.

There are over 600 potato growers in Tasmania plus many people employed in the processing, servicing and sales sectors of this important industry.

This season all the crops have now matured and harvesting and storing of tubers is in full swing. Damage to tubers during harvest due to dry soil conditions has contributed to delayed storage. At the time of writing some 30 percent of the crop had been. harvested of which about 24 percent had been processed. Tuber quality to date is good, however, tuber size has tended to be smaller than normal, due mainly to processors requiring a smaller tuber as well as the dry conditions experienced during the growing period of the crop.



It is anticipated that all production targets will be met with some surplus of Kennebec grown in excess of factory requirements. This has caused some depression in the demand for fresh potatoes.

The Potato industry in Tasmania is buoyant with increased demand expected from the existing processors and anticipated new enterprises.

NEW SOUTH WALES

Jonathan Eccles is the Special Horticulturist (Vegetables) with NSW Agriculture & Fisheries at Gosford.

NSW Potato production can be divided into three district areas—Riverina, Coastal and Tableland.

The Riverina area grows over half the State's production and continues to expand. Two crops are grown annually, in spring and autumn, on irrigated sandhills to produce a clean skin potato. Although the majority of the crop is sold on the fresh market there has been an increase in processing crops with 40 percent of the spring crop now grown for crisping.

Coastal areas also produce two crops a year. The spring crop is grown for both the fresh and crisp processing markets while the autumn crop is mainly grown for the fresh market. Coastal production has declined over the years mainly due to uncompetitive small land holdings unable to accommodate modern mechanical production techniques.

Tableland production, with only one crop grown annually, has increased in recent years due to development of pathogen tested certified seed and crisp processing crops. The area sown to certified seed has increased by 19 percent on the previous season and over 2000t of seed has been grown this year.

Sebago is still the major variety grown in NSW accounting for 75 percent of the State's production followed by 15 percent Pontiac. Other varieties grown include Atlantic, Desiree, Kennebec and Norchip.

For the second consecutive year wet weather has markedly influenced potato production in this State. Sowings of the spring crops in the Riverina and coastal areas were later than usual as wet soils delayed preparation. Although market

prices during the spring months were $800 to $1000 per tonne, by the time most spring crops had begun to be harvested the prices had plummeted to $250. Despite wet planting conditions earlier, quallity was very good. Also, with late spring harvests, the crisping processors had difficulty sourcing supply.

Central Tableland crops experienced unusual hot conditions which reduced yield and quality and with little summer rain these problems were exacerbated in non-irrigated crops.

The current Riverina autumn plantings have increased with farmers hoping for a repeat of last year's high winter and spring prices. Delayed dormancy and soft rots in seed have caused erratic crop emergence and harvesting will be about a fortnight later than normal. Coastal autumn plantings have been- severely affected by prolonged rain and farmers have had to either replant or abandon this season altogether.

WESTERN AUSTRALIA

Peter Dawson is the Horticulture Adviser and Seed Potato Inspector for the Albany region with the Department of Agriculture, Western Australia.

The potato industry in Western Australia continues to prosper and expand. A total of 100,000 tonnes was produced in the last year. A little over half this amount is for the fresh market with the balance going to the french fry and crisp processors. The crop is grown on about 2,700 hectares with 10 percent of this grown in the Perth region and the balance in the South West from Bunbury to Albany. Total production will rise to 130,000 in the next two years to meet processors' demands.

The fresh market is controlled by the Potato Marketing Authority (PMA). Potatoes are now graded by merchants to Premium, Class 1, Class 2 and Waste and the growers are paid for each grade. This marketing system based on quality has seen many growers change their management practices and many have even relocated to sandy soils. Many growers have made full use of the system and are prospering.

The french fry industry, based at Manjimup, will continue to expand as soon as raw product is available. Growers continue to have mixed results with the preferred variety Russett Burbank. Kennebec has low dry matter particularly in Western Australia and may be phased out. The Western Australia variety Cadima has the fault of splitting at the cutters. Nooksac has performed well in Western Australia and is the likely replacement of Kennebec for early plantings.

The crisp industry will stay at its current level with only one manufacturer—Cocacola Amatil. The preferred variety is now Atlantic. Atlantic does not store well, but fresh supplies ex-paddock process well in Western Australia from October to July. Cadima is still the major storage variety. Whitu, Tarago and Kennebec are also grown.

Plant Quarantine have imposed many restrictions on growers in the Perth area as a result of the finding of Potato Cyst Nematode. Growers within a 5 km radius of the infestations at Munster are subject to additional restrictions. The most important requirement for these growers is that they can only grow PCN resistant varieties. This approach will reduce numbers of PCN cysts more quickly than if the land was not planted. Crops from infected sites may only be processed.

VICTORIA

Tony Kellock is the Manager of the Potato Research Station at Healesville with the Department of Agriculture and Rural Affairs, Victoria.

Victoria has traditionally been the largest potato producing State. In 1988/89, production exceeded 400,000 tonnes compared with the total Australian production of about one million tonnes. Yields have increased steadily, with the State average being about 28 t/ha compared with 6 t/ha prior to 1950. Changes in yield have been due to new varieties, extensive irrigation and disease control through the use of certified seed potatoes derived from pathogen tested stocks.

Production has also been influenced by increased demand for processing potatoes, which in 1966 accounted for on ten percent of production. In 1988 close to 50 percent of potatoes were processed. The emphasis on processing production for french fries and crisping has stimulated research into improved varieties and more efficient agronomic techniques. Factors such as specific gravity (dry matter), shape, size,

cooking quality (colour) and long term storage are particularly important in growing high quality processing potatoes. New varieties have seen a marked swing away from the industry's dependence on only one variety, Kennebec, for both fresh and processing. Processing production has also seen a major move towards contract growing and the development of improved techniques for storage and handling potatoes.

