

# VEGETABLE

INDUSTRY REPORT 07 | 08



Know-how for Horticulture™





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## VEGETABLE OVERVIEW 2007/08

The vegetable industry strategic plan, Vegvision 2020, was launched by the Minister for Agriculture, Fisheries and Forestry, the Hon Peter McGauran, in September 2006. Vegvision 2020 targets doubling the 2006 value of fresh, processed and packaged vegetables in real terms by stimulating and meeting consumer preferences for Australian products in domestic and global markets.

The five strategic areas of investment have been identified as:

1. Delivering to changing consumer preferences and increasing demand.
2. Market recognition for quality, safety, reliable supply and innovation in products and services.
3. Internationally competitive Australian vegetable supply chains.
4. Advanced industry data and information systems to meet future needs.
5. Visionary leadership and managing change.

The Industry Advisory Committee (IAC) has been restructured to mirror these strategic imperatives. The IAC consists of representatives from each state and each strategic area, supported by the Advisory Groups, providing expert advice and the Working Groups, who assist in identifying the strategic areas requiring investment in pillar three: internationally competitive supply chains.

The initiative to drive development in these strategic pillars has been a focus of the restructured IAC since its initial meeting in March 2007. The IAC is responsible for acting on the strategic plan, Vegvision 2020. The IAC is also responsible for setting annual investment priorities and for making recommendations to Horticulture Australia Limited (HAL) on which projects should be funded through the vegetable investment program. The annual investment plan, detailing projects and service providers for 2008/09, is published in *Vegetables Australia*.

There is recognition that for Vegvision 2020 to be most effective, industry development activity alignment is required. HAL, with advice from the IAC and AUSVEG, has commissioned a vegetable industry development needs assessment project. Industry

development includes all activities that enable growers to make better business decisions. These services involve communication, data, extension activities and on-farm adoption of R&D results. The project comprises identification of i) services currently provided in the commercial market place, ii) services levy payers have identified as important and iii) delivery mechanisms required for effective development programs to vegetable growers. The initial step was to conduct an extensive desktop study to research if sufficient information was available. Surveys of growers and supply chain participants ascertained needs and then program gaps for funding were determined. Findings will be presented to the IAC for consideration and recommendations will be made to HAL before final approval. This project is due for completion in October 2009, when implementation of recommendations will commence.

The Australian Vegetable Industry Development Group (AVIDG) was established in March 2006 and funded directly from the Department of Agriculture Fisheries and Forestry. Projects that have been completed include:

- Continuous Improvement Model, a benchmarking study for the vegetable industry.
- Training Needs Analysis, which identified that growers are keen to learn business management and leadership development skills as long as those skills are tied directly to improving the profitability of their business.
- Domestic Marketing Strategy and Implementation Plan, aimed at achieving significant industry growth

through satisfying consumer demand for Australian vegetables.

- A business case for Vegvision 2020, to assist the vegetable industry to focus on those areas of investment that are most likely to generate the greatest level of return for vegetable levy payers and matching government funds.
- Global Comparative Analysis project funded by the vegetable industry's R&D levy has shown that when compared to China, the Australian industry must move quickly to improve its international competitiveness.

This group has now been finalised and further information on AVIDG and the various projects results can be found at their website: [www.avidgroup.net.au](http://www.avidgroup.net.au).

In 2007/08 \$13,181,345 was invested through the program in R&D projects, matched by Australian Government funding. For details on the investment see page 75. This report provides a snapshot of various projects funded in 2007/08. For further information on any of the projects or outcomes, we encourage you to contact HAL or the researcher named at the end of the project summary.

I have been supported by the energy and enthusiasm of both the participants in the IAC, the Advisory Groups and the Working Groups. The R&D process has benefited from this industry input. My thanks also to the AUSVEG team for their passion and commitment to the Australian vegetable industry.

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Climate Change is becoming an ever more important issue for the industry. In 2007/08 the industry began contributing to the horticulture component of the National Climate Change Research Strategy for Primary Industries (CCRSPI) as part of HAL's across industry program. HAL is contributing to the project in collaboration with other Rural RDCs, CSIRO and Federal, State and Territory Governments.

The aim is to develop a comprehensive research strategy that will allow our industries to be informed by good research and be prepared to respond to the opportunities and risks presented by climate change. The scope of the strategy will be broad, covering any issue that needs consideration over the short (3 years), medium (5+ years) and long term (10+ years).



## YOUR LEVY AT WORK

Established in 1996, the National Vegetable Levy is used to invest in research and development projects to help advance the industry and address major issues faced by Australian growers.

Through Horticulture Australia Limited (HAL), the vegetable levy is matched by the Australian Government dollar-for-dollar when invested in research and development activities.

### What is the National Vegetable Levy?

The National Vegetable Levy is a levy payable on selected vegetables to provide funding for research and development on behalf of industry. The levy is payable on vegetables produced in Australia and either sold by the producer, or used by the producer in the production of other goods. The current rate for the vegetable levy is 0.5 per cent of the vegetables' value at first point of sale. This equates to 50 cents out of every \$100 of produce sold.

### How is the levy collected?

The levy is collected at the first point of sale. This is usually at the wholesale market or processing company. If it is a direct sale it is collected via the retailer. A producer who sells produce direct to consumers, for example at a roadside stall, shed sales or farm gate, must submit the levy and returns directly to the Levies Revenue Service (LRS).

The levy is applicable to fresh and processed vegetables. The collected revenue is forwarded to the LRS, a designated Australian Government section under the Department of Agriculture, Fisheries and Forestry, that is responsible for collecting all agriculture levies.

In the case of the National Vegetable Levy the revenue is forwarded to Horticulture Australia Limited (HAL), an industry-owned company that coordinates, invests and manages research and development and promotional programs on behalf of Australia's horticultural industries.

### What vegetables are not included in the vegetable levy?

Potatoes, onions, processing tomatoes and mushrooms have separate levy arrangements and are not included in this program. Fresh tomatoes, garlic, melons and asparagus currently have no compulsory national levy arrangements.

### Who decides how the levy is spent?

HAL is responsible for managing industry funds and Australian Government-matched funds. HAL takes advice on how to invest the vegetable levy from the vegetable Industry Advisory Committee (IAC).

The Industry Advisory Committee (IAC) is a subcommittee of the HAL Board. The IAC and industry advisory group members are the key representatives who recommend to HAL what research and development projects should be funded by the National Vegetable Levy.

Consultation with vegetable growers is critical to determine the investment priorities for the National Vegetable Levy. Previously this strategy was predominantly structured around on-farm issues with individual growers forming six representative state-based product groups. This strategy has since changed. A new advisory group has formed to implement a more appropriate process and structure in order for the industry to achieve the goals outlined by industry strategic plan, Vegvision 2020.

The new advisory groups are aligned with the five strategic investment pillars outlined in Vegvision 2020. These advisory groups focus on key investment areas to drive the industry strategic plan and achieve a better industry outcome.

The advisory groups are Consumers, Market Development, Production, Information and Technology Development and Dissemination, and Leadership and People Development. Members of the five advisory groups include growers and specialists from private industries, education and R&D sectors. The Vegetable IAC comprises one levy-paying grower from each advisory group and additional levy payers to ensure each state is represented, as well as one AUSVEG board member and an independent chair.

Focus groups are established when required to deal with key issues facing the industry.

The new IAC gives greater representation to states as it brings together the industry, achieving goals outlined in VegVision 2020.

CONSUMERS ADVISORY GROUP		MARKET DEVELOPMENT ADVISORY GROUP	
Kim Vincent NSW	David De Paoli QLD	John Said (Chair) VIC	David De Paoli (Chair) QLD
Eddie Galea NSW	Nick Rodd NSW	Luke Harris NSW	Glenn Abbott QLD
Brad Wells HAL	Rob Henry TAS	David Cox SA	Jocelyn Midgley VIC
Tristan Kitchener VIC	Jan Vydra VIC	Michael Le WA	Andreas Klieber VIC
Sarah Pennell HAL	Maureen Dobra WA	Alison Anderson NSW (Secretariat)	David Chenu HAL
	David Ellement WA (Secretariat)		



## VEGETABLE INDUSTRY ADVISORY COMMITTEE

Kent West QLD	Andrew Mathews SA	Rob Henry TAS	Ian Young TAS	John Said VIC	Denise Ellenat WA	Robert Lawler AUSVEG (Ex-officio)
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### LEADERSHIP & PEOPLE DEVELOPMENT ADVISORY GROUP

Denise Ellement WA (Chair)
Kathy Sims NSW
Andrew Mathews SA
Barb McPherson SA
Damien Armistead VIC (observer)
Danny Trandos WA
Richard Stephens NSW
Craig Murdoch VIC (Secretariat)

### INFORMATION TECHNOLOGY DEVELOPMENT & DISSEMINATION ADVISORY GROUP

Jeff McSpedden NSW (Chair)
Roger Bramble HAL
Joe Elbustani NSW
Kim Vincent NSW
Brett Whelan NSW
Danny De Ieso SA
Dijana Jevremov SA
Ian James VIC
Alisha Johnson VIC (Secretariat)

### PRODUCTION ADVISORY GROUP

Kent West QLD (Chair)	Ian Tony	Bradley Ipsen WA	George Smith NSW	Brad Wells HAL
Ray Collins QLD	Lisa Crooks QLD	Dino Musolino SA	John Newman SA	Rick Butler VIC
Colin Houston TAS	Roger Orr TAS	Ian Young TAS	Phillip Loane # TAS	Tom Schreurs # VIC
Graeme Smith # VIC	Peter Dal Santo # VIC	Barry Hunt NSW (stand in for Jeff Yost)	Tim Burgess # TAS	
Melissa Fraser SA (Secretariat)	Roger Orr TAS (Secretariat)			

### CHEMICAL WORKING GROUP

Alan Norden ACT
Kevin Bodnaruk NSW
Martin Collett NSW
Domenic Cavallaro SA
Phillip Frost TAS
Ian Macleod TAS
Peter Cochrane VIC
Peter Dal Santo VIC
Dale Griffin VIC
Brad Wells HAL
Roger Orr TAS (Secretariat)

### IPM WORKING GROUP

Eddie Galea NSW
Sandra McDougall NSW
Kim Vincent NSW
Peter Deuter QLD
Andrew Johanson QLD
Nancy Schellhorn QLD
Dino Musolino SA
Frank Hay TAS
Paul Horne VIC
Ian Porter VIC
Tom Schreurs VIC
Sonya Broughton WA
Barbara Hall SA
Leanne Wilson HAL
David Ellement WA (Secretariat)

### PROTECTED CROPPING WORKING GROUP

Anthony Brandesema TAS
Jo D'anastasi NSW
Melanie Davies NSW
Godfrey Dol NSW
Joe Elbustani NSW
Gary Hippman TAS
Max Horvath QLD
Michael Le WA
Chris Millis VIC
Graeme Smith VIC
Mel Fraser SA (Secretariat)

### BIOSECURITY WORKING GROUP

Sophie Peterson ACT
Martin Wilson QLD
Mark Clements TAS
Phillip Loane TAS
Ryan Wilson TAS
David Anderson WA
Kim James HAL
Craig Murdoch VIC (Secretariat)

### ENVIRONMENTAL WORKING GROUP

Jeff McSpedden NSW
Jason Huggins QLD
Dino Musolino SA
William Allen SA
Tim Burgess TAS
Luis Gazzola VIC
Helena Whitman VIC
Alison Turnbull HAL
Alison Anderson NSW (Secretariat)

# Observer representative (non-voting) from Working Group.

## VITAL VEGETABLES

Developing novel, differentiated vegetable products is the core focus of the Vital Vegetables® program to ensure the long term viability of the Australian vegetable industry.

The Australian and NZ vegetable industries are facing increased competition nationally and internationally. In particular, vegetables produced in relatively low cost economies such as China, India, Africa and South America are increasing in quality and quantity on world markets. To remain competitive, Australia needs to differentiate its vegetable products in the market place.

The Vital Vegetables® (VV) project commenced in 2003 with a strong science focus to build the enabling technologies and capabilities required for identifying and analysing functional vegetable products. The overall project strongly targets on the development and commercialisation of functional vegetable products. These vegetable products are to be commercialised in Australia and New Zealand and, if successful, export and international commercialisation opportunities will be explored thereafter. The focus of all VV project activities remains the delivery of benefits to Australian and New Zealand vegetable growers through the production of value-added functional vegetable products.

At the start of the project an extensive market research study was conducted to see if the public would buy these new, high health VV products. The results were very encouraging. Nearly two in three consumers interviewed indicated that they would buy vegetables with proven health benefits. Furthermore, 84 per cent of respondents preferred to consume healthy foods as fresh fruit and vegetables rather than in a processed form. However, a key finding was that consumers will not readily forgo other product attributes like freshness and flavour. Hence the research program is not only ensuring that Vital Vegetables® have proven health benefits but that they maintain their freshness and they taste good.

During the project, substantial scientific capabilities have been developed and secured in the key areas of phytonutrient analysis, bioefficacy, and the effects of agronomic and postharvest conditions on health compounds, freshness and flavour. In addition, the project worked closely

with Clause Pacific Seeds, part of Groupe Limagrain, to screen their brassica seed collections for high phytonutrient varieties. As a result of these studies, the first VV product, a high-glucoraphanin broccoli variety, has been identified and a complete package of agronomic and postharvest handling protocols has been developed. Vital Vegetables® has also conducted several bioefficacy studies on this broccoli product which will serve to back up any health claims made in the marketing campaign.

The project has also identified and studied several other high phytonutrient vegetable crops including a range of lettuces, brassicas and Asian vegetables. It is hoped these new VV products will be developed to commercialization in the next Vital Vegetables® (VV2) project.

A major focus in the past 12 months has been on establishing a robust route to market for VV products and widening access to large, national and international vegetable germplasm collections. These have been achieved with the formation of the VV marketing and Germplasm Partners, respectively. The marketing partnership consists of six leading Australian fresh and processed food companies, who have made significant cash and in-kind contributions to the development of

business and marketing plans for the VV brand. A similar partnership is also being formed in NZ. The Germplasm Partners consist of three leading international vegetable seed companies, who will become actively involved in VV2 by providing access to huge germplasm collections and by establishing targeted breeding programs.

With the significant support of the commercial partners, VV now aims to establish a wide range of high health vegetable products in the next five years. The range will include new varieties of whole fresh vegetables, salad mixes, stir fries and a range of processed products. All will attract premium prices and the added value will be shared down the marketing chain, including growers. Response from the major retailers has been very positive and it is hoped that this project will create a new, premium market category of Vital Vegetables® that will help underpin the viability and sustainability of Australian and NZ vegetable growers.

### Project VG03095

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## TRENDS IN CHILDREN'S VEGETABLE INTAKE 1995-2007

More than a decade after a national nutritional survey found that children's vegetable consumption fell well below the recommended dietary intake, a follow-up survey has been undertaken to assess any changes to consumption.

Data collection through the Children's National Nutrition and Physical Activity Survey has been completed and after a launch by the Health Minister, analysis of the data will be undertaken.

The project trends in children's vegetable intake 1995-2007 will give the vegetable industry a better understanding of children's vegetable consumption and describe associated dietary and demographic characteristics.

Based on the findings, the project will develop communication messages for use in the general public to promote the role of vegetables in Australian children's diets.

### Project VG07160

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## STUDY TRACKS CONSUMER VEGETABLE HABITS

The first of two internet-based consumer surveys provides the vegetable industry with greater insight into consumer trends, perceptions and behaviours in the domestic market.

The *Vegetable consumer tracking study* also provides industry with an ongoing, systematic method for measurement of marketing activity that can be used in future planning and assessment.

This first online survey was conducted in February 2008 and the second in August 2008, when a panel of 1200 grocery buyers across Australia were asked to respond to a series of questions about their vegetable buying behaviour.

It found that almost all respondents had purchased vegetables in the previous two weeks. Fresh vegetable purchases appeared to be increasing and almost 60 per cent confirmed they had increased their vegetable consumption over the past year.

Two groups of "staple vegetables" have emerged. Primary staples, purchased by more than 70 per cent of respondents, were tomatoes, potatoes, carrots, onion and lettuce. A secondary group of staples, purchased by 50 to 70 per cent of respondents included mushrooms, broccoli, capsicum and pumpkin.

The survey also found that different household structures have different relationships.

Mums were high spenders, seeking supermarket convenience, needing advice on storing vegetables and planning their shopping in advance.

Couples were high spenders who liked cooking and selected vegetables at point of sale, working around what is in season.

Singles were big buyers of pre-prepared vegetables, limited by time and lacking interest in cooking. Children were bored by and disliked vegetables.

There was some emotional connection to vegetables (far less than fruit), with an appreciation of their general health credentials and a need to eat five serves a day. However, a majority of respondents only eat two to three serves a day.

The findings of the research are being used to develop one of the Australian Vegetable Industry Development Group's foundation projects, a marketing plan for the domestic industry.

Consumers, both adults and children, need assistance, education and stimulation to further increase the consumption and perceived value of vegetables.

Recommendations in overcoming identified barriers to vegetable consumption include raising the interest of vegetables through new serving suggestions, and integrating them with day-to-day life, as additions to foods currently eaten.

### Project VG07168

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## CATALOGUING HEALTH BENEFITS OF INTERNATIONAL VEGGIES

Information on the nutritional value of Indian and Asian vegetables is soon to be added to data already available on other vegetables commonly grown and sold in Australia.

The project *Compiling the nutritional and health benefit information for fresh vegetables* will also collate data on a number of other vegetables not already reviewed.

Previously published reports and information brochures have detailed the health benefits of tomatoes, salad vegetables, root vegetables, yellow and orange vegetables, brassicas, alliums, legumes, herbs, spinach, silver beet and eggplant.

*The Nutritional Attributes of Indian Vegetables* report is expected to be released in late 2008, with further reports to follow.

Although this project was agreed upon in principle following completion of the previous project, the content of the additional reports was not definitively confirmed until late in the 2007/08 financial year. While it was not possible to produce a final report before July 2008, planning has been completed and work is underway.

### Project VG05072, VG03096

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Photo courtesy of AUSVEG

### SPEED NEEDED TO IMPROVE EXPORT OPTIONS

Australia's vegetable industry must move quickly to improve its international competitiveness, according to the *Global Comparative Analysis* project.

The project was commissioned, through the Australian Vegetable Industry Development Group and HAL, to gain a better understanding of China's vegetable industry and assess consequent commercial and strategic issues relevant to Australia's industry.

The rapid increase in low-priced Chinese vegetable exports has been the most significant feature in international vegetable trade during the past decade. In contrast, Australia's vegetable exports have fallen by 50 per cent since 2003, and now represent less than 10 per cent of the industry's gross production value.

The project involved extensive on-ground research within China. This was completed with involvement from the Vegetable Industry Exporter Network (VIEN), which includes some of Australia's leading vegetable exporters.

Research focused primarily on China and investigated current trends relating to international trade in fresh and processed vegetables.

The project's findings showed a steady growth in the international trade of vegetable products, dominated by supply

from China, whose exports have risen from US\$2 billion to US\$5 billion during the past 10 years.

China's low labour costs and supportive government policies on rural development have helped to sustain this growth. The country continues to gather momentum as a major vegetable exporter, increasingly driven by large well-resourced businesses that are addressing issues relating to productivity, environmental constraints and food safety.

The project also found that China presents few opportunities to Australian vegetable exporters, although small niches exist for premium offerings in affluent urban areas.

Further work will evaluate how collaboration may improve competitiveness and commercial sustainability, dedicate R&D resources to information systems on global competitiveness, and test market in selected export destinations to defend or retain, then build on existing positions.

#### **Project VG07150**

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### SHIPPING TECHNOLOGY FOR AUSTRALIAN VEGETABLES

Technologies to extend the storage life of vegetables, particularly when in mixed loads, could help increase exports and open new international markets, such as Europe. They could also reduce price fluctuations of vegetables on the domestic market.

The *Evaluation of new shipping technology for Australian vegetables* project is building on previous research which examined the effect of various packaging materials, treatments and storage atmospheres on the storage and shelf life of broccoli, cauliflower and lettuce. As previously, the cost effectiveness of new technologies is also being evaluated – whether a treatment can improve product storage life and increase total profitability for certain markets.

Preliminary research is continuing on brussels sprouts, capsicums, chillies, celery and broccoli, with scope to include other crops as requested. Work has focussed on factors such as reducing sensitivity to chilling and the effects of ethylene, which could facilitate shipping in mixed loads. For example, some positive effects of exposing capsicums to UVC light have been found, although the effects declined after four weeks storage. A sea freight trial shipment using identified technologies is proposed for the next 12 months, to be developed in collaboration with industry.

#### **Project VG06045**

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### VIEN SECRETARIAT SUPPORT

The Vegetable Industry Exporters Network (VIEN) was formed in November 2006 to assist in the development of an export development investment agenda for the vegetable industry.

During the next year VIEN will oversee projects addressing recommendations in the Vegetable Industry Export Business Plan (released in July 2007) and the Global Comparative Analysis Study (released in May 2008); monitor the industry's Global Competitiveness Information System; ensure that all industry participants remain aware of global marketplace developments; deal with ad hoc issues effecting Australian exporters; and assist with developing

policy positions on issues effecting the global competitiveness of the industry and export and trade-related matters.

These plans will be realised through the *Vegetable Industry Export Network Secretariat* project, which was started to provide VIEN with the secretariat and project management capability to enable the network to develop and implement strategies identified in its business plan.

#### **Project VG07152**

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## UNIFORM MATURITY REDUCES HARVEST EFFORT

Focusing on plant nutrition and irrigation methods may help growers to produce broccoli and cauliflower crops that mature more uniformly, resulting in increased efficiency at harvest.

Experimental crops produced as part of the *Agronomic packages for reduced pass harvesting of export cauliflower* were often harvested in just one or two passes.

Traditionally, with crops maturing unevenly, cauliflower and broccoli have been hand harvested by workers who move through the crops a number of times. This is becoming increasingly expensive for growers, with labour costs rising and difficulty finding suitably skilled workers.

The project has developed an agronomic package for loam soils, focusing on nutrients and irrigation, to help growers reduce the spread of crop maturity. This could possibly allow mechanical harvesting of broccoli and cauliflower to be introduced in some farming businesses. The project was completed in February 2008 and a final report on the project is now available.



### Project VG02051

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## NON-CHEMICAL POSTHARVEST FRUIT FLY CONTROL FOR CAPSICUMS

The project *Heat disinfestation of capsicums for export to New Zealand and interstate* was undertaken to investigate the use of non-chemical postharvest heat treatment against fruit fly. The current postharvest disinfestation treatment against fruit flies uses the insecticide dimethoate, which is currently under review.

The research was based on the New Zealand Ministry of Agriculture and Forestry (NZ MAF) methodology (MAF Regulatory Authority Standard 155.02.03 – *Specification for the Determination of Fruit Fly Disinfestation Treatment Efficacy*). Physiological research was also undertaken to determine the most appropriate method of applying heat and its effects on fruit quality.

The initial trials used a vapour heat

treatment. However, predicted doses that would be efficacious against fruit fly caused unacceptable levels of fruit damage. In an attempt to improve the efficacy of the treatment and maintain fruit quality, a combination treatment using vapour heat treatment and cold treatment was investigated. The combined treatment did not achieve the required insect mortality and also resulted in unacceptable fruit damage.

A third treatment option using vapour heat treatment with low oxygen was examined. Again, predicted doses that would be efficacious against fruit fly caused unacceptable levels of fruit damage.

An alternative to heat treatments may be the use of irradiation. Small scale preliminary trials indicate that capsicums (green and red) will tolerate treatments as

high as 600 Gy (150 Gy is required for control of fruit fly). However, the use of irradiation on capsicums is not currently permitted under Standard 1.5.3 of the *Food Standards Australia New Zealand (FSANZ) Act*.

Further research using export quality fruit under controlled handling conditions will be required to develop a submission to FSANZ if irradiation is to be used to control Australian fruit fly species in capsicums. The project has been completed and a final report was submitted in 2008.

### Project VG04006

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## KEEPING THE INDUSTRY INFORMED

In 2007/08 the NSW Vegetable Industry Development Officer (IDO) has continued to work with other state officers, AUSVEG and HAL staff and other industry stakeholders to keep the NSW industry informed about the findings of the National Vegetable Research & Development (R&D) Program.

Key activities included publishing the NSW VegeLink newsletter, coordinating the third Annual NSW Horticultural Industries Dinner, helping to identify research and development needs for the NSW vegetable industry, and communicating research outcomes. The IDO was also responsible for training growers from non-English speaking backgrounds, for example Chinese growers in the Sydney Basin attended a training session on hydroponics.

In conjunction with the SA officer, a brassica think-tank was held to identify national research priorities for the industry, and brassica integrated pest management workshops were held to discuss the outcomes of the diamondback moth management project.

NSW also facilitated Soil Awareness workshops in five locations nationally and developed a soil DVD as part of the AUSVEG *Healthy Soils for Sustainable Vegetable Farms* project.

The NSW IDO position has been extended to 30 December 2008.



**Tony Har and Rick Donnan at hydroponic training for Chinese vegetable growers. The workshop was at Tony's farm and Rick Donnan was the presenter.**

**Project VG07140**

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## VICTORIA REVAMPS COMMUNICATION CHANNELS

A redesigned web site and revamped quarterly journal *Vegetables Victoria* are among the communication initiatives the Victorian Information Development Officer (IDO) has undertaken in the past year to provide growers with access to the latest information.

The amount of information available to support industry development, business innovation, investment and improved farm profitability is massive and is constantly growing and changing. The national network of IDO's is working to make sense of this information and to distribute relevant material to growers as quickly as possible.

Core industry development activities in Victoria this year have centred on improving communication between growers, researchers and service providers. In addition to the changes to the web site and journal, the state's industry database has been updated, allowing for targeted SMS messaging as well as email, post and fax alerts for specific issues.

Other activities include delivering levy-funded research and development, identifying current industry research priorities, promoting workforce development (apprenticeships, business skills, OH&S and other short courses) and discussion of industry issues, such as chemical use, water recycling and responsible resource management.

**Project VG03054**

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## INVEST IN SUPPORT TO DRIVE INDUSTRY-WIDE PROGRESS

Although the Northern Australian Industry Development Officer (IDO) position ended in May 2008, the project identified the value of investing in support for industry development and reinforced the importance of industry-led initiatives.

Activities coordinated by the project ranged from the development of a Queensland Strategic Plan, to complement to grower supply-chain tours.

Solid industry participation and a collective commitment to initiatives was achieved by cultivating stakeholder networks. The projects confirmed that flexible and focused service provision

has the potential to drive industry and alleviate significant industry hurdles, resulting in successful outcomes throughout the value chain.

The key is to provide support as close to growers as possible through grassroots engagement, to provide an understanding of the whole of the industry, not just localised issues, and to facilitate grower-initiated, industry-wide growth activities.

**Project VG07169**

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## WA LAUNCHES STRATEGIC PLAN

In the past year Western Australia has completed and launched its own Vegetable Industry Strategic Plan, which provides a framework for the development, profitability and sustainability of the state's industry. The WA Industry Development Officer (IDO) has played a pivotal role in the development of the plan, which aligns with the national *Vegetable Industry Strategic Plan – VegVision 2020*.

The IDO's role is to work with industry, and to prioritise activities that will maximise research outcomes, and to extend the findings to industry. Activities contributing to this goal during the year include the production of a technical transfer video and coordination of supply chain tours.

The IDO also manages the new web-based Vegetable Irrigation Scheduling

System (VISS), and has helped to establish and manage a daily weather irrigation (information) system.

Communication activities include production of the *WA VegeLINK* newsletter, producing articles for the website, providing the email news service *WA VegeNEWS*, and coordinating grower meetings, tours and field days. The grower database has been reviewed to provide targeted communication and a bulk SMS database and distribution system has been developed.

### Project VG04023

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**Grower Paul Bogdanich looking at one of his lettuce**

## WORKING WITH LOTE GROWERS IN SA

Establishing better networks and communication channels with vegetable growers who have a background language other than English (LOTE) has been one of the major initiatives of the SA Industry Development Officer (IDO). This includes facilitating training and education programs for LOTE growers.

Other activities since the IDO's appointment in December 2007 have been identifying statewide research priorities to feed into the national research and development program, participating in the Horticulture Plant Health Consultative Committee, and conducting a brassica think-tank in conjunction with NSW.

Communication initiatives include publishing the *SA VegeLink* newsletter to showcase research and development in SA and making regular contributions to the industry journal *RIPE* to provide insights to broader industry issues. The IDO also acted as tour leader for the 2008 Young Vegetable Growers Tour to New Zealand. The position has been extended to December 2008.

### Project VG03076

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## RAPID BIOSECURITY RESPONSE IN TASMANIA

The Tasmanian Industry Development Officer (IDO) works in the vegetable and potato industries to maximise the benefits of industry-driven research and development through the communication of outcomes. The IDO is currently hosted at the Tasmanian Institute of Agricultural Research and the position has been extended until December 2008.

A key function has been to provide targeted biosecurity alerts with rapid responses to new pest and disease incursions. This includes the delivery of the relevant management strategies. The use of pesticides remains a significant management issue and one under constant change. The IDO helps with the transfer of information on the processing

and distribution of chemical use permits and the progress of work towards certification or permits.

Other activities include promoting vegetables as part of the Tasmanian Vegetable Industry Strategic Plan and identifying industry issues and developing projects to address them. The IDO is also responsible for facilitating uptake of new technologies through forums, workshops, field days and information dissemination.

### Project MT07055

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### COMMUNICATION KEY TO SYDNEY IPM EXTENSION STRATEGY

The NSW Department of Primary Industries has undertaken a major extension strategy in the Greater Sydney region, establishing commercial integrated pest management (IPM) services for growers.

Good communication has been established through recent initiatives, particularly with lettuce growers, on issues such as Western Flower Thrip (WFT) control, farm hygiene practices and continued access to chemical controls.

The regional extension strategy for managing WFT and tomato spotted wilt virus in the Sydney Region builds on established networks and relationships in a community where English is a second language for the majority of participants and communication can be difficult.

Services have included troubleshooting on-farm issues, IPM assessments and field visits for early diagnosis of pests and diseases.

Surveys of key insect pests and viruses are underway, targeting hydroponic lettuce farms, to encourage growers who would not normally do so to adopt early intervention IPM strategies.

A number of commercial IPM consultants now operate in the area, and development of IPM accreditation is underway for consultants, growers, and for use in product branding.

#### **Project VG03098**

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### IPM OPTIONS TO REDUCE GREENHOUSE CHEMICAL RISKS

The current project to accelerate the development and commercialisation of soft chemicals and biocontrol agents for use in greenhouse vegetable production is nearing completion.

Integrated pest management (IPM) and chemical access were identified as the two priority issues for the industry in a meeting of industry leaders in 2004. The IPM for greenhouse vegetables – research to industry project was then developed to assist with the production of efficacy data for reduced-risk chemicals, for registration purposes.

Greenhouse trials of reduced-risk chemistry are almost complete with final experiments being conducted on two products. Several other reduced-risk pesticides have already been tested and a shortlist of the most effective pesticides has been compiled.

Literature reviews of appropriate methods to assess the side-effects of reduced-risk chemicals have been initiated including the evaluation of international industry standard protocols. Preparations are underway for a number of side-effect assays and trials to be undertaken at the Gosford Primary Industries Institute.

Several species of predatory mites have been studied in feeding trials using Western Flower Thrip (WFT) larvae in artificial arena experiments. The predatory mites *Hypoaspis aculeifer* and an unknown

Australian *Hypoaspis sp.* have been evaluated for their daily consumption rates of WFT and further work will develop and optimise a laboratory-rearing method for these mites.

Slowly the IPM arsenal is building, with the introduction of new biocontrol agents and new reduced-risk chemicals compatible with them. The next step is for more of the industry to invest in the latest greenhouse technology to enable participants to compete with other producers in Australia and overseas produce appearing on the supermarket shelves.

Better technology will also make it easier for growers to use biocontrol. The increase in the adoption of biocontrol in greenhouse pest management programs coupled with the replacement of synthetic chemicals with softer reduced-risk chemicals, plus the less frequent use of insecticides altogether, will mean a lower risk of residue violations and safer produce for Australian consumers. Greenhouse produced vegetables will quickly achieve a deserved reputation as clean, safe produce for families to consume.

#### **Project VG05093**

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### GROWERS ENDORSE IPM FUTURE FOR LETTUCE

Lettuce growers consulted across Australia in April and May 2008 have unanimously endorsed the continued development of integrated pest management (IPM) strategies, saying IPM is essential for the future of their industry.

This is despite the fact that 94 per cent of the industry uses imidacloprid treatment on Nas-susceptible lettuce varieties which seriously limits the potential for commercial-scale IPM trials.

Over the next two years commercial-scale IPM trials will be conducted in WA and Queensland. Research will continue on the potential for the soil predatory mite, *Pergamasus sp.* to control Western

Flower thrips and Currant lettuce aphid. Investigations into developing beneficial insect nurseries near crops will continue and trials into sunscreens for BTs will be conducted.

This project will continue the focus on adoption of lettuce IPM nationally and the attitudes of the lettuce market towards IPM will also be canvassed.

#### **Project VG07076**

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## BRASSICA GROWERS BROADEN PEST MANAGEMENT STRATEGIES

Integrated pest management is now being considered as part of a much broader management program often referred to as a whole system, sustainable or integrated crop management (ICM) approach.

These approaches seek to identify and capitalise on synergies that arise from integrating a range of management activities in an ecologically sustainable manner.

Brassica growers have indicated that they want to know how to capture the benefits generated from combining different management and production activities to create a sustainable production system.

The project developing sustainable solutions for integrated brassica crop management has five areas of activity. These include diamondback moth (DBM) monitoring, soil amendment strategies, identification of natural DBM enemies through DNA testing, and particularly early-season predators, and distribution of decision-support tools.

Diamondback moth (DBM) is the most

serious pest in Australian brassica crops, because of its capacity to become resistant to virtually all known insecticides. Ongoing insecticide resistance screening, targeting high-risk DBM populations, is being undertaken as a sentinel activity to provide early warning of resistance. DBM populations collected from Queensland, SA and NSW and screened this year indicate some populations have already developed tolerances to newer insecticides.

Soil amendments are being evaluated for their potential to increase populations of predatory insects, to increase the rate at which crop residues and plant pathogens decompose and to improve water use efficiency. DNA probes will be used to test a range of predatory species from brassica crops to determine which prey they consume.

In Queensland serious crop losses are usually due to a range of early season pests.

Trials investigating early season natural enemies will identify the potential they have for controlling these pests. A number



of experimental sites have been identified for soil amendment trials and for research on early season pests.

A brassica decision-support toolkit has been developed on CD, to provide growers with the tools to correctly diagnose and evaluate pest and disease problems. The CD has been distributed nationally along with issue 12 of the Brassica IPM national newsletter.

### Project VG07030

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## IPM ESSENTIAL TO PROTECT PESTICIDES' EFFICACY

By developing and extending pest management strategies for western flower thrips (WFT) in hydroponic lettuce, a new project aims to protect the efficacy of conventional pesticides.

*The development of integrated pest management (IPM) strategies and tools for Western Flower Thrips (Frankliniella occidentalis) in hydroponic lettuce project hopes to reduce the hydroponic lettuce industry's pesticide reliance and use by developing and extending an IPM strategy.*

Researchers say that without IPM strategies, Australia's industry risks having no management plans for WFT and the diseases this species brings, such as tomato spotted wilt virus.

Since the detection of WFT, *Frankliniella occidentalis* (Thysanoptera: Thripidae) in Australia in 1993, industry has been increasingly concerned about issues such as the feeding damage caused and

pesticide resistance in this species.

Hydroponic lettuce growers have limited tools, including very few pesticides, available to them to manage WFT populations and it is a situation that is unlikely to change in the future with WFT populations rapidly developing pesticide resistance and no commercially available biological control agents or reduced-risk chemicals available.

Tools are urgently needed to retain the efficacy of the small number of conventional pesticides registered for use in hydroponic lettuce crops for strategic use in future years.

The project aims to develop and extend IPM strategies for WFT by developing new biorational pesticides and discovering and developing new biological control agents.

Biorational pesticides used internationally will be sought as options for use in Australia. Field captured entomopathogenic fungal isolates and nematode species will have their use

against WFT assessed in laboratory and field experiments.

Extensive surveys of native and introduced arthropod fauna will also be undertaken to identify and evaluate possible biological control agents and their use for suppressing WFT populations. Target beneficial insect groups will include predacious bugs and mites.

So far, the officer recruited to undertake the experimental and extension work has completed field surveys of lettuce growers in the Sydney Basin, conducted preliminary examinations of the flora and fauna in and around lettuce farms in that area and started designing several experimental trials.

### Project VG07003

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### SOME INSECTICIDES ARE NOT SO SELECTIVE

Research is finding that some selective insecticides, although targeting a narrow range of pest species, do affect other beneficial insects.

Through the *Pesticide Effects on Beneficial Insects and Mites in Vegetables* project, researchers have found that some selective insecticides can be toxic to just one or two beneficial species and harmless to others. Also, some pesticides do not cause rapid mortality but they can reduce populations of beneficial insects over a generation.

For example, results have shown the negative impact of pymetrozine on ladybirds over a generation while being harmless to many other beneficial insects, and also the variable toxicities of pirimicarb to different beneficial species.

Although new insecticide types are typically selective for a narrow range of pest species and are much less toxic to most of their natural enemies than the older broad-spectrum insecticides, the research shows that growers and advisers need more detailed information on pesticide effects.

Some fungicides and herbicides can also

have detrimental effects on beneficial insects and mites, but each product needs to be tested against each species-of-interest before impacts are known.

Learning how these products affect beneficial insects and mites is important because they provide a vital biological control component in crops that are grown under integrated pest management (IPM).

A challenge for growers and pest management advisers is to understand the effect that pesticide applications have on these organisms, so that choices can be made that minimise disruption to biological control.

Through the project, new information about pesticide toxicities to beneficials has been gathered by performing detailed tests on the short and long-term effects of insecticides, fungicides and herbicides.

So far, the work has focused on determining the long-term effects of selective insecticides on beneficial species and continuing short-term acute tests with a range of fungicides and other insecticides.

#### Project VG06087

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### MODERNISING CONTROL OF VEGETABLE SUCKING PESTS

Vegetable sucking pests not only cause physical damage to crops, they can also transmit viruses and contaminate produce.

Although some pest-specific products have been registered for use in some vegetable crops, vegetable sucking pest management practices are still heavily reliant on older broad-spectrum pesticides. These non-selective products prevent further adoption of integrated pest management (IPM) systems and their frequent, multiple-crop-use pattern has the potential to increase pesticide resistance in the pest population.

To modernise sucking pest control in the vegetable sector the project A scoping study of IPM compatible options for the management of key vegetable sucking pests has been undertaken.

A team of entomologists, in liaison with crop consultants, growers and specialist reviewers, conducted a scoping study of the impact of at least five common vegetable sucking pests. They also used literature reviews, an industry workshop, interstate producer interviews and farm visits to identify management options that would best fit into an IPM system for vegetable sucking pests.

#### Project VG06094

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### PROVIDING AN IPM ADVISORY SERVICE FOR TASMANIA

Specialist assistance in integrated pest management (IPM) is being provided to Tasmanian farmers and agronomists who want to improve vegetable production.

Workshops on IPM have been held for agronomists and farmers from the north coast of Tasmania. The workshops run for about five hours and cover background on IPM such as why it was developed, what it is, how it differs from pesticide-based approaches, what is required for IPM implementation and crops that may benefit from its introduction. The main feature of the workshops is the development of an IPM strategy for any crop that participants want to know about so they can immediately implement the strategy.

As well as increasing awareness of IPM there are now several examples of Tasmanian farmers and agronomists implementing an IPM approach. There has been a reduction in insecticide use and a change in the type of insecticides used as a result of this project.

IPM workshops have been run with a range of groups, including field officers from the processors McCain and Simplot and agronomists from several organisations including ServeAg, Roberts and Agronico. Entomologists from IPM Technologies Pty Ltd in Victoria have provided technical support.

The involvement of different members of the vegetable production sector (for example, farmers, agronomists and field officers) has been vital to changing the approach to pest management. The project is on-going and there are plans to work with more growers and grower groups, as well as building on existing contacts.

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## MORE BRASSICA GROWERS TAKE ON INTEGRATED PEST MANAGEMENT

An increasing number of brassica growers are recognising the benefits of adopting integrated pest management (IPM) strategies.

The project *Demonstrating integrated pest management or IPM in brassica crops* has helped brassica growers in several states of Australia implement an IPM strategy for the first time during the past year, and has helped others to refine their existing control measures so that biological, cultural and chemical control methods work together in a better way.

Although the benefits of IPM, such as sustainable pest control and reduced reliance on insecticides, are known, IPM is complex because it involves biological and cultural controls. It takes into account the effects of pesticides on beneficial insects.

Growers cannot be expected to automatically change from a relatively simple and familiar method of pest control to one that is unfamiliar and more complex unless they have some help. Seeing IPM strategies working successfully in their

locality may help them to make the change from pesticide-based control.

The project aims to help growers and advisers implement an IPM strategy by assisting with any local issues and demonstrating IPM in a commercial situation. This may involve IPM advisers visiting the same crop several times during the life of the crop and showing how assessments of pests and beneficial numbers are made, what cultural controls could be used, and if necessary, how to select appropriate insecticides.

In other situations, where growers or advisers are already able to conduct monitoring, the project can assist with decision-making and the selection of pesticides for different scenarios.

Both outdoor and protected-cropping brassica growers have been involved in new or revised IPM strategies during the past year. An important aspect of the project is that it deals with all pests of brassicas, because the insecticides targeting one

pest can disrupt the control of other pests, and the pest complex varies between sites. The project will continue in 2008/09.

### Project VG05007

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## MORE IPM OPTIONS FOR SWEET CORN

The Australian sweet corn industry continues to expand its integrated pest management (IPM) strategies with the trial of three new chemicals and the collation of more information on beneficial organisms that can contribute to the management of the wider range of pests.

The project has released two new reports, and will summarise its findings in a final report which will be available in early 2009.

*Pests and Beneficial Insects and Arthropods in Sweet Corn* builds on previous data identifying beneficial organisms and their role in pest control.

The second report *Narrow Spectrum Pesticides with Potential to Contribute Towards Improved IPM Systems in Sweet Corn*, evaluates three pesticides for their insect control and fit within IPM strategies. The three treatments showed minimal detrimental effects on the beneficial insect populations, and although some additional work may be needed, the report provides some efficacy data that may assist with registration of the chemicals for sweet corn in Australia.

### Project VG05035

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## IPM SEEN AS A CRISIS OPTION

There is little motivation for vegetable growers to change to integrated pest management (IPM) techniques unless there is a 'crisis', such as insecticide resistance or withdrawal of products, new research has found.