AREA: The total area planted to potatoes has declined steadily since 1950 (19,600 ha) to about 14,500 ha in 1987/88. This has been accompanied by a trend towards larger farms and fewer growers. Increased mechanization has reduced labour costs on larger units, and improved the efficiency of production. Large harvesters, travelling irrigators, seed cutters and large scale implements have forced many small, inefficient growers from the industry.

VARIETIES: In 1962, about 60 percent of the Victorian crop was Sequoia and three percent Kennebec. By 1976 Kennebec accounted for 40 percent of the total crop, with Sequoia declining to 10 percent. Sebago (25 percent) and Coliban (15 percent) emerged as important varieties for domestic use in the 70's, particularly with the advent of washed potatoes in supermarkets. More recently Russet Burbank (french-fries) and Atlantic and Tarago (crisps) have emerged as important varieties for processing. Atlantic, for example, released in 1984, has seen more than 2,000 tonnes planted in most States this year. This trend towards new varieties with improved processing quality will certainly continue into the next decade with support from the processing industries.

New varieties for domestic use have also been released from the breeding/ importing program based at the Potato Research Station, (P.R.S.) Healesville. These include Toolangi Delight (purple skin), Desiree (yellow flesh), Patrones (yellow flesh), Bison, Crystal and Bintje. Numerous cross-bred lines with both red and white skins are in advanced stages of selection for early release to the industry.

SEED PRODUCTION: Victoria was amongst the world's leaders in developing a pathogen tested seed scheme in 1967, which now forms the basis of the Victorian Certified Seed Potato Scheme. Current production reached a record 28,000 tonnes last season, produced by about 140 growers on 1,700 ha. The Thorpdale district produced about 12,800 tonnes in 1988 or 46 percent of tonnes certified, while the Central Highlands, Kinglake-Toolangi and Otway Ranges produced the remainder. There are currently over thirty varieties entered in the Scheme and this is likely to increase with new imports and breeding lines.

The Scheme is backed by tissue culture and pathology services of the Plant Research Institute (P.R.I.), Burnley in providing technical services.

SOUTH AUSTRALIA

Chris Williams is a Senior Research Officer (Potatoes) with the Department of Agriculture based at Lenswood Horticultural Centre in South Australia.

In 1988/89, 119,147 tonnes of potatoes were produced from 3,860 hectares with a gross value of $43.2 million. In the previous season the area sown was similar but the gross value was $29.7 million, mainly due to differences in price per tonne.

In recent years, production in South Australia stabilised and ranged from 100,000 to 125,000 tonnes per annum. An increase of over 10 percent is expected in 1990 and the potential to increase production further exists. This is due to the increased demand for processed potato products, the production of out-of-season potatoes for the fresh market and for new cultivars, such as yellow flesh potatoes.

Approximately 65 percent of South Australia production is marketed fresh and 35 percent is processed, mainly into crisps, chips and french fries.

The South East, Northern Adelaide Plains, Mount Lofty Ranges and Murray Lands are the main areas of production. The Northern Adelaide Plains and Murray Lands are the main areas of washed potato production for the ware market. The production of ware potatoes has increased significantly in Murray Lands in recent years and a 15 percent to 20 percent increase in area sown is planned in 1990. The cultivar Atlantic has performed well in the Mount Lofty Ranges and North Adelaide Plains this year provided it is processed immediately after harvest.

A new, high technology, crisp factory in Adelaide is seeking to increase supply by 1993, of quality South Australian potatoes, by 10,000 tonnes per annum.

Fresh chippers in Adelaide require an increase of 2,000 tonnes per annum of suitable quality potatoes.

In the Lower South East of South Australia a factory currently making frozen french fries is in the process of expanding its plant. It will have potential to expand three times the current production or process a total of 60,000 tonnes of potatoes in the district by 1993.

QUEENSLAND

John Kerr is the District Adviser at Gatton with Department of Primary Industries, Queensland.

Weather has seriously affected Southern Queensland potato production for the past two years. Excessive early April rain is again affecting prospects for the present autumn crop.

The high prices last spring benefitted only a small number of Lockyer growers who were able to plant and harvest before the November price crash. Harvest of the remaining Lockyer crop coincided with the later growing areas which emphasised the marketing problems at the end of the year.

The 1990 autumn crop was planted in hot dry conditions but establishment and early growth was good. Excessive early April rain has already affected potential yields.

Production areas in Southern Queensland are changing with increasing areas being planted on the Darling Downs, Burnett and coastal districts with some fall in area in the traditional growing areas. Just under 50 percent of the Queensland crop is grown in the Lockyer Valley.

The fresh market is the major outlet but the processing industry in Queensland is increasing its market share with at least 15 percent of the crop now directed at this market.

The potato industry on the Atherton Tableland in 1989 consisted of 80 growers. High yields and high prices in 1989 resulted in the production of 30 000t worth a gross value of $20 million which was well above the average production of 22 000t and gross value of $8 million. The market in 1989 was all domestic, with most sold on the wre market and the remainder for processing. Atherton Tableland production represents approximately 12 percent of total Queensland production.

The Tableland traditionally supplies out of season potatoes at a time when Australian ware potato supplies are low. The crop is marketed principally in Sydney. Because production is out of season and quality is generally good, the crop regularly attracts high prices.

There have been initial moves to grow potatoes on contract for processing. About 40 hectare of the variety Atlantic are to be grown during the 1990 winter months for delivery to Brisbane in September, October and November. If these trial plantings are a success, further significant expansion of the Tableland Potato Industry can be expected.

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