A scoping study on IPM potential and requirements found that growers do not think IPM is too expensive or complicated or that there are not enough selective chemicals. Instead, one of the main factors contributing to IPM's non-adoption was the fact that current pesticide approaches still worked.

In most horticultural industries there has not been great adoption or implementation of IPM despite significant funding support. The scoping study aimed to clarify why, and what was needed to improve IPM adoption.

Through a survey sent to vegetable growers and advisors, researchers found that only about 28 per cent of growers used IPM well. However, a very high percentage (80 per cent) of those who had

previously used IPM continued to use it.

Most respondents said local demonstrations and contact with advisors specialising in IPM were desirable. And results indicate that while there is good awareness of IPM, its benefits and practicality need to be demonstrated before change will occur.

It also found that the vegetable industry needs a clearly communicated and accepted definition of IPM, because the approach can be seen to fail, even when it is not actually being practised.

Crop advisers who can offer growers information first-hand and give simple and clear advice provide the best means of maintaining and improving IPM implementation, the study concluded.

### Project VG06086

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## NEW STRATEGIES FOR ASIAN VEGETABLE GROWERS

A publication of fact sheets and posters identifying, in a number of translations, the pests and diseases affecting Asian vegetables has been one of the key outcomes of the project *Integrated management strategies for pests and diseases in Asian vegetables*.

The project has addressed the critical need to develop and adopt strategies to meet consumer, worker and environmental safeguards for the 1600 growers of Asian vegetables in Australia. Most are family-based enterprises with poor English and plant protection skills.

Crop surveillance and laboratory diagnostics were also used to identify, validate and update records of the key diseases and pests in Asian vegetables across the major Australian production areas. Field trials have assessed and demonstrated a range of improved management strategies. Existing translated information on disease and pest recognition and integrated pest management (IPM) was collated, gaps identified and new material published.

This project was completed in July 2008 and will be published on the Rural Industries Research and Development Corporation website.

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## REVIEW TO IDENTIFY CAUSE OF HYDROPONIC LETTUCE RESIDUES

Pesticide residues in hydroponic lettuce can exceed the maximum residue limit and the reasons for this are not clear.

A review of the systems and practices used in this sector is being undertaken as part of the *Pesticide residues in hydroponic lettuce* project, to shed light on this issue and help tailor future research and development towards a solution.

It includes a review of information in scientific literature, previous and existing lettuce projects and interviews with growers and others involved in the industry.

Once completed, the work will be

summarised in a report, making recommendations for further action. Existing guidelines for the use of pesticides in hydroponic lettuce systems will be modified accordingly.

This project is due for completion in September 2008.

### Project VG07165

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Photo courtesy of AUSVEG

## NUTRIENT GUIDELINES FOR ASIAN VEGETABLES

By determining general nutrient and specific nitrate guidelines for leafy Asian vegetables, the *Nutrient management of Asian vegetables* project aims to address findings that these vegetables can potentially accumulate nitrate.

Through the project, critical nutrient concentrations will be established and simple protocols will be developed for assessing the nutrient status of crops in production.

The project started this year. So far, team meetings have taken place and a technical officer has been appointed. Also, the preliminary Asian vegetable experimental crop has been established.

### Project VG07153

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## EXTENSION FOCUS OF LETTUCE PEST CONTROL

Extension with growers has been the focus of activities during the past year, as part of the *Further developing integrated pest management for lettuce* project, which has received funding for a further two years. Research trials are also helping growers to improve their crop protection practices.

At least one lettuce integrated pest management (IPM) information session or workshop has been held with growers in

each state and five issues of the *Lettuce Leaf* newsletter have been published. Monitoring of hydroponic and field lettuce crops in the Sydney basin and north of Perth has provided specific advice on improved practices for these growers.

Field trials underway include soil amendment work in the Adelaide Hills to increase beneficial predatory soil mites, and a commercial scale variety trial of Nas

resistant head lettuce in Hay. In Sydney and Yanco three autumn plantings of wheat, rye, oats and barley are being assessed for suitability as beneficial nursery crops.

**Project VG05044**

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Assessing cereals of a nursery for beneficial insects – trial at Yanco

## CULTURAL CONTROLS BOOST PEST MANAGEMENT

Often overlooked, cultural controls that favour beneficial species or reduce pest impacts can be the most important component of an integrated pest management (IPM) strategy.

A completed HAL project has evaluated several cultural controls for their potential to assist with pest management in leafy vegetables, studying how the use of non-crop plants, composted fowl manure and flowering weeds can augment populations of parasitoids and predatory insects and mites.

Composted fowl manure, and practically any rotting organic matter, enhances the presence of predatory mites by

providing a reliable food source. As long as they do not attract pest species or disease, flowering weeds can also attract a range of beneficial species.

Western Flower Thrips (WFT) have been suppressed in IPM-grown lettuce crops, which were abundant in native predatory species. Four predators of WFT were identified from field research and further laboratory studies confirmed that at least three could be important in controlling WFT.

**Project VG05008**

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Grass strip, planted as part of the Cultural Control

### NEW MANUAL PROVIDES IPM PATHWAY

By incorporating a risk assessment framework, a new manual aims to provide growers with an implementation pathway for integrated pest management (IPM) practices.

The approach – through the project *Build capacity of greenhouse growers to reduce crop loss through adoption of preventative disease management practices* – is designed to assist growers to develop practical and feasible implementation programs on their farms.

Providing comprehensive advice to growers on the sources of pests and diseases and how these can be managed is important, given that implementing preventative practices is a fundamental tactic of IPM, but to date has not been given much attention.

By allowing measured and strategic adoption, the approach should also ensure that growers do not become overwhelmed and consequently fail to adopt recommendations.

The manual will be published in late 2008. Further project extension will be obtained through a workshop that will provide interested consultants with a preventative pest and disease management practices package.

**Project VG07118**

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Areas in the greenhouse are marked to assist growers to monitor crops

### WASPS COMBAT SILVERLEAF WHITEFLY IN QUEENSLAND

More than 700,000 parasitic wasps have been released on Central and North Queensland vegetable farms in 2007/08 to combat silverleaf whitefly, which costs the state's producers several million dollars a year on insecticides, in lost production and damaged produce.

The *Eretmocerus hayati* wasps were released in Bowen and Gumlu districts, and have resulted in 50 to 80 per cent control of the pest. Growers are also reporting reduced insecticide use.

As a biological control agent, the wasp breeding and release is part of the *Development and promotion of IPM strategies for silverleaf whitefly in vegetables* project, designed to address key industry issues, such as insecticide resistance and pest migration across the crop commodities. Wasp releases are continuing for Burdekin vegetable farms. Post release research is evaluating the performance and establishment of the wasp in Bowen and Gumlu. Field trials are being conducted to integrate the biological control agent with 'softer' insecticides in vegetable crops.

Insecticide resistance levels were also monitored in silverleaf whitefly populations for 2006 and 2007. Resistance to imidacloprid and insect growth regulators seems to be increasing in some areas of south-east and northern Queensland.

**Project VG05050**

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## COUNTING MOTHS TO CONTROL EGGFRUIT CATERPILLARS

Researchers have used pheromone traps to catch moths, hoping it will provide a guide on the extent of eggfruit caterpillar infestation in eggplant crops. While they have found a significant relationship does exist, the data are too variable to make accurate management predictions.

The work is part of the project *Refining integrated pest management of eggfruit caterpillar*, which finishes this year. The caterpillar is a major pest of eggplant, but is difficult to monitor and control because larvae feed inside the fruit with no external sign of their presence. Losses can be high.

The project has also evaluated the efficacy of a number of insecticides using the pheromone traps as a monitoring tool.

The results have been supplied to relevant companies and product registrations may follow.

The development rate of eggs, larvae and pupae at constant temperatures has been determined and studies continue on the insect's seasonal occurrence. Extension activities included talks at grower workshops and distribution of a project newsletter.

**Project VG05052**

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**Cropped moth**



**EFC pheromone trap**

## GUIDELINES TO MAKE IPM EASIER

Effective integrated pest management (IPM) requires a 'whole of crop' approach. As such, guidelines that collate current knowledge of best practice for IPM into easy-to-follow recommendations are being produced. Growers can use this as a framework for implementing IPM for both lettuce and brassica production.

The publication will also be supported by an archive of published material from previous and existing IPM projects.

Through the *Best practice production models (lettuce, brassicas)* project, gaps in knowledge and future research opportunities will also be identified.

Discipline experts were identified and have agreed to provide input to the project, helping to develop individual IPM recommendations for their area of expertise, for example insect control in lettuce.

A workshop held in March 2008 helped to develop a template for strategies, reviewed the pest and disease issues and discussed the end product. Initial draft templates were aimed for completion by the end of August 2008.

**Project VG07110**

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## TRIALS TO IDENTIFY NEW FUNGAL-FIGHTING AGENTS

As part of the National Vegetable Integrated Pest Management (IPM) Pathology program, laboratory research, and greenhouse and field trials are underway to identify new plant or fungal volatiles, surfactants or biosurfactants to eradicate soil-borne disease pathogens.

The major pathogens being targeted are sclerotinia, pythium, fusarium and rhizoctonia.

The project *Best Practice IPM strategies for control of major soil-borne diseases of vegetable crops throughout Australia* also aims to find products that will prevent infection or induce systemic acquired resistance.

The project is a cooperative effort between HAL and the Victorian Department of Primary Industries, the Queensland Department of Primary Industries and Fisheries and the Northern Territory Department of Primary Industries, Fisheries and Mines.

A literature review has been completed to identify possible new strategies, and a survey conducted to screen metabolites from endophytes in temperate and tropical regions of Australia.

Soil-borne disease workshops have also been held in the Lockyer Valley and Granite Belt, Queensland, and Cranbourne in Victoria, to promote best practice IPM.

**Project VG07125**

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## FUNGICIDE ALTERNATIVES AND OTHER MEASURES TO COMBAT RESISTANCE

Frequent resistance to the fungicides used to control fungal diseases of Australian vegetable crops has necessitated the exploration and evaluation of fungicide alternatives through the *Integrated management of foliar diseases in vegetable crops* project.

The project aims to develop integrated pest management (IPM) strategies to manage the foliar diseases of vegetable crops, especially powdery mildew on pumpkin and zucchini; downy mildew on



lettuce, cucumber and squash; anthracnose on cucumber; and white blister on broccoli, cauliflower and Chinese cabbage.

In addition to looking at general crop husbandry practices, other project activities are: a review and evaluation of available fungicide alternatives, including environmentally-friendly options, evaluation of cultivars for genetic resistance and assessment of plant activators which stimulate the host defence mechanisms to the target diseases.

The project started at the beginning of 2008 and is on schedule to be completed by the end of the 2010 season.

**Project VG07127**

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**Genetic resistance in cucumbers to downy mildew from recent field trials**

## COLLABORATION ON SCLEROTINIA RESEARCH

Collaborative research is underway to develop a package of effective and economical control measures for Australia's most important soil-borne vegetable disease, sclerotinia, in conjunction with integrated pest management strategies.

The *Integrated management of soil-borne pathogens (sclerotinia beans, lettuce and others)* is a national project involving research teams from government agencies, private industry and universities.

The Victorian Department of Primary Industries is investigating new approaches to eliminate inoculum from soils and enhance disease control.

In several long-term field sites in eastern Australia, the Victorian Department of

Primary Industries, the Queensland Department of Primary Industries and Fisheries and Peracto are evaluating conventional and new control strategies relevant to local farming practices for the integrated control of sclerotinia.

The Tasmanian Institute of Agricultural Research and the University of Tasmania are developing new methods, including polymerase chain reaction (PCR) techniques, to predict the risk of white mould infection, the need for fungicide applications and the best time for applications.

**Project VG07126**

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## FUNGICIDE RESISTANCE IDENTIFIED

Information on the extent of fungicide resistance within Australian vegetables is being gathered to develop systems for improved resistance management. Already, preliminary testing of botrytis samples has indicated varying degrees of sensitivity, with one sample resistant to benzimidazoles.

The *Identification and monitoring of resistance in vegetable crops in Australia* project aims to distinguish instances where fungicide resistance accounts for failure to control disease.

Many growers report disappointing levels of fungal and bacterial disease control on vegetable crops after spray programs, which could be due to genetic resistance.

Within Australia there is limited information about the status of fungicide resistance in vegetable crops. The project addresses the information gap by using reference and field isolates to quantify the extent of resistant populations and by developing data for organisms' baseline sensitivity levels to new fungicides. The organisms targeted are downy mildew, white blister, sclerotinia, botrytis and bacteria.

### Project VG07119

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## PREDICTIVE MODELS BENCHMARKED

Government agencies, private industry, universities and international researchers are collaborating to benchmark predictive models to reduce fungicide sprays while maintaining produce quality.

The project – *Benchmarking predictive models, nutrients and irrigation for management of downy and powdery mildews and white blister* – was developed by the IPM Pathology GAP Analysis project VG06092.

A powdery mildew predictive model for cucurbits is being developed by the University of Queensland and the Queensland Department of Primary Industries and Fisheries.

The Victorian Department of Primary Industries is developing a downy mildew predictive model for lettuces. The new version of the Brassicaspot model for white blister is under evaluation in two field trials in Victoria and will also be trialled by Peracto in Tasmania.

Horticultural Research International UK (HRI UK) is developing a real-time spore trap for white blister.

An irrigation trial has been established at Werribee, Victoria for a comparison of early morning and evening irrigation to reduce white blister disease pressure. The effect of nutrients on the susceptibility of brassica plants to white blister is being evaluated by SARDI.

### Project VG07070

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## VEGETABLE DISEASE GUIDE REVISED

A new, fully revised edition of the industry's reference guide, *Diseases of vegetable crops* is being prepared and will be released in May 2009.

The new book will cover diseases affecting vegetable crops throughout Australia. The content will emphasise integrated disease management, and include pathogens considered a biosecurity threat based on industry biosecurity plans.

*Diseases of vegetable crops* was originally published in 1994 by the Queensland Department of Primary Industries and Fisheries. The standard reference for identifying diseases affecting vegetable crops in Australia, the information source has been out of print for several years.

CSIRO has prepared a revised and considerably expanded manuscript in collaboration with plant pathologists throughout Australia. New chapters covering diseases in Asian vegetables, herbs and speciality crops have been prepared, recognising their increased importance. The number and quality of images has also increased.

### Project VG07136

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## LETTUCE GROWERS LEARN HOW TO MAXIMISE PRODUCTION POTENTIAL

Lettuce growers have learnt strategies to minimise the impact of common, sub-optimal growing conditions on production and maximise crop potential with good postharvest management via lettuce training days held across six states.

The opportunity to learn about recent research findings was taken up by 187 growers, processors and others involved in the lettuce growing industry.

Information on how to manage inputs to maximise the yield and quality of head lettuce and cos varieties for fresh market or processing, and about risk management was presented.

Feedback from the training sessions was positive with participants finding the information beneficial and easy to follow. For many, standout sessions were postharvest management, crop nutrition and crop scheduling.

Much of the technical input for the training came from a three-year research project funded jointly by OneHarvest and HAL, called *Best Practice Manual and Training for the Australian Lettuce Industry*.

The research was conducted on commercial lettuce suppliers' farms across some of the main lettuce growing regions in Australia. Postharvest trials were run at OneHarvest lettuce processing facilities in Wacol, Queensland, and Bairnsdale, Victoria.

The results have significant value for suppliers of lettuce for the fresh market industry especially as the market moves towards wrapped whole head iceberg and sleeved cos lettuce.

AHR Training acknowledged the support of all participants in the original research project and the many contributors to the success of the lettuce training project, especially the funding bodies.

Copies of the publication, which contains the key research findings presented during training, can be obtained from AHR Training on 02 9527 0826 or [lynn@ahr.com.au](mailto:lynn@ahr.com.au).

**Project VG06034**

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## FIELD GUIDE FOR CUCURBIT PESTS AND DISEASES

A quick reference guide to the pests and diseases that affect cucurbits is being developed for Australian growers.

In Australia, cucurbit production is a \$185 million industry that encompasses cucumbers, zucchini, pumpkins, squash, bitter melons, gourds, hairy melons, watermelons and cantaloupes.

Cucurbits share many of the same pests and diseases, for example pumpkin beetle and powdery mildew. An integrated pest management audit in 2006 noted there was no quick reference tool for Australian growers that gave a comprehensive summary of cucurbit pests and diseases.

Early in the year a list was compiled of all pests, beneficial insects, disorders and diseases for cucurbits in Australian growing areas. Information on these will be published, with accompanying photographs, as a field identification guide.

Over the next few months the text will be written and edited. The guide will then be printed for distribution to growers through the vegetable Industry Development Officers network.

**Project No VG07015**

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## SILVERLEAF WHITEFLY PARASITOID SUCCESSFULLY ESTABLISHED

Silverleaf whitefly, first detected in Australia in 1994, has become a damaging melon pest in Queensland and Western Australia. The whitefly has a considerable capacity to develop resistance to insecticides and so management strategies that are heavily reliant on insecticides are unlikely to be sustainable.

In response CSIRO introduced the parasitoid *Eretmocerus hayati*, which has since established and spread across much of the whitefly's current distribution. This parasitoid has proved effective under similar conditions in southern Texas. CSIRO also began field experiments to determine what made *E. hayati* so effective with the aim of using this information to advise growers how to gain the most from this new management tool.

In 2007/08 CSIRO continued the release program with a release in Carnarvon, WA. A follow-up survey found the parasitoid had

established. In addition, follow-up surveys across northern Queensland confirmed well established populations as far as Mareeba and all points between there and northern NSW. CSIRO also delivered a series of presentations to growers in Bundaberg, St George and Chinchilla to explain the outcomes of the program.

The project has now completed all its objectives. The paper describing the importation, release and post-release evaluation of *E. hayati* has recently been accepted for publication in *Bulletin of Entomological Research* and is likely to appear in press in either late 2008 or early 2009.

### Project VG06029

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Female parasitoid *Eretmocerus hayati*,



Male parasitoid *Eretmocerus hayati*,

## CHANGES IN FERTILISER LAWS UNLIKELY TO PROVE COSTLY

Following a Council of Australian Governments (COAG) agreement in 2004, states and territories introduced legislation to limit access to security-sensitive ammonium nitrate (SSAN), including non-liquid fertilisers containing more than 45 per cent ammonium nitrate.

The impact of this legislation, which directly affects the way primary producers manage crop nitrogen needs, was examined through the project *Security sensitive ammonium nitrate fertilisers: impact on crop nutrient management and alternative fertiliser strategy*.

Financial analysis of the legislation's impact suggested that costs are small relative to the value of the industry, although there is potential for individual growers or enterprises to face moderately higher costs when complying or changing fertiliser regimes, according to findings of the South Australian Research and Development

Institute (SARDI).

Growers will incur moderate extra costs associated with transport, secure storage and record keeping if they choose to continue to use SSAN. For the average vegetable growing enterprise this was estimated to be \$630 per year. However, individual growers need to balance this against the advantages of continued SSAN use compared to certain alternative nitrogen fertiliser forms. These may include early and faster growth of some winter vegetables and reduced likelihood of burning of leaves of certain vegetables.

Researchers also undertook a grower survey and literature review to examine the effects that the changes were having on the Australian vegetable industry. The survey indicated that most growers who had previously used SSAN had switched to other forms of nitrogen fertilisers. The literature review, which focused on different nitrogen fertiliser types and associated management issues, identified areas for future research including

robust evaluation of liquid fertilisers and nitrogen inhibitors.

The final report was submitted in June 2008 and project results were communicated via three fact sheets distributed through *Vegetables Australia* magazine and are also available on the AUSVEG website.

The project provides a clear understanding of the impacts brought about by SSAN legislation and associated changes to the supply and sale of SSAN fertilisers on the vegetable industry in Australia. It provides the basis from which future research activities can be developed.

### Project VG06019

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## GUIDE BOOK AND DEMONSTRATION SITES TO IMPROVE GREENHOUSE SYSTEMS

Concurrent projects are underway to help improve the productivity of greenhouse cropping systems by facilitating the transition to hydroponics through a best practice manual and hydroponic greenhouse demonstration sites.

Many greenhouses in the Australian vegetable protected cropping industry are low technology and have production issues due to soil borne diseases. The project *Improving greenhouse systems and production practices* is designed to provide information about and demonstrate improved techniques to assist growers to increase their production efficiency and potentially adopt more sophisticated greenhouse technologies.

The best practice manual will detail options for converting from soil growing to hydroponics and a first draft has been produced using literature searches and grower case studies. The manual covers all aspects of simple hydroponic systems and success factors.

The next draft of the manual is being developed in consultation with growers and industry personnel. Several growers in the Northern Adelaide Plains have volunteered their properties to be used

for demonstration sites and are providing significant contributions of land, labour and finances.

HAL has approved an adjunct project (VG07145) that will assist with funding the set-up and technical support for the demonstration sites that will be established later in 2008. This component of the research is being conducted by NSW Primary Industries.

The aim of the demonstration sites is to show the benefits of making modifications to production systems in low technology greenhouses. Benefits will be measured in terms of yield and fruit quality characteristics, such as shelf life.

### Project VG07144

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### Project VG07145

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## FRUIT FLY INSECTICIDE ALTERNATIVES EXPLORED

Results that show untreated tomato and capsicum samples are not necessarily infested with fruit flies are helping researchers to develop alternative control options to the common insecticide dimethoate.

Sampling of 23,800 tomatoes and 16,000 capsicums not treated with dimethoate showed no infestation in field fruit or packhouse samples.

Through the project *Alternative fruit fly control and market access for capsicums and tomatoes*, researchers aim to address fruit fly and market access issues by focusing on finding alternative options to dimethoate. Widely used for both pre-harvest and postharvest treatments to ensure fruits are free from flies to meet domestic and export market requirements, dimethoate products are being reviewed because of toxicological concerns. It is likely that certain uses will no longer be allowed, jeopardising market access protocols.

The project will continue its district-wide trapping and assessment of a management program's efficacy with no pre-harvest dimethoate sprays. Data will be incorporated into approaches to meet market access requirements.

This project is a levy and voluntary contribution project.

### Project VG06028

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## THRIPS CONTROL INVESTIGATED

Habits, such as feeding on developing pods within flowers, make thrips not only a continuing pest problem, but also a difficult one to control or manage for the green bean industry.

Through the *Thrips management in the green beans industry* project researchers will examine damage in Tasmania, often categorised as wind scorch, determine appropriate recommendations for management in Tasmania and Queensland, and carry out insecticide efficacy trials in both states.

The trials will compare new sap-sucking insecticides with traditional insecticides in the hope that alternative products will show promise and give growers greater insecticide choice.

A trial using two soil-applied insecticides, imidacloprid and a newer product from DuPont, plus foliar-applied insecticides – Bayer’s Movento™, the grower-standard Success, and a biopesticide – found Movento™ reduced larvae found in flowers, but was not as good at reducing adult populations.

A new efficacy trial saw beans planted in Queensland in September. Tasmania’s wind scorch and efficacy trials will begin in late 2008.

### Project VG07017

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## LOOK BEYOND CROP BOUNDARY FOR PEST CONTROL OPTIONS

Recent information on the crucial role of native perennial vegetation for maintaining pest control services has highlighted the importance of considering pest problems beyond the crop boundary.

However, vegetable growers frequently ask what the benefits will be in maintaining or creating areas of native vegetation and whether there is a risk of increasing their pest problems.

The *Revegetation by design, Queensland: natural resource management and IPM* project has conducted an extensive literature review, experiments and a grower survey to answer these questions.

It has identified numerous species of native plants that pose low risk of creating pest problems and are suitable for integrating with vegetable pest management.

Beneficial insects also move from remnant vegetation into crops, as do some pests, particularly when remnants are weedy.

The grower survey found that the majority of growers have a high regard for native vegetation and are interested in the concept of ‘Revegetation by Design’, but need guidelines, and demonstration to move forward.

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## VIRUS CONTROL TO EXTEND CUCURBIT MARKETABILITY

A project to extend the growing period for production of marketable cucurbit produce is focusing on control of viruses that cause yield and quality losses and visual defects including skin bubbling, blotchiness and blemishes.

An important part of *Developing and communicating strategies for controlling virus diseases in vegetable cucurbit crops* is research to identify where cucurbit viruses survive between growing seasons.

The aim is to develop an integrated disease management strategy to reduce virus levels in crops.

After testing more than 4000 pumpkin seeds the role of seed transmission seems to be minimal. An extensive survey of weeds has identified several alternative weed hosts.

Field trials evaluating commercially available virus-resistant pumpkin and zucchini varieties have shown promising results and further trials are planned this year in WA and Queensland to confirm results. Grower visits and meetings and industry newsletter articles are keeping industry up-to-date with findings.

### Project VG06022

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## BIODIVERSITY PROVIDES SUSTAINABLE PRODUCTION STRATEGY

Growers who invest in well-designed, integrated, perennial native plant refuges stand to gain an additional strategy for long-term sustainable production.

*Revegetation at property scale – designing the 'right' biodiversity for sustainable vegetable production* has found that providing habitat for the natural enemies of crop pests simultaneously reduces the need for chemical weed control. Lower pest numbers also reduce insect-vectoring disease.

In the high-density vegetable production North Adelaide Plains region Western Flower Thrip (WFT) cause major crop losses through the transmission of tomato spotted wilt virus. Chemical control of WFT within crop is becoming less effective, and recent research has also confirmed that exotic weeds near crops act as a reservoir for pest thrips. The alternative WFT cultural control strategy has been a bare earth buffer around crops.

However, pest thrips are rare on endemic plant species in the North Adelaide Plains, suggesting that refuges of native perennial plants could replace weeds while providing long-term benefits for growers and the environment. This observation has prompted research to understand the associations between insect guilds and individual endemic plant species.

This project has set out to determine which endemic plant species have foliage that does not support WFT breeding. A foliage screening system is being developed to identify plants with this type of foliage and results have already identified several low-pest-risk revegetation plant species that have potential.

Integrated refuges on horticultural properties were also evaluated to identify which parasitic wasps they harbour that attack vegetable pests, and the associations between the plants and the wasps.

Two new parasitic wasps associated with native vegetation were identified for their biocontrol potential. One is a tiny (less than one millimetre) wasp (*Ceranisia* sp.) that targets pest thrips. The first recorded parasitoid (*Telenomus* sp.) of the sap-sucking Rutherglen bug has also been identified.

A new endemic plant host association for a well-known wasp (*Hemiptarsenus varicornis*) that parasitises cosmopolitan vegetable leafminer fly pests (such as *Liriomyza huidobrensis*) has also been identified.

**Project VG06014**

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## VIRUS RESEARCH TARGETS TRANSMISSION

Watermelon mosaic virus in zucchinis, tomato spotted wilt virus in capsicum and lettuce, and turnip mosaic virus in brassica crops – the identification of these viruses in a survey of Australian crops highlights the difficulties in managing vegetable viruses.

Viral diseases often have many host crops and may have many active insect carriers. Once infected, plants cannot be cured.

Surveys conducted during 2008 as part of the *Integrated Viral Disease Management in Vegetable Crops* project have already identified some major viral diseases, with a winter crop survey underway. The project aims to reduce the impact of viruses by developing integrated management systems targeting the viruses, their active insect carriers and alternative host plants.

Research will target virus transmission and use host resistance as a management tool. New viruses found during surveys will be characterised and their potential economic impact determined.

Reference material will be prepared and training provided for industry personnel on the identification, epidemiology and management of viral diseases.

**Project VG07128**

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## REVIEW IDENTIFIES SOIL HEALTH PRIORITIES

A year-long review of soil health in the temperate Australian vegetable industry has helped to refine HAL's five-year Vegetable Soil Health Management program, in consultation with industry and research agencies.

*The Management of soil health for sustainable vegetable production project*

has identified four priority areas for research, development and extension to improve soil health and crop management on-farm. These are:

1. To measure and benchmark good farm practices for improved soil health.
2. To measure and understand the impact of crop rotations and tillage

on soil structure, erosion and disease suppression.

3. To better manage organic inputs and organic carbon for improved soil health and water use efficiency.
4. To extend information that would drive adoption of 'best practice' soil health management in terms of biological, chemical and physical (especially tillage and water use efficiency) inputs.



Workshops in SA, Tasmania and Victoria in 2007 identified three key drivers behind the adoption of soil health management. These were: more effective management of inputs (water, pesticides, fertilisers and organics); grower understanding of how to improve soil structure and water use efficiency using modified tillage and crop organics; and sustainable disease control.

Better management of these aspects of soil health should improve yields, profit and product quality on-farm, while minimising environmental costs and maximising natural resource protection and will be supported by the identified research priorities.

A literature review identified that a global shift in funding towards environmental issues was occurring worldwide (particularly funding for soil health, air and water quality) and the willingness by the vegetable industry to participate in soil health activities is seen as a significant step towards future food security and environmental sustainability.

Finally, 35 potential biological, chemical and physical soil health indicator tests were evaluated in demonstration trials at properties of two key vegetable growers in southern Australia. Several of these were judged to be of value in future soil health benchmarking and research trials.

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## SYNERGIES TO ENHANCE BIOPESTICIDE EFFECTS

Researchers are examining whether the use of the insecticide imidacloprid, in non-lethal doses, will make diamondback moths, cabbage cluster caterpillars and green vegetable bugs mortally susceptible to the effects of the biopesticide *Beauveria bassiana*.

The project *Enhancing the efficacy of fungal pathogens using a synergistic chemical, Imidacloprid* aims to measure the susceptibility of each pest to fungal pathogen *B. bassiana* and imidacloprid.

If successful, the project could provide more reliable control of target insect pests with the bio-pesticide.

The efficacy of *B. bassiana* against all three pests has already been quantified in both topical and foliar bioassays. The efficacy of imidacloprid against all three pests has also been measured in foliar bioassays.

The interactions between imidacloprid and *B. bassiana* in all three pests are currently being evaluated along with any behaviour modifications and physiological stress effects resulting from sub-lethal doses of imidacloprid.

### Project VG07039

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## UNDERSTANDING SPINOSAD RESISTANCE IN WESTERN FLOWER THRIPS

In Australia, spinosad is the most widely used insecticide for controlling Western flower Thrips (WFT) on host crops. Until 2003/04, resistance to spinosad in field-collected populations of WFT remained relatively static at 2.6-fold.

Unfortunately, resistance in field-collected populations dramatically increased during the 2004/05 season to 40-fold resistance. That increased again to 87-fold resistance by season 2005/06 and further, to 180-fold in season 2006/07. Spinosad resistance levels in WFT continue to increase and could topple the whole WFT control strategy.

This project, *The sustainable use of pesticides (especially spinosad) against WFT in vegetables*, aims to monitor spinosad resistance in field-collected WFT while also investigating the biochemical and molecular mechanisms behind spinosad resistance.

The chemicals piperonyl butoxide, triphenyl phosphate and dimethyl maleate are

pesticide synergists that do not themselves have pesticidal properties but enhance the pesticidal properties of other chemicals, including spinosad. Bioassay with these synergists was used to investigate whether spinosad-resistant WFT were degrading the insecticide before it could take effect. Preliminary results suggest pesticide degradation is not the cause of the spinosad resistance and that genetic mutations associated with target site are responsible.

With this knowledge, biochemical/molecular research has concentrated on isolating proteins that bind to spinosad in susceptible WFT. A protein associated with spinosad's mode-of-action in WFT has been successfully isolated from a susceptible strain, a first for WFT research.

The next step will be to purify and concentrate the protein so that its primary amino acid sequence can be determined. This information will be used to identify the gene that codes for the protein. Then it will

be possible to design a rapid polymerase chain reaction-based assay to detect spinosad resistance in field isolates.

At the same time as the protein's amino acid sequence is being determined its spinosad-binding efficiency in both susceptible and resistant WFT will be compared.

In addition, resistance monitoring will continue and an initial trial will be undertaken by Sonya Broughton in Western Australia to relate resistance to field control. This is considered essential if spinosad resistance is to be managed in an integrated pest management system where spinosad resistance has been detected.

**Project VG06010**

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## VEGETABLE PLANT AND SOIL HEALTH

Understanding the issues that influence soil health will allow vegetable growers to implement better plant and soil health strategies.

Fourteen paired sampling sites were established in vegetable production areas in northern Queensland, NSW and WA to evaluate how practices (such as minimum till), which growers believed would improve the physical, chemical and biological properties of soil, compared with conventional practice.

The results revealed two national priorities and two soil-type-specific priorities.

Nationally, the vegetable industry needs to improve fertiliser-use efficiency, particularly phosphorus use, as excessive phosphorus was recorded on several farms. The terminology used in soil carbon management also needs clarification so vegetable producers can improve carbon sequestration, leading to soil health improvements.

Issues of poor soil health on clay soils

revolved around soil compaction and poor aggregate stability either due to sodicity or a decline in organic matter. For sandy soils, further work is required to determine how to increase soil nutrient and water holding capacity.

**Project VG06100**

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**Tony Pattison demonstrates how to measure labile carbon, one of the indicators used to measure soil health, to participants at a Bowen field day.**



## SOIL IS SOURCE OF BRASSICA CANKER

DNA tests have identified brassica stem canker as originating in the soil, and plants become infected within the first two weeks after planting.

These findings come from the project *Managing brassica stem canker* which builds on the scoping study (VG05005) initiated after the disease was first observed in the Adelaide Plains region of South Australia in 2000, when up to 80 per cent of some cauliflower crops was lost. The scoping study discovered that a complex of several fungi was involved, and that the disease affects all mainland southern states.

This project is studying the epidemiology of the main two fungi involved, *Rhizoctonia solani* and *Leptosphaeria maculans* (black leg), and evaluating management strategies to reduce the economic loss of the disease. Cauliflower varieties Skywalker and Atlantis have already been identified as being less susceptible to rhizoctonia infection and trials are underway to determine varieties less susceptible to black leg.

Greenhouse and field trials are screening fungicides applied as preplanting drenches for their efficacy in managing the disease.

### Project VG06018

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BSC in field-collapsed cauliflower plants from Brassica stem canker



Stem with Brassica stem canker

## CORNELL MODEL BASIS OF SOIL HEALTH BENCHMARKS

Three researchers from Cornell University, New York, have visited Australia to demonstrate their successful soil health program, which forms the basis of a similar program being developed here. The Cornell University program is the longest running soil health program for vegetables worldwide.

*Benchmarking soil health for improved crop health, quality and yields in the temperate Australian vegetable industries* is using the Cornell model to benchmark soil health and provide industry with a score card which can help improve soil health.

To date, trials have shown that simple changes (such as reductions) to fertiliser and pesticide programs can increase profits for broccoli crops between \$300

to \$1000/ha, using standard grower practices at specific sites in southern Australia.

The project has established long-term trials comparing the effects of different nitrogen and organic treatments on soil health. Results from these trials help to develop better management options for growers to improve management of soils, crops and crop health in the vegetable industry and assist future sustainability.

### Project VG07008

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## COMBINED APPROACH TO MAXIMISE GREENHOUSE DISEASE CONTROL

Fusarium wilt and pythium root rots are the most severe diseases affecting greenhouse-grown cucumbers throughout Australia. These diseases cause both transplants and mature plants to wilt and die, with potential crop losses of more than 30 per cent.

The project *Integrated management of greenhouse vegetable diseases: development of microbial biocontrols, biorational chemical and cultural controls* aims to combine a number of management strategies to determine the most effective disease control options.

The pathogens responsible for fusarium wilt and pythium root rots are widespread and have structures that can survive for long periods without a host crop. While this strain of *Fusarium* only affects cucumbers and rockmelons, there are several *Pythium* species that can attack a wide range of plants.

Internationally several published studies report effective disease suppression by microbial biocontrols. Replicated

greenhouse experiments in Australia have also confirmed the efficacy of a product containing the bacterium *Bacillus subtilis* in controlling pythium root rot. An earlier project also demonstrated that regular applications of microbial suspensions containing a mixture of both the bacterium *Bacillus subtilis* and the fungi *Trichoderma* spp. halved plant death rates in commercial crops (although this was not a commercially acceptable level of disease control).

Screening for fusarium wilt control with a range of current commercially formulated microbial biocontrol products has failed to identify any product that provides significant control. A number of other microbial biocontrols have recently been obtained from collaboration with Australian researchers and will be assessed in similar trials.

The fungicides thiabendazole, prochloraz, DPX-LEM17-053 (DuPont chemical), fludioxanil, and azoxystrobin were assessed as drenches or seed dressing treatments

with some promising results. Similarly, seed dressing with the plant defence activator product Bion® was assessed as providing good disease control.

In collaboration with a number of other HAL projects disease risk factors identified include in-crop and farm hygiene. A best practice manual has been drafted to provide growers and consultants with auditable guidelines to minimise the impact of these factors.

In the final phase of this project on-farm trials will combine improved hygiene with compatible microbial biocontrols and chemical applications, with the aim of achieving robust and economical disease control.

### Project VG05084

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## PEST RISK LEVELS DETERMINED FOR CUCURBITS

Silverleaf whitefly (SLW) poses the biggest risk to Australia's cucurbit production, dramatically increasing production costs and decreasing yields of some pumpkin and zucchini varieties.

*Determining the level of resistance to silverleaf whitefly in cucurbits* is exploring pumpkin and zucchini varieties' tolerance to SLW. Trial results will help growers make informed decisions on which varieties to grow.

So far, the work has identified differences in the levels of damage caused by SLW and also varieties' attractiveness to adult whiteflies. For example, Panther consistently had less leaf silvering than other zucchini varieties, but usually had the highest number of SLW adults on leaves meaning it most likely has host plant resistance. Butternut pumpkin types proved to have the least amount of leaf silvering and to also be the most unattractive for adults to land on.

In a final trial, selected varieties will

be subjected to differing infestation levels to determine tolerance thresholds contributing toward developing management plans.

### Project VG06011

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Silverleaf Whitefly on watermelon leaves



## SCENT OF SUCCESS FOR SWEET POTATO WEEVIL CONTROL

Pheromone technology has been used successfully in a Queensland trial to control sweet potato weevils, as part of a project to reduce the industry's reliance on broad-spectrum insecticides. The trial on a property near Rockhampton was part of the *Improving the management of sweet potato soil insect pests* project.

Based on its success, a scoping study has been prepared on the possibility of an area-wide pheromone control strategy. Weevils are one of the two main causes of sweet potato market failure. The other is wireworm, which is also the subject of new research.

Soil applied insecticides to control wireworm have shown significant differences between treatments in trials at Bundaberg (Queensland) and Cudgen (NSW). More than 1000 adult wireworm click beetles have been collected using light traps and field baiting and identified to the genus level. The project is on track with the only changes being the inclusion of two nematicide efficacy trials.

### Project VG05037

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Wireworm damage to sweet potato in the field



Wireworm damage to sweetpotato once washed

### TWO VIRUSES THE CULPRITS IN RHUBARB DECLINE

In recent years rhubarb crops in some production areas have suffered severe yield decline, and developed leaf mosaic and necrosis symptoms. Left unchecked, the disease may make rhubarb farming unviable in some districts, and some farms are already facing this prospect.

The *Virus identification and development of long-term management strategies for the rhubarb industry* project has identified seven viruses in rhubarb, including tomato spotted wilt virus, cherry leafroll virus, cucumber mosaic virus (CMV), turnip mosaic virus and, previously unknown, rhubarb closterovirus (RCV) and two additional isometric viruses.

RCV and CMV were the most widespread, occurring in NSW, Queensland and Victoria. No viruses were detected in WA and Tasmanian plants. A wide range of symptoms occurs in infected plants, but decline disease is most closely correlated with RCV infection.

Researchers have found that the infection is aphid-transmitted and has dock (*Rumex crispus*) as an alternative host. CMV was also widespread in rhubarb, and in the common weeds *Chenopodium album*, *Stellaria media*, *Sonchus oleracea* and *Capsella bursa-pastoris*.

Tissue culture plants have been derived from

virus-free conventional planting material, and have comparable yield and horticultural characteristics to virus-free conventional material. When virus-free plants were placed in an established infected crop, re-infection rates were high. After 18 months, levels of RCV and CMV approached 90 per cent and 40 per cent, respectively.

Soil drench treatment with calcium silicate is being examined for possible effects on the rates of re-infection of tissue culture plants with RCV and CMV.

Tissue culture lines from virus-infected plants have been produced by meristem tip culture and heat therapy at 33°C and have indexed negative for RCV six weeks after deflasking, a promising result for the establishment of virus-free lines from infected planting material.

This project is nearing completion, and expected outcomes include knowledge of virus epidemiology to assist integrated disease management and the necessary tissue culture and virus indexing expertise to support a virus-free planting material scheme.

#### Project VG05053

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### DEATH KNOCK FOR DIAMONDBACK MOTH

Although the notorious vegetable pest the diamondback moth (DBM), *Plutella xylostella*, has developed resistance to most groups of insecticides, work by Sassan Asgari and Mike Furlong at the University of Queensland's School of Integrative Biology holds promise.

Their project *Investigating the potential of an ascovirus for biological control of Diamondback Moth (DBM), Plutella xylostella* is exploring the efficacy of transmitting a lethal virus to DBMs.

Ascoviruses cause death in infected caterpillars and are transmitted to their hosts by parasitoid wasps. Research has shown that DBM and *Crocidolomia pavonana* larvae can be infected by an ascovirus and killed within days. At low doses individuals may not be killed and they enclose, although as adults most are deformed and die soon after emerging.

The researchers are investigating whether ascovirus can be transmitted by DBM parasitoids. However, neither DBM nor *C. pavonana* appear to be favourable hosts and only small amounts of virus are produced during infection. This could pose a significant hurdle to developing an effective mechanism of pathogen delivery.

#### Project VG06044

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## 'HANDS – ON' HELP TO CUT FERTILISER COSTS

By building growers' confidence in new fertiliser practices, the *Developing guidelines for environmentally sustainable use of mineral fertilisers* project aims to ensure that growers adopt more efficient and lower cost fertiliser programs.

Grower fertiliser practices could be made more efficient by ensuring a better match between fertiliser supply and plant demand during crop establishment. On sandy soils, excess fertiliser applied at this time is mostly leached below the root zone before the crop can use it, polluting groundwater used for irrigation.

To address this, the project will employ

on-farm demonstrations and extensive one-to-one communication with researchers backed up by topical research to solve transition-phase problems.

An early success has seen adoption of the new practice on 83 hectares of lettuce resulting in fertiliser applications and costs halved and yields increased with an improved environmental outcome.

**Project VG07036**

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A research station trial comparing new methods from which best practice fertiliser programmes were derived.



The first stage in the adoption process with a DAFWA technician making yield estimates from a small demonstration plot in a grower's crop to provide evidence of yield increase associated with new fertiliser practices.



The final stage 18 months later showing a full lettuce crop grown using the new practice at Nanovich Farm Wanneroo.



The next stage where the grower was convinced to try a full bay (between sprinkler lines) of the new practice. After this he did it a number of times on a bigger scale himself.

## RACE TO IDENTIFY SNOW PEA WILT FUNGI

Research is continuing to identify exactly which race of the fungus *Fusarium oxysporum* is causing wilt in snow peas in different parts of Australia in the hope of identifying the most resistant variety of snow pea for each growing area.

*Fusarium* wilt is a soil borne disease caused by the fungal organism *Fusarium oxysporum*, which commonly affects many plants including cotton, watermelon, snake beans and other crops. The fungus often colonises rotting plant material but is also capable of infecting living plants.

The type of *Fusarium oxysporum* may be specific to particular hosts; the type affecting peas is *Fusarium oxysporum* f.sp. *pisi* (Fop). The project *Fusarium* wilt of snow peas aims to further define the organism in Australia. Symptoms include yellowing of the whole plant and plant death. Different races of Fop may cause different symptoms. Early wilt symptoms occur when the plants are young; near wilt occurs when plants are near podding.

The disease severely reduces yield and once the soil is infected with the fungus it remains present for many years. A large number of isolates of the fungi have been collected from snow pea growing areas in Queensland, NSW and Victoria where crops have shown wilt symptoms.

During the past year the project has attempted to identify the different *Fusarium oxysporum* races occurring in each growing region. Most varieties of snow peas are resistant to only one race. Knowing which form of the fungus occurs in each area can help growers to select the snow pea variety with the best resistance. Resistant varieties are

expected to be the best management option for the disease.

The main option for control currently is fumigation with chloropicrin or metham sodium. However, this is expensive and can only be carried out by bigger growers. Trials have been carried out with seed dressings as a means of reducing disease levels and this research is ongoing.

**Project VG05029**

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## CLIMATE DATA TO HELP DEFINE FOLIAR DISEASE DEVELOPMENT

Fortnightly assessments of foliar diseases among cucumber, capsicum and eggplant crops in commercial greenhouses, in conjunction with the collection of climate data, are part of a project to better define the environmental conditions conducive to the development of foliar diseases.

The project *Sustainable integrated control of foliar diseases in greenhouse vegetables* is also investigating fungicides and other management options. These include resistant cultivars, modified environmental conditions and biological controls with the potential to form part of an integrated disease management program for the main diseases.

The efficacy of 18 products has been assessed in greenhouse screening trials for the major foliar disease, powdery mildew. Effective and available products have been incorporated into programs aligning with resistance management guidelines and withholding periods of the fungicides. Several products showed excellent efficacy but the relevant chemical companies were unwilling to support applications for a permit for greenhouse use.

The efficacy data has also been used by reviewers at the South Australian Research and Development Institute (SARDI) when advising on permit applications for SA through the Australian Pesticides and

Veterinary Medicines Authority.

This year a further eight spray programs for powdery mildew have been evaluated in a trial in the research greenhouse and the more promising programs will be considered for incorporation into spray trials in commercial greenhouses in the coming season.

The fungicides selected to be screened against the other major foliar diseases, botrytis and downy mildew, will be evaluated in the greenhouse in 2008.

A technique for inoculating plants with botrytis is being assessed and validated and techniques for downy mildew will be investigated once inoculum is available in the field. The potential for modifying environmental conditions to manage diseases like botrytis will be evaluated once the inoculation technique is reliable.

Seed of the most common commercial vegetable varieties has been sourced from the main suppliers and variety trials are currently underway to assess resistance to the major diseases.

### Project VG05094

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## PRIORITY INVESTMENT AND COOPERATION AIDS BIOSECURITY PREPAREDNESS

Information from the *Vegetable biosecurity and quarantine gap analysis* project will allow the vegetable and seed industries to prioritise their biosecurity investments.

The research identifies the biological and regulatory challenges that affect the import and export of fresh vegetables and vegetable seed from market access, production and distribution perspectives.

This allows the vegetable and vegetable seed industries to assess their investment approach to biosecurity preparedness as well as recognise areas that may benefit from resource sharing, cooperative surveillance and data management activities.

Biosecurity impediments of greatest concern are not those directly inflicted by pests and diseases, but rather regulatory inconsistencies between states, chemical security, and the lack of coordinated national surveillance. These issues need to be considered to support market access and pest status allocations (that is 'pest free area' status).

Recommendations to enhance vegetable biosecurity along the supply and production chain are provided. This project is due for completion September 2008.

### Project VG07087

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## ROOT DAMAGE CONTRIBUTES TO PARSNIP CANKER

Damage to the roots of parsnips predisposes them to canker, according to the findings of the research project *Identification of the extent and cause of parsnip canker*.

The project also found that several fungi could be responsible for canker, including *Itersonilia perplexans*, *Cylindrocarpon* spp., *Fusarium* spp., *Mycocentrospora acerina*, *Pythium* spp. and *Rhizoctonia* spp.

Parsnip canker is a significant issue that can result in crop losses of up to 80 per cent. Surveys in 2006 and 2007, as part of the two-year industry-funded research project, showed that canker levels peaked between September and November on crops sown in February and March. The peak average loss due to canker for this period was 45 per cent in 2006 and 23 per cent for 2007, representing a potential loss of A\$3 million over two years, in an industry valued at A\$20 million.

Findings have been presented in conference posters, at steering committee meetings and field days.

**Project VG05045**

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Group of parsnips with canker



36 Parsnip field trial at Rosebud



Field day at Devon Meadows



## WEATHER MODEL TO FORECAST MILDEW

A disease-forecasting model, identifying weather conditions likely to result in powdery mildew on cucurbits, is one of the anticipated outcomes of current mildew-related research.

The aim of the *Management of powdery mildew in field and greenhouse cucurbits* project is to develop new strategies for controlling the disease, in response to the failure of conventional systemic fungicides.

Resistance testing, weather-based disease forecasting, varietal selection, and integrated crop management are all being evaluated to optimise control options.

Field trials at Bowen and Ayr on zucchini, button squash and pumpkin have been completed and weather data for the disease-forecasting model have been collated. Fungicide resistance tests on 10 pathogen isolates from various cucurbit crops in the Bundaberg region have also been completed, with updates provided at grower seminars in March 2008. Final glasshouse trials are underway and the project is expected to be complete in early 2009.

**Project VG05054**

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## VIRUS RESEARCH TARGETS TRANSMISSION

Watermelon mosaic virus in zucchinis, tomato spotted wilt virus in capsicum and lettuce, and turnip mosaic virus in brassica crops – the identification of these viruses in a survey of Australian crops highlights the difficulties in managing vegetable viruses.

Viral diseases often have many host crops and may have many active insect carriers. Once infected, plants cannot be cured.

Surveys conducted during 2008 as part of the *Integrated Viral Disease Management in Vegetable Crops* project have already identified some major viral diseases, with a winter crop survey underway. The project aims to reduce the impact of viruses by developing integrated management systems targeting the viruses, their active insect carriers and alternative host plants.

Research will target virus transmission and use host resistance as a management tool. New viruses found during surveys will be characterised and their potential economic impact determined.

Reference material will be prepared and training provided for industry personnel on the identification, epidemiology and management of viral diseases.

**Project VGO7128**

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## LADYBIRDS AND LACEWING AGENTS IN PEST CONTROL

Since its accidental arrival in Australia in 2000, the ladybird *Hippodamia variegata* has demonstrated to vegetable growers that it could be a useful predator of aphids. It has the potential to control the ever-present threat of the lettuce aphid, *Nasonovia ribis-nigri*, as well as some other small, soft-bodied insect pests such as thrips and caterpillar eggs and small larvae.

Properly managed, this natural enemy could reduce, or possibly even replace the use of chemicals against these pests.

The native brown lacewing *Micromus tasmaniae* has also long been regarded as having similar potential as a natural enemy. In New Zealand, *Micromus* is being effectively used against the invasive lettuce aphid, *Nasonovia ribis-nigri*. This aphid pest is now present in Tasmania and could make its way to the mainland and become a problem there.

The *Development of Hippodamia and Micromus biocontrol agents for use in brassica and other vegetable crops* project will undertake an ecological

study of these species as the basis for the development of an effective pest management strategy for targeted vegetable crops in Australia.

**Project VG05086**

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## IMPROVING CUCURBIT IMMUNITY TO POWDERY MILDEW

Treatments that encourage plants to improve their own resistance to powdery mildew have been successful in cucumber crops, although they have not been as effective for zucchinis.

Powdery mildew causes serious problems for many horticultural crops, especially when it covers the leaves of the plant and as a result the plant does not produce fruit. This means a reduced return for the grower.

The project *Managing mildews: prevention using systemic acquired resistance (SAR) in greenhouse and field grown cucurbits* has investigated new strategies to control powdery mildew in cucumber and zucchini crops.

It has investigated incorporating integrated pest management and safe chemicals that boost plants' natural defence systems. These chemicals induce systemic acquired resistance (SAR) in plants so that they are ready to fight a pathogen when it attacks. SAR could allow growers to minimise the number of chemical applications in a season without compromising crop yield.

The results showed that disease control using this method was excellent for cucumbers, however, the response was not as dramatic for zucchini. The results also showed that good agronomic practices were critical; healthy plants responded much better to the program than those that were compromised by factors, such as lack of water or nutrients.

Many of the chemicals used in these trials are not currently registered for use on horticultural crops in Australia. However, it may be possible to apply for minor-use permits for these chemicals (Bion<sup>®</sup>, Rezist<sup>®</sup> and Milsana<sup>®</sup>) to allow this work to continue. More Australian efficacy data will strengthen the case for registration through the Australian Pesticides and Veterinary Medicines Authority.

**Project VG05034**

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Fungicide treated leaves (left) and untreated leaves (right)



Field trial set up 2006



## BIOCONTROL OF HYDROPONIC LETTUCE ROOT ROT

A series of replicated trials has found that root rot diseases in hydroponic lettuces caused by the common water moulds *pythium* and *phytophthora* can be effectively controlled by microbial biocontrol agents.

The project *Effective management of root diseases in hydroponic lettuce* identified one commercial product containing a strain of the bacterium *Bacillus subtilis* that consistently suppressed root rot diseases to the same level as uninfected crops. Of the other potential biocontrols assessed, *Pseudomonas putida* and *Streptomyces lydicus* provided intermediate control of root rots.

The project also found that greater levels of disease were associated with higher nutrient temperatures, moisture stress, poor crop and farm hygiene and infection with tomato spotted wilt virus. There was also a large variation in lettuce cultivar susceptibility.

Aside from biocontrols, other control methods assessed included chemical disinfectants, which proved to be phytotoxic to plants at the levels required to control disease. UV-light disinfection units were effective, however the cost would be prohibitive to all but the largest farms. The project was completed in May 2008.

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## PREPARING AUSTRALIA FOR EXOTIC LEAFMINER INCURSION

Key leafminer species of the genus *Liriomyza* cause serious economic damage to vegetable crops worldwide.

Australia requires a response plan because these exotic insects could eventually invade the country, affecting the vegetable industry's production and trade.

This project, *Leafminer pest-generic incursion management plan for the Australian vegetable industry*, aims to develop a contingency plan that can be appended to PLANTPLAN, Australia's generic emergency response plan for plant pest incursions.

Desktop research was used to estimate the potential geographical distribution of key exotic leafminers in Australia in relation to climate, assess the potential damage to the vegetable industry and review and identify pest management strategies, diagnostic tools and survey protocols.

A communication plan and structure is being developed that identifies steps necessary to quickly respond to a leafminer incursion in the event of a positive identification.

The next steps are the completion and compilation of the work, and tailoring the contingency plan to the Plant Health Australia format and guidelines.

### Project VG06113

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## GENES WITH PROMISE FOR CLUBROOT RESISTANCE

Several promising genes have been identified in the search for the source of clubroot disease resistance in brassica vegetable crops.

The project *Pyramiding genes for clubroot resistance in brassica vegetable crops* aims to develop molecular markers to breed brassicas, such as Chinese cabbage and cauliflower, that are more resistant to the clubroot disease.

Microarray expression studies have been conducted on several genotypes of brassica with varying levels of resistance to clubroot. Current research is directed towards confirming the function of the promising genes that have been identified.

The work involves isolating the genes that code for enzymes, and comparing the levels in resistant and susceptible lines. Later this year single-nucleotide polymorphisms (SNP) will be identified from resistant and susceptible brassica plants. These SNPs will be validated on an F2 population generated from a cross between two tolerant Chinese cabbage lines.

### Project VG03047

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## NEW FUNGICIDES AND STRATEGIES FOR SCLEROTINIA AND RHIZOCTONIA

After two seasons, 22 efficacy and residue trials have been completed to expedite registration of a new fungicide for *Sclerotinia* control in lettuce, spinach, Chinese cabbage, green pea, green bean, snow pea, cucumber, zucchini, broccoli and brussels sprouts. Additional trials will be conducted in 2008/09 to support new fungicide registrations for root and stem vegetables.

These trials are part of the *New fungicides and strategies for sustainable management of Sclerotinia and Rhizoctonia diseases on vegetable crops in Australia* project, which aims to address the lack of new fungicides being registered for long-term use in controlling the diseases these two organisms cause.

Research into *Rhizoctonia* has found that it is not a single species, but a collection of non-interbreeding subgroups, not all of which affect vegetable production. Potential chemical and non-chemical products have been screened for the control of the most common subgroup *R. solani* AG2.1. However, further studies are required to develop suitable control strategies before products can be recommended or registered for commercial use.

### Project VG05090

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## SILICON SHOWS DISEASE-CONTROL PROMISE IN FIELD TRIALS

Potassium silicate has shown some promising results in controlling the disease *Sclerotinia*, as well as boosting the yield of peas in recent field trials.

The project *Management of vegetable diseases with silicon* has been hampered by low disease pressure during the past two years. However, in two replicated field trials the yield of pea bordered on statistical significance ( $0.05 > P < 0.1$ ) with foliar application of potassium silicate, basal application and non-treated crop yielding 5.9t/ha, 5.8t/ha and 4.8t/ha respectively in the first trial. Yields in the second trial were 13.5t/ha, 11.7t/ha and 11.5t/ha respectively.

In the first trial, foliar application had significantly ( $P < 0.001$ ) lower incidence of *Sclerotinia sclerotiorum* than basal application, which in turn was significantly lower than the non-treated, although overall incidence was low (<10%). This supported previous *in vitro* trials, which have shown that potassium silicate inhibits the growth of *S. sclerotiorum*. The final year of the project will investigate the use of potassium silicate on pea, carrot and cucurbit crops.

### Project VG06009

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## CONFIGURATIONS TO IMPROVE CAULIFLOWER PLANTING AND HARVEST

Research into the most efficient planting and harvesting of cauliflowers and broccoli has found increasing the density of plantings will not necessarily increase the spread of plant maturity, and could provide new options for mechanical planting.

The project *Export cauliflower – Alternative planting configurations* has investigated the most productive crop densities for loam and sandy soils, and the impact of these crop densities on crop maturity. It focused on reducing the spread of maturity of cauliflower and broccoli crops in order to reduce the number of harvests, as the labour required for multiple harvests is a considerable expense for growers. In some areas growers also have difficulty finding adequately skilled workers.

The project also investigated brassica crop densities to determine if planting machinery could be used to plant other crops, such as lettuce.

Experimental work focused on two soil types, loams and coastal sands. The plant density was modified by alteration of both the within-row spacing and the configuration of the plants in a bed. A plant configuration of two, three and four rows per bed and a plant density ranging from 29,000 plants per hectare to 69,000 plants/ha were examined.

For both cauliflower and broccoli, the plant



density per hectare could be increased compared to current industry practice without causing a negative impact on yield, depending on soil type and the plant density selected.

Increasing planting density or altering row configurations did not significantly improve maturation uniformity of cauliflower and broccoli crops, but the high density crops could be planted using machinery suitable for other vegetable crops.

Successfully increasing planting density to improve yield requires modification to current management programs. Nutrition and irrigation programs may need to be increased and crops will require regular

monitoring for pests and diseases.

Investigation of alternative methods for covering cauliflower crops indicated white shade cloth with a light transmission of 50 per cent could successfully prevent yellowing of curds and removed the need for the high density crops to be manually covered.

The project was completed in January 2008 and a final report is available.

### **Project VG04008**

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## IMPROVING EMERGENCE AND RELEASE METHODS FOR THE STERILE INSECT TECHNIQUE

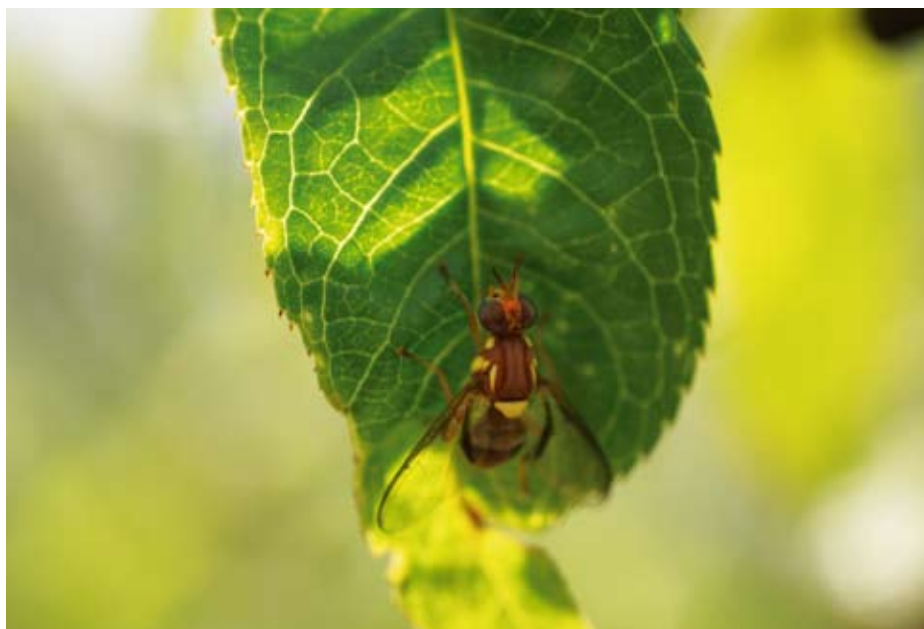
The sterile insect technique (SIT) is the current, internationally-approved technique for eradicating Queensland fruit fly (Qfly).

The technique involves breeding large quantities of sterile male Qfly, which are then released to mate with wild females in infested areas. This produces non-viable eggs, leading to a decline in Qfly populations.

Critical to the success of SIT is ensuring adult insects emerge from the sterilised pupae and having effective means of releasing flies in their pupal and adult stages.

Laboratory studies compared substrates that might aid the emergence of adult Qfly from its pupal stage. No beneficial substrates were identified. Results are not yet available from pupal release trials that assessed the effect of seasonality and pupal loadings on fruit fly emergence.

The effectiveness of two sterile fruit fly release methods were compared, the bin release (used in South Australia) and the plastic adult rearing container (PARC box) method (used in NSW). Results are not yet available. Adult release trials also identified optimal pupal loadings for PARC boxes.



**A sterile Queensland Fruit Fly (Qfly)**

A variant of SIT is chilled adult release, whereby sterile adult Qfly are chilled prior to release to allow more compact packaging, easier transportation and lower costs. Preliminary results suggest that chilling does not adversely affect Qfly performance and SIT efficacy.

**Project MT06049**

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## OPTIMISING IRRADIATION PROCEDURES FOR QFLY SIT PROGRAM

A continuing project has identified ways to optimise irradiation procedures used in the Queensland fruit fly 'sterile insect technique' (SIT) program.

In SIT, millions of flies are sterilised with irradiation and released to disrupt reproduction of pest populations. SIT has been used to combat Queensland fruit flies (Q-flies) continuously for 15 years but there has never been an assessment of irradiation procedures. By investigating each step of the irradiation and delivery process, potential improvements have been identified, resulting in more sterile flies available for release and higher

quality flies (more effective at reducing wild populations) with no increase in production costs.

It has been found that significant improvements to fly quality can be achieved, without any reduction in sterility, by irradiating at the lowest possible dose rates (5 Gy/minute) and by reducing the total dosage from 70–75 Gy to 60–70 Gy. Specifically, irradiating at lower dose rates and total doses produces flies that are superior in stress tolerance, an important measure of performance in the field.

**Project HG06040**

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## REGIONAL RESEARCH ADAPTS THRIP-CONTROL TECHNOLOGY

An extension program involving growers and agricultural consultants has been an important part of a project to adapt information and management strategies for the control of thrips and tospoviruses for Queensland's major vegetable production districts.

Western Flower Thrips (WFT) in particular cause significant horticultural problems in Queensland. Region-specific research through the *Provision of western flower thrips technology transfer services in Bundaberg and Bowen* is helping to adapt management systems developed for southern Australia to northern cropping systems.

Workshops have been held this year at Bowen, Gumlu, Ayr and Bundaberg and presentations were made at several scientific meetings. Issue seven of *WFT Queensland Update* was circulated widely, and project consultants have held discussions with many growers. Agricultural consulting companies are part of the project team and are helping to ensure the successful commercialisation and transfer of technology.

This project is nearing completion and is being externally evaluated to assess its success.

**Project VG03099**

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**Workshop being held at Bundaberg QLD**



**Thrips in capsicum Flower (photo courtesy Bowen Crop Monitoring Services)**



## GOOD TIMING THE KEY TO GROWING VEGETABLES ON SANDY SOILS

The sandy soils of the Swan Coastal Plain have low water-holding capacity and low nutritional status, making it difficult to grow vegetables without leaching fertiliser into the underlying aquifers.

A project involving more than 20 properties in WA indicates that efficient fertiliser use depends on good irrigation scheduling and synchronising the application of nutrients with crop demand and uptake.

Rohan Prince, a specialist development officer, is employed to work on monitoring of soil moisture, nitrogen levels and existing practices on-farm. This work is to help vegetable growers to improve their irrigation systems and nutrient use.

The research validates irrigation scheduling recommendations for carrots, lettuce, broccoli and corn and demonstrates that the use of compost and the addition of clay can reduce the need for crop fertiliser and increase yields.

Articles have been published in WA Grower and a paper was presented at the Irrigation Australia Conference. The project will be completed by 30 September 2008.

### Project VG04009

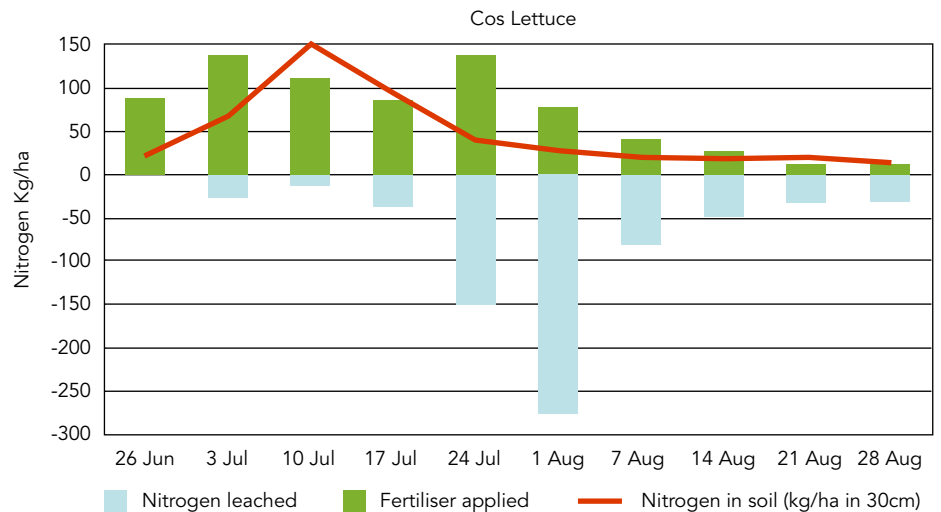
For more information contact:

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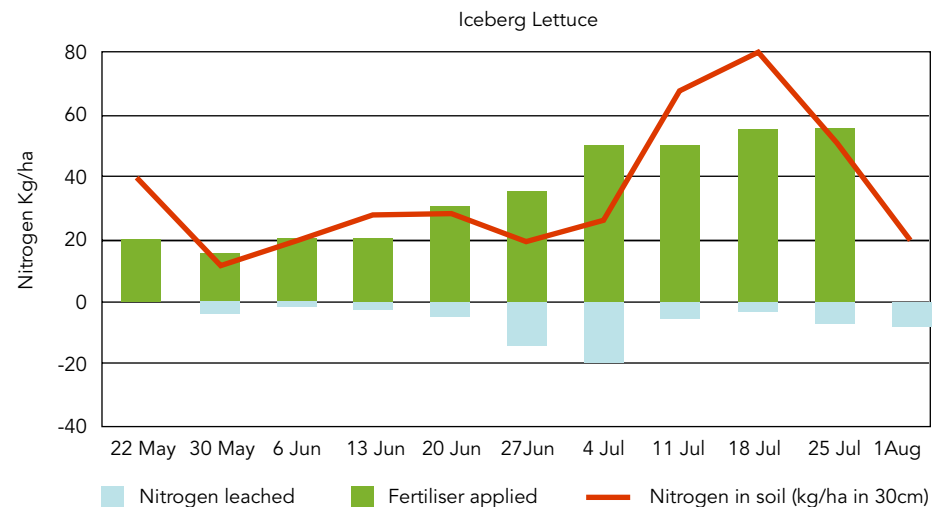
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### Poorly timed application of fertiliser resulting in high leaching loss



### Well timed application of fertiliser synchronising soil nitrate concentration with crop demand



## FOOD SAFETY PROMPTS NITRATE, NITRITE STUDY

For the first time in Australia, a research project has assessed the concentrations of nitrate and nitrite in Australian leafy vegetables.

The study aimed to determine the main causes of nitrate and nitrite accumulation in response to food safety and quality issues. It revealed that high nitrate concentrations in vegetables are due to over supply of nitrate in production and not due to climatic influences, such

as light conditions. It also highlighted that nitrite levels are not influenced by production practices.

While no direct link has been made between nitrate obtained from diet and ill health, some countries regulate the concentrations of nitrate and nitrite as high levels are considered undesirable, reflecting excessive fertiliser use and reduced vegetable quality.

The final report of this completed project was submitted in 2007, and the results were published in the *Australian Journal of Agricultural Research* 2008.

### Project VG04019

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## NEW OPTIONS NEEDED FOR GREEN BEAN DISEASE CONTROL

A project to review *The management of bean root and stem diseases* has identified diseases in Tasmania and Queensland which had previously only been found in NSW. The review has also identified some effective chemical controls, although some products are not currently available in Australia.

The collaborative project was carried out in NSW, Tasmania and Queensland and reviewed diseases affecting green beans, especially those that contribute to stem and root rots. Soil-borne diseases can result in large areas of crop either not germinating or suffering damage at a later growth stage. Many of these organisms can survive for long periods in soils, in plant material or on volunteer weeds or alternate crops.

This project began in January 2004 after the fungicide used to control *Aphanomyces* root rot (ARR) in crops on the NSW north coast was removed from sale. The only control option for ARR was to avoid land that has been growing beans for up to 10 years. This project found ARR was also present in Tasmania

and black root rot was discovered in Tasmania and Queensland, although not previously reported on beans in these states.

All bean varieties tested were found to be susceptible to ARR. A pre-plant soil test was established to help growers understand disease levels before planting. The project identified some fungicides that controlled ARR when used as either seed dressings or soil drenches but the products were either not available or registered for use in Australia.

Biological control, potential break crops and soil fumigation options to reduce disease impact were reviewed. Fumigation showed some success at controlling the disease but may be too costly to adopt.

After a commonly used fungicide used to control white mould on beans in Tasmania and Queensland was withdrawn alternatives were investigated. In Tasmania the first fungicide timed at flowering has been considered critical. In Queensland all fungicide treatments

applied reduced levels of white mould as compared to the untreated plots.

Seed dressings with a more targeted approach to soil borne disease control (as compared to thiram – which is a broad spectrum fungicide) were trialled.

A commonly used fungicide used to control white mould on beans in Tasmania and Queensland has been withdrawn and alternatives are being investigated. In Tasmania the first fungicide timed at flowering has been considered critical. In Queensland all fungicide treatments applied reduced levels of white mould as compared to the untreated plots.

Seed dressings to replace thiram (a broad spectrum fungicide) were examined and found to be suitable replacements for controlling other seedling diseases.

### Project VG03002

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# COORDINATION OF MINOR USE PERMITS FOR HORTICULTURE

Diseases, insects and weeds all reduce Australian horticultural production, but legal access to appropriate agrichemical products to control these problems is limited in some crops and non-existent in others.

The project *Coordination of minor use permits for horticulture* was conducted from October 2004 to June 2007 to assist horticultural industries gain access to the pesticides necessary for sustainable production.

The aim was to critically assess the pesticide uses and requirements of horticultural industries and develop a systematic approach to facilitate access to minor use permits across all horticulture industries.

The project has gathered data to support permit requests, accelerating permit approvals for horticultural industries through the Australian Pesticides and Veterinary Medicines Authority (APVMA). It also conducted a Strategic Agrichemical Review Process (SARP) to plan for future pesticide requirements and project

	Minor permits received	Minor permits received (%)
Vegetables	85	59 per cent
Fruit crops	23	16 per cent
Nuts	17	12 per cent
Berries	8	5 per cent
Nursery/flowers	7	5 per cent
Others	4	3 per cent

recommendations have resulted in the follow-on project *Managing pesticide access in horticulture*.

Many horticultural industries have been involved in the SARP to analyse their current and future pesticide requirements, identify any 'gaps' in the current control options and any potential plant pests. The process has improved the focus of discussions with chemical companies so investments can work in partnership, improving returns for both parties.

Every major horticultural industry has benefited from the outcomes of this

project. The mix of minor use permits received during this project is shown above.

Although the project is now complete, discussions with agrichemical companies and the APVMA are continuing, in order to transfer as many current minor use permits as possible to registered use on pesticide labels.

### Project AH04009

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## MINOR USE PERMITS FOR VEGETABLES

The vegetable industry faces a number of challenges in gaining access to agrichemicals for the control of pests, weeds and diseases. These include the withdrawal or rationalisation of some chemicals, new and emerging crops, pesticide resistance, and the reluctance of manufacturers to register products for minor crops. Growers are also increasingly turning to integrated pest management strategies, and looking for improved agrichemical choices.

Horticultural produce, particularly vegetables, must meet minimum standards relating to quality, safety and consumer expectations. Quality Assurance programs dealing with the whole production process, including agrochemical use, residues, and withholding periods, demand that growers exercise good management practices.

In response to these issues HAL has more than 100 trials underway to provide

the data necessary to secure minor use or off-label use permits for agrichemical products.

The data APVMA requires to register a product for use in Australia can be expensive to generate and many horticultural crops are too small individually to make these costs worthwhile for agrochemical manufacturers.

APVMA's National Permit System does provide some flexibility by providing minor use permits, for uses not specified on the product label. However, APVMA still requires data verifying that the permitted use will be effective and will not have any harmful effects on humans, the crops or the environment.

Peracto Pty Ltd conducted 30 residue trials in 2006/07 in specified regions throughout Australia and data from these trials has been submitted to APVMA together with the relevant applications for permits or permit renewals. The company has conducted another 21 field trials in 2007/08

to support seven minor use permits. Residues in treated crops were assessed to establish appropriate Maximum Residue Limits (MRL) and withholding periods. The residue data is generated in accordance with the Organisation for Economic Co-operation and Development (OECD) Principles of Good Laboratory Practice (GLP) using Peracto's systems and procedures. The laboratory analyses are continuing and minor use permit applications are being prepared.

Study plans for a further 62 field trials have been developed and test items from agrichemical manufacturers have been sourced. Study plans and test item samples have been issued to the field personnel and four trials have commenced.

### Project VG06162, VG05097, VG07188

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## MINOR USE PERMIT APPLICATIONS

In 2007 Agrisearch Services Pty Ltd completed a national program of integrated field and laboratory studies to determine residues of a range of active ingredients in vegetable crops grown in differing environments. The crops and active ingredients studied are presented in the table below.

Active Ingredient	Crop	No. of locations
Bifenazate	Leafy lettuce – protected structure	4
Phosphorous acid	Leafy lettuce – protected structure	4
	Capsicum – field and protected structure	2 + 1
	Eggplant – field and protected structure	1 + 2
Fipronil	Head and leafy lettuce – field	6
	Celery – field	4
Methomyl	Head and leafy lettuce – field	6
Phenmedipham	Head and leafy lettuce – field	6
Lambda-cyhalothrin	Cucumber – field and protected structure	1 + 2
Cyprodinal +fludioxonil	Cucumber – field and protected structure	1 + 2
	Capsicum – field and protected structure	1 + 2
	Leafy lettuce – field and protected structure	1 + 2
Chlorothalonil	Cucumber – protected structure	3
	Silverbeet – field	4
	English spinach – field	2
Endosulfan	Cucumber – protected structure	3
	Capsicum – protected structure	2
	Chilli – protected structure	1
Methomyl	Silverbeet – field	4
	Asian root vegetables – field	4
Pymetrozine	Eggplant – field and protected structure	1 + 2

All trials have been successfully completed for project (VG06156) to the Good Laboratory Practice (GLP) standard and the final report has been submitted to HAL. This data will be used to support minor use permit applications to the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Agrisearch Services has additional integrated field and laboratory studies underway, as summarised below.

Active Ingredient	Crop	No. of locations
Azoxystrobin	Carrots, capsicum,	2
	Cucumber, lettuce	12
Cyprodinil+Fludioxonil	Lettuce (head and leafy) – field and greenhouse, endive, chicory, radicchio	7
Emamectin	Celery	3
	Eggplant – greenhouse and hydroponic	3
	Snow and sugar snap peas	2
Quinoxyfen	Silverbeet	3
Tebuconazole	Carrots	2
Pymetrozine	Lettuce	4

This project (VG07190) is running to schedule and the report will be completed in December 2009. This data will be used to support minor use permit applications to the APVMA.

**Project VG06156, VG07190**

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## MINOR USE STUDIES

Agrisearch Services Pty Ltd has conducted 11 studies on 21 different pesticides including fungicides, herbicides, insecticides and miticides in 2007/08. These studies were conducted at 30 different field sites in NSW, Queensland and Victoria. It included crops such as greenhouse-grown capsicums, field-grown chillies, horseradish, brassica leafy vegetables, lettuce, silverbeet, spring onions, celeriac, celery, snow peas and sugar snap peas.

The studies involved one or multiple applications of the pesticides on the target crops, sampling the crops at or around the normal commercial harvest time, and then analysing the sampled plant parts for residues of the target pesticide. Detailed study reports on the field and analytical components were prepared and these were used as part of the permit applications to the APVMA.

**Project VG04071**

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## MINOR USE RESIDUE STUDIES

Agronico has developed plans for six residue studies for the use of products that contain fenhexamid, iprodione, metribuzin, phen-medipham, pyrimethanil and s-metolachlor in various vegetable crops. The study plans are being finalised and the field-phase activities of all six studies are scheduled to begin between September and October 2008 to generate the residue data required for minor use permit applications.

**Project VG07194**

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### SHAMROCK PROVES LUCKY AGAINST PARSLEY NEMESIS

Screening flat-leaf parsley cultivars in Victoria has shown that Shamrock has up to 70 per cent less root rot than other cultivars, making it potentially useful in areas where both summer and winter root rot are problematic.

Through the *Identification and management of parsley root rot* project researchers are continuing to better understand parsley root rot and investigate control options.

It can cause up to 100 per cent crop losses in Queensland and in Victoria, where in summer it is associated with fusarium, but in winter is caused by water moulds *pythium* and *phytophthora*.

Although summer root rot may not require chemical controls, winter root rot attacks both seedlings and mature plants and results in the complete and often rapid collapse of the root system and major crop losses.

Research shows a fungal biocontrol of the naturally occurring mycoparasite water



mould, *Pythium oligandrum*, is effective against water moulds in pot trials, but its commercial preparation is ineffective.

**Project VG06046**

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### MAINTAINING ACCESS TO PESTICIDES

AgAware Consulting Pty Ltd continues to provide strategic agrichemical use and permit review services and information to industry through the Managing pesticide access in horticulture program, now in its second year.

Work on urgent permit applications and the consolidation of permits is ongoing, with 16 urgent renewals and four consolidated renewal applications submitted to the Australian Pesticides and Veterinary Medicine Authority (APVMA) in the past four months.

There were 32 permits issued for various vegetables; two permits were not renewed as the use was either now registered or not required by industry. Permit information is distributed to all relevant vegetable industry participants as soon as a permit is issued. A complete list of all horticultural permits was distributed in May 2008.

Information on the current use of herbicides and pesticides and alternative use strategies has been provided to the Tasmanian vegetable industry, various industry development officers, Queensland Department of Primary Industries and Fisheries and agricultural chemical manufacturers.

Contracts have been issued for new projects to generate pesticide data and desktop reviews including 25 new data generation projects (147 trials) to be completed by late 2009. Ten desktop projects, including SA pesticide exemptions, were contracted and completed by late June 2008.

**Project MT07029**

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### IMPROVING MARKET ACCESS FOR ASIAN VEGETABLES

Consumer confusion and uncertainty are the main barriers Asian vegetables face in the Australian market. Consumers are confused by different names for what appear to be the same vegetable, and they are unsure about how to prepare these vegetables.

The project *Improving market access for Asian vegetables* is designed to develop standard names for Asian vegetables and encourage the use of these names across the industry. It will also investigate what consumers think of these vegetables, and develop ways to more effectively market and present Asian vegetables to people who are unfamiliar with them.

In the final stage of the project a series of focus groups were conducted with consumers. These were followed by an online survey of more than 1000 grocery buyers.

Both studies provided insights into why consumers do or do not buy Asian vegetables, as well as their other vegetable shopping habits. The results have been presented to key industry members in Sydney and Melbourne with further publications planned.

The final project report was submitted to the Rural Industries Research and Development Corporation (RIRDC) in February 2008 and will be published online.

RIRDC has provided funding for a new study *Adding value to Asian vegetables*, which will build on this project's results. Work on this has recently begun with a survey of Asian vegetable products currently available and under development.

This will guide the allocation of resources in developing new value-added products for the Asian vegetable industry.

**Project VG04031**

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### RESIDUE RISK ANALYSIS FOR VEGETABLE EXPORTS

The export of horticultural commodities provides a potential area of growth for the industry. An analysis of pesticide residue management options and export compliance has been undertaken to ensure Australian produce meets the requirements of importing countries.

Breaches of residue standards have the potential to damage export trade, with flow-on effects to growers supplying the produce, and the possibility that access to overseas markets will be jeopardised for the entire industry.

The *Residue risk analyses and management option development for export vegetable crops* has examined the risks of pesticide residue non-compliance for 11 export crops – beans, beetroot, broccoli, cabbages, capsicums, carrots, cauliflower, celery, leeks, lettuce and sweet corn.

The project objective was to identify options to help these Australian vegetable exports achieve compliance with the standards of importing countries. This was first addressed through the provision of information on current pesticide-related standards. Second, where disparities existed, alternative pesticide options were identified to help exports conform to the required standards.

Project coordinators at AKC Consulting have liaised with chemical manufacturers, and international and domestic regulatory organisations to collate listings of Maximum Residue Limits (MRLs) for the nominated export markets.

They have also undertaken a residue risk analyses, comparing Australian MRLs with those of a range of importing countries and provided information on MRLs for markets as nominated by the vegetable industry.

Residue management options were developed for the commodity-market combinations nominated by the vegetable industry and these options have also been supplied as input to the Minor Use coordinator involved in other Horticulture Australia Limited projects (Project AH04009 and AH06104).

The project coordinators have also sought to keep the industry informed of new developments, and progress of existing residue issues. The results of analysis and new residue management options have been made available to industry for consideration and feedback.

**Project VG05019**

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# SUPPORTING DIMETHOATE AND FENTHION APPROVAL TO MAINTAIN MARKET ACCESS

Efforts are progressing to maintain as many registered uses of dimethoate and fenthion as possible. This follows the beginning of a review of these insecticides by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Their review is being conducted as part of an ongoing program, which is designed to ensure that pesticide products meet improved standards of safety and performance.

The outcomes of the review will be significant to many horticultural industries because these insecticides are essential for the control of fruit-fly, and are necessarily applied before some commodities can be transported to interstate markets or exported overseas.

An important aspect of the APVMA's review involves the consideration of residues that remain in the harvested produce following application of the insecticides as pre-harvest sprays and/or as postharvest dips.

Because these insecticides were registered many decades ago existing registrations were sometimes based on residue data is now considered insufficient, out-dated, or inconsistent with current use patterns. Hence, the APVMA required extra data to be generated for most crops that appear on current product labels.

Therefore, a large multi-industry project started, which was aimed at generating the data that APVMA require. The project begun early in 2007 and was comprised of two separate residue studies, one to generate pre harvest use data and, the other for postharvest-use data.

The project is close to the end of its first year and all those field trials, have been completed. Sample analyses have been completed for many crops with the remainder being analysed over the coming weeks.

Soon after, the data will be assessed by

the project team, in collaboration with the APVMA and decisions will be made regarding the final season's trials. It is expected that these will be targeted at crops and/or at use-patterns that may face greater scrutiny during the APVMA review.

A related study is also underway, investigating the impact of lower doses of dimethoate in postharvest dips, on fruit-fly control. If these trials indicate lower doses are effective, further studies may be required to satisfy quarantine security requirements for access certain markets.

This research is being administered by HAL as part of the horticulture industry's market access strategic R&D plan.

### Project MT06022

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## A SYSTEMATIC APPROACH TO MARKET ACCESS R&D

Market access is a key priority for Australia's horticulture industries including the vegetable industry. The HAL Market Access Research and Development (R&D) Strategic Plan administered by the Working Group for Market Access R&D (WGMARD), has been revised during 2007/08 under a Strategic Framework termed 'Pathways to Market'. The revised plan will provide improved focus directly on market access related R&D for a wide range of pests using a multi industry approach, where possible.

The revised R&D approach is designed to support the normal World Trade Organisation (WTO) Sanitary and Phytosanitary Measures (SPS) market access framework. Systems Approaches and Disinfestation are the two major categories for market access R&D within this revised framework. Within these two major categories there eight key Pathways to Market priorities to accommodate the scope of research

which may be required to address the various pathways that lead to international market access.

The Systems Approach category contains market access data packages, pest control and management and other systems approaches. The postharvest Disinfestation category contains fumigants, chemical treatments, cold disinfestation, heat treatments, irradiation and other disinfestation treatments. The plan describes an R&D program investment of \$18.3 million over five years, and follows on from the industry, agency and government investment of around \$6.5 million since the original market access strategic R&D plan was conceived.

It is important to note that the scope of the original eight key research areas within the original R&D plan, are included within the revised and expanded market access plan R&D framework. While fruit flies remain one of the main concerns, other insects e.g. light brown apple

moth, fullers rose weevil, codling moth, mealy bugs, scales, mites, etc are also of significance and have been considered within this plan. The plan places an emphasis on multi-industry projects. This is relevant to pre-harvest systems, in mixed crop orchard areas as well as in areas where there is a patchwork of single crop orchards growing fruit fly or pest hosts.

The next step in the implementation of the plan will be development of benefit cost analysis (BCAs) and business cases for investment in the plan. Industry, government and other funding bodies will be consulted for funding support for the Pathways to Market Access R&D Plan for the 2007/08–2012/13 period.

### Project MT06020

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### DEVELOPMENT NEEDS PRIORITISED

The Vegetable Industry Advisory Committee (IAC) is prioritising industry development needs following information generated through the *Vegetable Industry Development Needs Analysis* project.

The project, which set out to review the vegetable industry's development portfolio, identified two areas where additional information was needed to determine the industry's development needs. These were in internationally competitive vegetable supply chains and advanced industry information systems.

To find out more about internationally competitive supply chains, the project team – Concept Consulting Group – undertook detailed interviews with a representative sample of vegetable levy payers.

This allowed an insight into the nature of the services sought by vegetable levy payers to improve their competitiveness and the competitiveness of the value chain in which they participate. It also allowed the project team to identify key service providers involved in supporting vegetable levy payer businesses to improve their competitiveness.

By sending out a structured survey, the project team also found out more about

advanced industry information systems.

Detailed interviews with state association executive officers, industry development officers and representatives of each link in the value chain (processors, retailers, rural distribution, commercial R&D service providers, state and national research agencies, wholesalers and central market authorities) were also undertaken.

The information collected will help industry achieve their vision as set out in the strategic plan Vegvision 2020.

The project was initiated because the HAL Board required that all member industries complete a review of their industry development needs to ensure maximum return on investment in this area. Investment in vegetable industry development is significant. Between 2002 and 2008 the industry invested \$15.3 million in industry development projects, equating to 25 per cent of the total R&D levy investment.

#### Project VG07154

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### VEGETABLE INDUSTRY COMMUNICATIONS & PASSWORD PROTECTED WEBSITE

Vegetable growers now have easier access to project results through a more comprehensive suite of communication channels.

A 2004 audit of the industry established that awareness levels of the National Vegetable Levy and its research and development outcomes was very low.

This three-year project established a functional framework to ensure the communication function and the delivery of research and development outcomes were conveyed to a somewhat fragmented Australian vegetable industry.

This project financed the execution of the communication strategy, in particular the employment of communication staff to deliver all aspects of the communication strategy such as the R&D website, *Vegenotes*, Vegetable Industry Conference and Language Other Than English (LOTE) communications. They also support the publication of *Vegetables Australia*.

The Vegetable Levy Payer, password protected website has been up and running since 2005, with the number of growers and researchers registered consistently growing.

The website holds information on all R&D projects completed since 2005, including articles, final reports, presentations and images. To protect the information the site can only be accessed by a password system.

#### Project VG07062

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### REPORT PROMPTS ASSESSMENT OF R&D RETURNS

A recent Productivity Commission report highlighted Government concerns about the lack of evidence supporting a positive return on expenditure by Research and Development Corporations (RDCs).

In response, RDCs are considering how best to demonstrate that their R&D programs have a net positive impact to stakeholders through the project *Benefit Cost Analysis 10 years of Vegetable levy investment*. Horticulture Australia Limited (HAL) has commissioned an assessment of the return on investment from the National Vegetable Levy over the 10 years from 1998 to 2007. The project aims to quantify the benefits that have accrued from expenditure using a cost-benefit analysis of selected projects.

Still in its early stages, the project has mapped out the linkages between the R&D priorities of the Australian Government, the Department of Agriculture, Fisheries and Forestry (DAFF) and the vegetable industry and identified a series of measurable outcomes. Stakeholder consultation will quantify the outputs of a number of projects that have delivered tangible benefits.

#### Project VG07089

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### CONSOLIDATED INDUSTRY ECONOMIC DATA ALLOWS BETTER ANALYSIS

A project to consolidate information on Australian vegetable industry production has improved the breadth and accuracy of the industry database for future statistical analysis. It has also identified gaps which future projects will need to address in order to provide growers with best financial practice information and benchmarks.

The *Economic Research and Statistics Development Program* was born out of the need to provide ongoing economic research and develop a statistical database for the Australian vegetable industry. The six-month project was designed to allow the industry time to develop a longer-term approach for the provision of economic services, to be dovetailed with the vegetable industry's strategic plan.

Economic data from the Australian Bureau of Statistics (ABS) and the Australian Bureau of Agriculture (ABARE) and Resource Economics has been collated, and processes established to ensure the continuing provision of quality data for the vegetable industry. In June 2008 the ABS provided additional, extensive data, which will enable more in-depth economic analysis to be undertaken on the industry, including some regional analysis.

The program has also involved providing speeches to selected groups and writing

industry articles and reports. Economic services have been provided to the Australian Vegetable Industry Development Group, and the Vegetable Industry Advisory Committee, with general information provided to growers on economic matters. The industry has been represented in public forums and in interaction with Government; there has been liaison with HAL, and representation on the Horticulture Market Access Committee.

Gaps identified include further and expanded data collection, including consistent time-series data. More extensive data on costs of production is needed to establish benchmarks that individual producers can strive to achieve as best business practice.

Further economic work is required on supply

chain demands and interchange of economic information with processors and retailers. The paucity of data on consumption needs to be addressed. Studies of demographic and lifestyle trends are essential to help the industry achieve the strategic direction outlined in *VegVision 2020*.

Ongoing economic expertise is essential to provide the rigour and research necessary to demonstrate the vegetable industry's importance, to support industry objectives and to help vegetable growers understand wider economic issues.

#### Project VG07059

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### SURVEY TO UNCOVER TRUTH ABOUT INDUSTRY STATISTICS

Concern about the accuracy of ABS statistics on the NSW vegetable industry has led to a new project to provide information about the industry.

According to ABS (2006) figures, NSW, which contains about 33 per cent of the Australian population, produces only about 13 per cent of total Australian vegetable production. This suggests that NSW imports more than 60 per cent of its vegetables from other states. Analysis of ABS (2006) data also suggests that Sydney imports close to 90 per cent of its vegetable requirements from outside the Sydney region, either from regional NSW or from interstate.

People close to the NSW vegetable industry believe these figures

underestimate the value and volume of vegetable production in NSW. The ABS data for Sydney, suggests that the Sydney region has about 800 vegetable farms producing about 3700 ha of assorted vegetable crops. However, estimates of grower numbers from grower organisations, government agencies, retailers and others, indicate that there are between 1600 and 3000 commercial vegetable farms in the Sydney area. Further adding to the uncertainty is the fact that some of the Sydney growers have poor English language skills and do not have any contact with government agencies or grower organisations.

The project *Ground truthing survey of vegetable industry statistics*, which commenced in February 2008, seeks to

address these issues by collecting readily available data from multiple sources, and conducting a field survey of the Sydney Basin and surrounding areas.

Initial data collected from the field survey suggests that the Sydney Basin contains at least 900 commercial vegetable growing properties and the area devoted to the production of field and greenhouse vegetables is at least 1300ha and 230ha, respectively.

#### Project VG07073

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## LANGUAGE PROVIDES A VALUABLE LINK FOR GROWERS

About 40 per cent of Australian vegetable growers do not speak English as their first language. In the past this has meant they may not have been well represented within the broader industry, such as having a say in where the National Vegetable Levy is invested or being represented on industry advisory committees.

Through the *LOTE (Language Other than English) Communication Program for the Vegetable Industry* a foundation for better communication and networks among growers from non-English speaking backgrounds and the rest of the industry is being built.

By improving communication with these

growers, the program also aims to increase the adoption of research funded by HAL and the Rural Industries Research and Development Corporation (RIRDC).

As part of the program, the inaugural National LOTE Grower Forum was held in Perth on 31 May 2008. Vietnamese, Chinese, Arabic and Cambodian growers, researchers and representatives from HAL, AUSVEG and RIRDC attended the forum, which included presentations about the HAL National Vegetable Levy R&D Program and process, RIRDC and EnviroVeg.

Growers discussed preferred communication channels, the purpose of an active communication network and

opportunities for engaging in broader industry events. Participants also recalled past R&D outcomes that have been useful and suggested funding priorities for next year's levy investment.

Growers who attended the forum have committed to play a role in the communication network among growers from a LOTE background. As the project progresses, the network continues to grow, involving many people who work with LOTE growers and others who are keen to see improved communication channels within the industry.

The broader industry has responded well to Asian vegetables, LOTE growers and association profiles in *Vegetables Australia* magazine, leading the program's researchers to think there is an opportunity to include similar material in other industry publications.

Media contacts and networks, to establish radio as another tool for communicating with growers from a LOTE background, have also been built.

### Project VG06066

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LOTE growers at training

## SURVEY SHEDS LIGHT ON VEGETABLE INDUSTRY

A survey of more than 300 vegetable farms across Australia will help provide an understanding of the profitability of Australia's vegetable growing regions and the issues faced by growers.

In 2006, the Australian Vegetable Industry Development Group (AVIDG) was established to provide an industry-wide perspective on directions for sustainable growth of the industry. One of the group's first tasks was to develop a strategic plan for the industry, known as *Vegvision 2020*.

In developing this plan, the AVIDG recognised that the industry needed a better understanding of the key drivers of the physical and financial performance of vegetable farms. Industry-wide data was identified as an essential tool for setting a strategic direction and developing

research and development programs.

The objective of this project, *Financial Performance of Australian Vegetable Farms* is to collect and disseminate representative data on the economic structure and financial performance of the Australian vegetable growing industry to help stakeholders develop plans for the long-term direction of the industry.

HAL commissioned the Australian Bureau of Agricultural and Resource Economics (ABARE) to carry out the survey of vegetable growers across Australia, which will involve three annual surveys between 2007/08 and 2009/10.

Field data collection for the first industry survey began in May 2008 and was completed at the end of July 2008. The target sample was 330 vegetable farms

across Australia. The questionnaire included questions on farm structure, land use, production, capital, income, costs, debts, assets and farm labour. Questions on supply-chain relationships, management practices, and impediments to business growth were also included.

ABARE is now editing the data collected. Once it has been analysed, the results will be published and communicated to growers and policy makers.

### Project VG07063

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# AUSTRALIAN VEGETABLE INDUSTRY CONFERENCE

The Australian Vegetable industry conference was held in May 2007 at the Sydney Exhibition and Convention Centre and hosted approximately 500 delegates from the Australian vegetable industry.

The conference focused on consumers, asking delegates how the vegetable industry can meet consumer needs and desire. It also challenged the industry to have vegetables claim centre of the plate to increase their position as a consumer priority. The theme of the conference was 'Vegetables Claim Centre Plate' as per the logo on the right.

A host of key notes speakers presented including Woolworths CEO, Michael Luscombe, David Palmer, Managing Director, MLA, Robert Belcher, Chairman, and Sustainable Agricultural Communities who spoke on a variety of topics. The late Professor Peter Cullen delivered a thought provoking presentation on water reform.

The conference was informative and informal. The R&D innovation showcase included vegetable, fresh potato, processed potato, onion and general streams which were a great success.



vegetable industry  
CONFERENCE 2007

The trade displays boasted 36 exhibitors offering the latest innovation and products from agricultural suppliers, seed companies, government bodies and industry associations. Ninety five per cent of delegates rated the trade show as either good or excellent.

The next Australian Vegetable Industry Conference will be held in Melbourne in May 2009.

**Project MT06040**

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## VEGETABLES AUSTRALIA KEY SOURCE OF INDUSTRY NEWS

In the past year, *Vegetables Australia*, the vegetable industry's key print communication tool, has undergone a redesign to maximise its readability and relevance to its audience of growers, service providers and industry stakeholders. The magazine will continue into its fourth year delivering news about the outcomes of research and development funded by HAL using the National Vegetable Levy and matched funding from the Australian Government.

It provides information about industry figures and bodies, state organisations, researchers, grower profiles and achievements, import and export markets, the economy, and industry-related news. There has also been a growing editorial focus on issues beyond the farmgate, which helps growers to understand their part in a global marketplace. Articles have increasingly emphasised the interconnectivity of research and development projects, and how research findings and discussion assist further research.

**Project VG06005**

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## PRODUCTION OF AUSTRALIAN VEGETABLE INDUSTRY VEGENOTES SERIES

*VegeNotes* is a series of fact sheets that provide vegetable growers with timely and technical information that can be applied to on-farm practices.

It was first funded in January 2007 and is mailed to growers bi-monthly. To date, nine issues of industry-related information have been distributed.

Sources such as researchers from the state departments of primary industries are consulted to ensure the relevance and accuracy of each *VegeNotes* topic. In addition, recently completed national vegetable levy-funded projects are also used to contribute information to *VegeNotes*.

In April 2008, a survey was mailed to *VegeNotes* readers to gather feedback, determine reader satisfaction and provide the opportunity for growers to suggest future topics. Of the 250 responses received, 99 per cent indicated the information in *VegeNotes* was clear and relevant to on-farm practices.

The positive feedback to the survey indicates *VegeNotes* has been well received by growers and the broader vegetable industry.

**Project VG06127**

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### PROGRAM PROVES LIFE CHANGING FOR PARTICIPANTS

The *Australian Rural Leadership Program (ARLP)* brings out the leadership potential of up to 35 individuals from rural and regional Australia through an 18-month multi-session program.

John Said, managing director of Fresh Select (Australia) Pty Ltd, was sponsored by Horticulture Australia Limited (HAL), and participated in the program which began in May 2008 with a two-week experiential session in Western Australia's Kimberley region.

The region was chosen because of its uniqueness and ability to provide a rare and personally challenging opportunity for participants, allowing them to become aware of themselves and their interaction with others through a range of experiences.

For many, the experience is demanding and life changing. Although out of his comfort zone, Mr Said felt supported by his fellow participants, facilitators and the country itself. The activities' physical impacts may have been strong, but it was the emotional effects which caused him to re-evaluate his view of himself, to see how he could improve his potential.

Mr Said's vision is to see the creation

of economic sustainability for rural and regional Australia, to provide the framework for innovative and strategically placed regional and community development and vibrant rural communities.

The ARLP was established in 1993 to confront the challenges facing rural Australia. It aims to develop passionate and committed rural leaders, people with a vision for the future and the capacity to translate that vision into action.

Although, the program does not expect that graduates will necessarily become leaders at the nation's highest levels, it is hoped that they will take on some sort of leadership role within their communities, their organisations, their industries or their regions. The program maintains that leaders at the community level are no less important or necessary to Australia than the leaders at the upper echelons of government.

#### Project VG07101

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**T 02 6281 0680**  
**E LeighT@rural-leaders.com.au**

### YOUNG GROWERS TOUR TO NEW ZEALAND 2007

Ten young Australian Growers took an educational tour of vegetable growing facilities and farms in New Zealand to learn and expand their knowledge of horticulture. The tour demonstrates the need to develop more activities that cater to young horticulture growers in our community.

The young growers were exposed to a range of on and off- farm business practices and introduced to technological innovations and latest farm techniques. The tour provided a forum to develop grower networks and discuss topical issues with their New Zealand counterparts.

The tour from 27 July to 4 August 2007 included farm visits in the Canterbury and Nelson regions of the South Island and attendance at the Horticulture New Zealand annual conference in Christchurch.

The following recommendations were that:

- Further international tours for Australian growers are investigated and promoted to the industry. These tours provide an opportunity for growers to learn about alternative on and off farm business practice and observe the latest technological innovations/ techniques.
- Tours are developed solely dedicated to young growers. These individuals will be the future leaders in the industry and have the most potential to adapt, expand and promote Australian Horticulture.
- Future tours need to visit different growers and demonstrate different growing methods to ensure that all participant interests are catered for and a broad understanding is given of the industries visited.

#### Project VG07103

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### SCHOLARSHIPS AVAILABLE TO HORTICULTURAL PRODUCERS

Each year a Nuffield Australia Farming Scholarship is offered to producers within the horticultural industry in a bid to help the industry compete in a global environment.

Although some horticultural producers have been awarded scholarships in the past, since 2007 Nuffield has offered an exclusive annual scholarship for horticultural producers.

Nuffield awards scholarships to Australian farmers with the objective of increasing practical farming knowledge, management skills and techniques and providing opportunities for the further development of leadership attributes and skills.

The scholarships give growers the opportunity to study farming practices in New Zealand, Europe, Asia, South and North America and other countries best suited to the scholar. They also promote a closer understanding between farmers in the countries visited.

Upon returning to Australia scholars are expected to actively spread the knowledge and understanding they have gained among fellow farmers and others.

#### Project VG07100

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# Across Industry Program 2007/08

The vegetable industry contributes funding towards an across industry program that addresses issues affecting all of horticulture. Details of the current program are listed below. A full report of the program can be found at [www.horticulture.com.au/industry/acrossindustry.asp](http://www.horticulture.com.au/industry/acrossindustry.asp).

Project No.	Title
<b>Outcome 1</b>	<b>Enhance the efficiency, transparency, responsiveness and integrity of the supply chain for the total industry to provide clear market signals</b>
AH04007	Pesticide regulation coordinator
AH04009	Coordination of minor use permits for horticulture
AH06004	Horticulture Code of Conduct – Industry Support Package
AH07033	Incident Response Protocol – development and training for horticulture
<b>Outcome 2</b>	<b>Maximise the benefits of horticultural products in the eyes of consumers, influencers and government</b>
AH07006	Promoting the health advantage of fruit and vegetables to increase their consumption
AH07007	Horticulture Wellbeing Initiative
<b>Outcome 3</b>	<b>Position horticulture to compete in a globalised environment</b>
AH07002	HAL Market Access Coordinator
AH07003	Market access support program
AH07017	Codex Committee on Fresh Fruit and Vegetables participation
<b>Outcome 4</b>	<b>Achieve long term viability and sustainability for Australian horticulture</b>
AH06002	Horticulture Industry Strategic Plan (Future Focus)
AH06015	Cooperative venture for capacity building (CVCB) membership fees
AH07009	Horticulture Water Initiative
MT07029	Managing pesticide access in horticulture
AH07001	Horticulture Statistics database
AH06019	Australian horticulture's response to climate change and climate variability
AH07022	Horticulture for Tomorrow – Environment Communication Program
AH07026	The Current and Future Human Resource Needs of Australian Agriculture
AH07027	Horticulture component of the National Climate Change Research Strategy for Primary Industries
AH07031	Peri-urban horticulture and land use planning: Literature Review & 'Tool-kit'
AH07032	Independent quarantine and biosecurity review

## AUSVEG & HAL PARTNERSHIP AGREEMENT

The partnership agreement between AUSVEG and HAL is the agreement by which each organisation undertakes to perform certain tasks to enable the other to discharge its responsibilities. This is the mechanism through which AUSVEG claims receives HAL R&D funds to carry out its required functions that are related to levy payers and industry services. Conducting meetings of the Working Groups, Advisory Groups and IAC and the Annual Levy Payers Meeting are all activities funded through the Partnership Agreement. Communications with HAL and managing R&D project development are included in the agreement. AUSVEG has had a continuously funded partnership agreement with HAL since 2003.





# Vegetable Program 2007/08

Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
<b>CONSUMERS</b>							
VG03095	Vital vegetables: Australian component 5 year project, a trans-Tasman collaborative program to produce fresh, flavoursome and functional vegetables	VC	15-Jun-04	30-Aug-08	Victorian Department of Primary Industries	Bruce Tomkins 03 9210 9209	6
VG03096	Vital vegetables: New Zealand component 5 year project, a trans-Tasman collaborative program to produce fresh, flavoursome and functional vegetables	VC	16-Jun-04	30-Aug-08	New Zealand Institute for Crop & Food Research	Ross Lill 64 6 356 8300	6
VG07160	Trends in children's vegetable intake 1995-2007	Levy	16-Jun-08	16-Jan-09	CSIRO Human Nutrition	Jane Bowne 08 8305 0635	6
VG07168	Vegetable consumer tracking study	Levy	02-Jan-08	31-Dec-08	Horticulture Australia Limited	David Chenu 02 8295 2300	7
VG05072	Compiling the nutritional and health benefit information for fresh vegetables	Levy	30-Dec-05	31-Dec-07	Crop & Food Research Institute	Lesley Hedges 64 3 325 6400	7
MT07036	Data Collection Programme	Levy	01-Jul-07	15-Aug-08	Horticulture Australia Limited	Roger Bramble 02 8295 2300	N/A
<b>MARKET DEVELOPMENT</b>							
VG02051	Agronomic packages for reduced pass harvesting of export cauliflower	Levy/ VC	01-Sep-02	29-Feb-08	Department of Agriculture & Food Western Australia	Rachel Lancaster 08 9780 6210	9
VG04006	Heat disinfestation of capsicums for export to New Zealand and interstate	Levy	01-Jul-04	29-Sep-07	QLD Department of Primary Industries & Fisheries	Elizabeth Hall 07 4044 1660	9
VG06045	Extension to project VG04020 'Evaluation of new shipping technology for Australian vegetables'	Levy	01-Mar-07	03-Feb-10	NSW Department of Primary Industries	Jenny Ekman 02 4348 1942	8
VG06159	A value chain analysis of the vegetable processing sector	VC	01-Jul-07	31-Jan-08	University of Tasmania	Rob Clark 03 6226 6282	N/A
VG07150	Global comparative analysis China	Levy	28-Sep-07	29-Feb-08	Food Advantage Consulting Services	Ross Ciaravolo 0417 700 611	8
VG07152	VIEN secretariat support	Levy	16-Jun-08	29-Nov-08	Inovact Consulting	Simon Drum 03 8610 6877	8
VG07189	Project for developing a marketing plan for the Australian vegetable industry	VC	17-Mar-08	13-May-08	Horticulture Australia Limited	David Chenu 02 8295 2300	N/A
<b>COMPETITIVENESS – INDUSTRY DEVELOPMENT OFFICERS</b>							
MT07055	Facilitating the communication and development of the Tasmanian Vegetable Industry (cont VG00070)	Levy	01-Sep-07	01-Jul-08	University of Tasmania	Mike Hart 03 6336 5202	11
VG07169	Facilitating the development of the vegetable industry in Northern Australia	Levy	01-Jul-07	30-Jun-08	Growcom	Alex Livingstone 07 3620 384	11
VG03054	Facilitating the communication and development of the vegetable industry in Victoria – Stage 2	Levy	01-Oct-03	30-Jun-08	Vegetable Growers Association of Victoria	Craig Murdoch 03 9687 4707	10
VG03076	Facilitating communication and development of the South Australian vegetable industry – Stage 2	Levy	01-Oct-03	01-Oct-08	ARRIS Pty Ltd	Melissa Fraser 08 8303 6714	11
VG04023	Facilitating the development of the Vegetable Industry communication network in Western Australia – Stage 2	Levy	23-Aug-04	30-Jun-09	Vegetable Growers Association of WA Inc	David Ellement 08 9226 0244	11
VG07140	Facilitating the communication and development of the vegetable industry in NSW (cont of VG99053)	Levy	01-Jul-07	01-Jul-08	NSW Farmers Association	Alison Anderson 0400 600 628	10

# Vegetable Program 2007/08

Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
<b>COMPETITIVENESS – INTEGRATED PEST MANAGEMENT</b>							
VG03098	Regional extension strategy for managing western flower thrips and tomato spotted wilt virus in the Sydney Region	Levy	01-Apr-04	31-Oct-09	NSW Department of Primary Industries	Leigh Pilkington 02 4348 1900	12
VG04032	Integrated management strategies for pests and diseases of Asian vegetables	Levy	31-Jan-05	31-Jul-08	NSW Department of Primary Industries	Len Tesoriero 02 4640 6406	16
VG05007	Demonstrating integrated pest management of IPM in brassica crops	Levy	17-Aug-05	31-May-09	IPM Technologies Pty Ltd	Paul Horne 03 9710 1554	15
VG05008	Development of cultural control methods for pests of leafy vegetables	Levy	01-Aug-05	31-Jul-08	IPM Technologies Pty Ltd	Paul Horne 03 9710 1554	17
VG05035	Improved IPM systems in the Australian sweet corn industry	Levy/ VC	01-Nov-05	31-Jul-08	QLD Department of Primary Industries & Fisheries	Peter Deuter 07 5466 2233	15
VG05044	Further developing integrated pest management for lettuce	Levy	15-Sep-05	15-Aug-08	NSW Department of Primary Industries	Sandra McDougall 02 6951 2728	17
VG05050	Development and Promotion of IPM Strategies for Silverleaf whitefly in vegetables	Levy	14-Oct-05	30-Nov-08	QLD Department of Primary Industries & Fisheries	Siva Subramaniam 07 4761 4000	18
VG05052	Refining integrated pest management of eggfruit caterpillar	Levy	01-Jul-05	29-Dec-08	QLD Department of Primary Industries & Fisheries	Iain Kay 07 4155 6244	19
VG05093	IPM for greenhouse vegetables - research to industry	Levy	01-Jan-06	31-Aug-09	NSW Department of Primary Industries	Leigh Pilkington 02 4348 1900	12
VG06086	Scoping study on IPM potential and requirements	Levy	01-Sep-06	01-Sep-07	IPM Technologies Pty Ltd	Jessica Page 03 9710 1554	15
VG06087	Pesticide effects on beneficial insects and mites in vegetables	Levy	01-Oct-06	29-May-09	IPM Technologies Pty Ltd	Paul Horne 03 9710 1554	14
VG06088	Providing an IPM Advisory Service for Tasmania	Levy	02-Apr-07	01-Aug-10	IPM Technologies Pty Ltd	Paul Horne 03 9710 1554	14
VG06094	A scoping study of IPM compatible options for the management of key vegetable sucking pests	Levy	01-Nov-06	31-Aug-08	QLD Department of Primary Industries & Fisheries	David Carey 07 5466 2222	14
VG07003	Development of IPM strategies and tools for Western Flower Thrips ( <i>Frankliniella occidentalis</i> ) in hydroponic lettuce	Levy	01-Jul-07	01-Nov-10	NSW Department of Primary Industries	Leigh Pilkington 02 4348 1900	13
VG07030	Developing sustainable solutions for integrated Brassica crop management	Levy	02-Nov-07	31-Oct-10	South Australia Research & Development Institute	Cate Paull 08 83039543	13
VG07040	Revegetation by design, Queensland: natural resource management and IPM	Levy	01-May-08	31-Jul-11	CSIRO Entomology	Nancy Schellhorn 61 7 3214 2721	N/A
VG07076	The delivery of IPM for the lettuce industry – an extension to VG05044	Levy	01-Jan-08	31-May-10	NSW Department of Primary Industries	Sandra McDougall 02 6951 2728	12
VG07110	5.1 Best practice production models (lettuce, brassicas)	Levy	30-Oct-07	31-Oct-09	Victorian Department of Primary Industries	Rob Dimsey 03 5152 0600	19
VG07118	Build capacity of greenhouse growers to reduce crop loss through adoption of preventative disease management practices	Levy	30-Aug-07	30-Sep-09	NSW Department of Primary Industries	Jeremy Badgery-Parker 02 4348 1920	18
VG07153	Nutrient management of Asian vegetables	Levy	31-Jan-08	31-Jan-11	NSW Department of Primary Industries	Sophie Parks 02 4348 1914	16



Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
VG07165	Pesticide residues in hydroponic lettuce	Levy	04-Feb-08	04-Sep-08	NSW Department of Primary Industries	Sophie Parks 02 4348 1914	16
<b>COMPETITIVENESS – PLANT PATHOLOGY PROGRAM</b>							
VG07010	Enhancing the plant immune response for improved disease control	Levy	15-Oct-07	31-Jul-10	Victorian Department of Primary Industries	Robert Faggian 03 8341 2414	N/A
VG07109	Program 1: Development of effective pesticide strategies compatible with IPM management used on farm	Levy	20-Sep-07	30-Sep-09	AgAware Consulting Pty Ltd	Peter Dal Santo 03 5439 5916	N/A
VG07119	Identification and monitoring of resistance in vegetable crops in Australia	Levy	30-Dec-07	22-Jul-10	NSW Department of Primary Industries	Leanne Forsyth 02 4640 6428	21
VG07137	Vegetable pathology program – workshops and coordination	Levy	06-Aug-07	30-Sep-08	Horticulture Australia Limited	Leanne Wilson 02 8295 2300	N/A
VG07125	Project 2.2 Best-practice IPM Strategies for Control of Major Soilborne Diseases of Vegetable Crops throughout Australia	Levy	17-Sep-07	31-May-10	Victorian Department of Primary Industries	Ian Porter 03 9210 9217	20
VG07126	Project 2.1 Integrated management of soilborne pathogens (Sclerotinia beans, lettuce, carrots, celery and other)	Levy	17-Sep-07	30-May-10	Victorian Department of Primary Industries	Oscar Villalta 0448 710 867	20
VG07127	3.1 – Integrated management of foliar diseases in vegetable crops	Levy	30-Nov-07	31-Dec-10	QLD Department of Primary Industries & Fisheries	Chrys Akem 07 4783 0411	20
VG07136	Review of “Diseases of vegetable crops”	Levy	15-Oct-07	30-Dec-08	QLD Department of Primary Industries & Fisheries	Tony Cooke 07 3896 9549	21
<b>COMPETITIVENESS</b>							
HG06040	Optimal irradiation procedures for sterilisation of Queensland	Levy	01-Oct-06	30-Sep-09	Macquarie University	Phillip Taylor 02 9850 9463	42
MT06032	Enhanced Biosecurity risk analysis tools	Levy	01-Dec-06	07-Mar-10	CRC For National Plant Biosecurity	David Cook 02 6246 4093	N/A
MT06049	Enhancing emergence and release methods of the sterile insect technique (SIT) to improve market access	Levy	16-Feb-07	13-Dec-11	NSW Department of Primary Industries	Olivia Kvedaras 02 6938 1613	42
MT06064	Food service research – Phase 1	Levy	01-May-07	01-Sep-07	Horticulture Australia Limited	David Chenu 02 8295 2300	N/A
VG03047	Pyramiding genes for clubroot resistance in brassica vegetable crops	Levy	01-Oct-03	30-Nov-08	RMIT University	Eddie Pang 03 9925 7137	40
VG03099	Provision of western flower thrips technology transfer services in Bundaberg and Bowen	Levy	01-May-04	29-Dec-08	QLD Department of Primary Industries & Fisheries	Iain Kay 07 4155 6244	43
VG04008	Export cauliflower – Alternative planting configurations	Levy/ VC	01-Jul-04	03-Dec-07	Department of Agriculture & Food Western Australia	Rachel Lancaster 08 9780 6210	41
VG04009	Increasing water and nutrient use efficiency in vegetable production on sandy soils	Levy	01-Jul-04	30-Sep-08	Department of Agriculture & Food Western Australia	Peter O’Malley 08 9368 3313	44
VG04012	Effective management of root diseases in hydroponic lettuce	Levy	15-Nov-04	01-Apr-08	NSW Department of Primary Industries	Len Tesoriero 02 4640 6406	39
VG04019	Assessing nitrate and nitrite levels in vegetables	Levy	01-Jul-04	31-May-08	NSW Department of Primary Industries	Sophie Parks 02 4348 1914	44
VG04030	Taro industry development – the first step	Levy	28-Feb-05	30-Apr-08	QLD Department of Primary Industries & Fisheries	Jeff Daniells 07 4064 1130	N/A
VG05029	Fusarium wilt of snow peas	Levy	01-Oct-05	31-Jul-09	NSW Department of Primary Industries	Andrew Watson 02 6391 3100	34

# Vegetable Program 2007/08

Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
VG05034	Managing mildews: prevention using systemic acquired resistance (SAR) in greenhouse and field grown cucurbits	Levy	10-Jan-06	30-Oct-07	The University of Sydney	Jenny Jobling 02 9351 3498	38
VG05037	Improving the management of sweet potato soil insect pests	Levy	01-Jul-05	30-Nov-09	QLD Department of Primary Industries & Fisheries	Russell McCrystal 07 4132 5528	31
VG05045	Identification of the extent and cause of parsnip canker	Levy	01-Jan-06	31-Jan-08	Victorian Department of Primary Industries	Elizabeth Minchinton 03 9210 9224	36
VG05053	Virus identification and development of long-term management strategies for the rhubarb industry	Levy	03-Oct-05	05-Jan-09	QLD Department of Primary Industries & Fisheries	John Thomas 07 3896 9371	32
VG05054	Management of powdery mildew in field and greenhouse cucurbits	Levy	09-Jan-06	22-Dec-08	QLD Department of Primary Industries & Fisheries	Chrys Akem 07 4783 0411	37
VG05064	Improving yield in hybrid carrot seed crops	VC	01-Jul-05	01-Oct-08	University of Tasmania	Philip Brown 03 6226 2716	N/A
VG05068	Optimising crop management and postharvest handling for baby leaf salad vegetables	VC	01-Aug-05	30-Aug-08	Applied Horticultural Research Pty Ltd	Gordon Rogers 02 9527 0826	N/A
VG05084	Integrated management of greenhouse vegetable diseases	Levy	01-Jan-06	31-Mar-09	NSW Department of Primary Industries	Len Tesoriero 02 4640 6406	30
VG05086	Development of Hippodamia and Micromus biocontrol agents for use in Brassica and other vegetable crops	Levy	30-Sep-05	01-Nov-10	NSW Department of Primary Industries	Leigh Pilkington 02 4348 1900	37
VG05090	New fungicides and strategies for sustainable management of Sclerotinia and Rhizoctonia diseases on vegetable crops in Australia	Levy/ VC	03-Apr-06	26-Feb-10	Peracto Pty Ltd	Hoong Pung 03 6423 2044	40
VG05094	Sustainable integrated control of foliar diseases in greenhouse vegetables	Levy	30-Jan-06	18-Dec-09	South Australia Research & Development Institute	Barbara Hall 08 8303 9562	35
VG06003	Enviroveg manual new sections – hydroponic, greenhouse and organic production	Levy	01-Jul-06	01-Oct-08	AUSVEG Ltd	Helena Whitman 03 9544 8098	N/A
VG06009	Management of vegetable diseases with Silicon	Levy	03-Jul-06	29-May-09	University of Tasmania	Frank Hay 03 6430 4907	40
VG06010	The sustainable use of pesticides (especially spinosad) against WFT in vegetables	Levy/ VC	01-Jul-06	30-Sep-09	NSW Department of Primary Industries	Grant Herron 02 46406333	28
VG06011	Determining the level of resistance to silverleaf whitefly in cucurbits	Levy	01-Aug-06	30-Dec-08	Department of Agriculture & Food Western Australia	Amanda Annells 08 9956 3333	30
VG06013	Use of plant growth regulators for reduced pass harvesting of cauliflower and broccoli	Levy/ VC	01-Sep-06	15-Mar-10	Department of Agriculture & Food Western Australia	Rachel Lancaster 08 9780 6210	N/A
VG06014	Revegetation at property scale - designing the 'right' biodiversity for sustainable vegetable production	Levy	03-Jul-06	31-May-09	South Australia Research & Development Institute	Glenys Wood 08 830 39660	26
VG06015	Implementation of national environmental strategy for the vegetable industry	Levy	01-Jul-06	29-May-09	AUSVEG Ltd	Helena Whitman 08 9358 6742	N/A
VG06018	Managing Brassica stem canker	Levy	31-Jul-06	31-Jul-09	South Australia Research & Development Institute	Barbara Hall 08 8303 9562	29
VG06019	Security sensitive ammonium nitrate fertilisers: impact on crop nutrient management and alternative fertiliser strategies	Levy	01-Oct-06	31-Mar-08	South Australia Research & Development Institute	Chris Williams 08 8303 9567	23



Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
VG06022	Developing and communicating strategies for controlling virus diseases in vegetable cucurbit crops	Levy	01-Feb-07	31-Mar-10	Department of Agriculture & Food Western Australia	Brenda Coutts 08 9368 3266	25
VG06028	Alternative fruit fly control and market access for capsicums and tomatoes	Levy/ VC	15-Jul-06	30-Jan-09	QLD Department of Primary Industries & Fisheries	Siva Subramaniam 07 4761 4000	24
VG06029	Release, post-release evaluation and habitat management of the silverleaf whitefly parasitoid	Levy/ VC	03-Jul-06	01-Sep-08	CSIRO Entomology	Paul De Barro 07 3214 2811	23
VG06034	Best Practice Manual and training for the Australian lettuce industry	Levy	01-Sep-06	21-Dec-07	AHR Training Pty Ltd	Michael Titley 02 9527 0826	22
VG06044	Investigating the potential of an ascovirus for biological control of Diamondback Moth (DBM), <i>Plutella xylostella</i>	Levy	01-Jul-06	31-Oct-09	The University of Queensland	Sassan Asgari 07 3365 2043	32
VG06051	Factors controlling Broccoli inflorescence development and architecture	VC	20-Nov-06	29-May-09	University of Tasmania	Philip Brown 03 6226 2716	N/A
VG06053	Agronomic programme to improve the uniformity of broccoli for once-over mechanical harvest	VC	01-Nov-06	01-Nov-09	Applied Horticultural Research P/L	Gordon Rogers 02 9527 0826	N/A
VG06090	Management of soil health for sustainable vegetable production	Levy	01-Oct-06	30-Sep-07	Victorian Department of Primary Industries	Ian Porter 03 9210 9217	27
VG06100	Vegetable plant and soil health	Levy	01-Dec-06	30-Nov-08	QLD Department of Primary Industries & Fisheries	Tony Pattison 07 4064 1127	28
VG06113	Leafminer pest-generic incursion management plan for the Australian vegetable industry	Levy	10-Jan-07	31-Dec-08	QLD Department of Primary Industries & Fisheries	Elio Jovicich 07 4783 0411	39
VG06136	Water use efficiency – interpretation and training in the use of soil moisture data	VC	01-Mar-07	23-May-09	AHR Training Pty Ltd	Jenny Jobling 02 9351 3498	N/A
VG06140	Beetroot variety isolation in relation to colour pigmentation	VC	30-Apr-07	31-Jan-08	Golden Circle Limited	Lydia Grant 0430 092 852	N/A
VG06144	Development of a crop scheduling program for cos and iceberg lettuce in the major growing regions in Australia	VC	30-Apr-07	30-May-10	AHR Training Pty Ltd	Michael Titley 02 9527 0826	N/A
VG06146	Feasibility study for the introduction of <i>Bombus terrestris</i> in Australia	VC	31-May-07	30-Nov-08	Australian Hydroponic & Greenhouse Association	Stephen Goodwin 02 4374 1641	N/A
VG06151	Evaluating water secure sites	VC	30-May-07	30-Apr-09	Harvest FreshCuts Pty Ltd	Thomas Robson 403 833 194	N/A
VG07008	Benchmarking soil health for improved crop health, quality and yields in the temperate Australian vegetable industries	Levy	01-Nov-07	31-Oct-10	Victorian Department of Primary Industries	Ian Porter 03 9210 9217	29
VG07015	Pests, beneficials, disorders and diseases in cucurbits: Field Identification Guide	Levy	01-Jul-07	31-Dec-08	NSW Department of Primary Industries	Anthony Napier 02 6951 2796	22
VG07017	Thrips management in the green beans industry	Levy/ VC	21-Jan-08	31-Aug-10	QLD Department of Primary Industries & Fisheries	John Duff 07 5466 2222	25
VG07023	Driving better vegetable irrigation through profitable practice change	Levy	10-Mar-08	30-Nov-10	QLD Department of Primary Industries & Fisheries	Craig Henderson 07 5466 2214	N/A
VG07035	Understanding spatial variation in sweetcorn production	Levy	01-Jul-07	30-May-08	Australian Centre for Precision Agriculture	Alexander McBratney 02 9351 3214	N/A
VG07036	Developing guidelines for environmentally sustainable use of mineral fertilisers	Levy	11-Jan-08	01-Feb-10	Department of Agriculture & Food Western Australia	Dennis Phillips 08 9368 3319	33

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Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
VG07039	Enhancing the efficacy of fungal pathogens using a synergistic chemical, Imidacloprid	Levy	01-Aug-07	31-May-09	The University of Queensland	Sassan Asgari 07 3365 2043	27
VG07046	Enhancing the profitability of the processing brassica vegetable sector	Levy	01-Jul-07	30-May-09	Tasmanian Farmers & Graziers Association	Bruce Williams 03 5852 1546	N/A
VG07058	Controlled traffic farming systems for the Tasmanian vegetable industry	Levy	01-Jul-07	30-May-08	Tasmanian Farmers & Graziers Association	Bruce Williams 03 5852 1546	N/A
VG07060	Australian vegetable industry data	Levy	16-Jun-08	30-Apr-09	Australian Bureau of Statistics	Cherie Poulton 03 6222 5955	N/A
VG07070	Benchmarking predictive models, nutrients and irrigation for management of downy and powdery mildews and white blister	Levy	09-Nov-07	30-May-11	Victorian Department of Primary Industries	Elizabeth Minchinton 03 9210 9224	21
VG07074	European greenhouse study tour – October 2007	VC	07-Sep-07	31-Jan-08	Australian Hydroponic & Greenhouse Association	Graeme Smith 03 5427 2143	N/A
VG07079	Reducing Listeria contamination from salad vegetable farms	Levy	17-Jun-08	31-May-10	Global FS Pty Ltd	Robert Premier 03 9887 6301	N/A
VG07087	Vegetable biosecurity & quarantine gap analysis	Levy	01-Apr-08	01-Sep-08	Scholefield Robinson Horticultural Services Pty Ltd	Prue McMichael 08 8373 2488	35
VG07081	Developing 'superyellow' enhanced pigment sweetcorn for eye-health	VC	01-May-08	30-Sep-12	QLD Department of Primary Industries & Fisheries	Tim O'Hare 07 5466 2222	N/A
VG07106	Brassica think tank	Levy	03-Dec-07	01-Dec-08	ARRIS Pty Ltd	Alison Anderson 0400 600 628	N/A
VG07128	Integrated viral disease management in vegetable crops	Levy	30-Nov-07	23-Dec-10	QLD Department of Primary Industries & Fisheries	Denis Persley 07 3896 9375	26
VG07138	Workshop to develop greenhouse proposal/s	Levy	01-Jul-07	01-Jul-07	Horticulture Australia Limited	Melanie Davies 02 8295 2300	N/A
VG07144	Improving greenhouse systems and production practices (greenhouse production practices component) (parent – VG07096)	Levy	07-Jan-08	31-Dec-10	South Australia Research & Development Institute	Barbara Hall 08 8303 9562	24
VG07145	Improving greenhouse systems and production practices (greenhouse technology systems component) (parent – VG07096)	Levy	05-Nov-07	30-Nov-10	NSW Department of Primary Industries	Sophie Parks 02 4348 1914	24
VG07146	Australian vegetable industry soil and land management knowledge exchange	Levy	19-Oct-07	31-Jan-11	ARRIS Pty Ltd	James Kelly 0427 821 625	N/A
VG07169	Facilitating the development of the vegetable industry in Northern Australia (cont of VG03052)	Levy	01-Jul-07	30-Jul-08	Growcom	Alex Livingstone 07 3620 3844	10
VG07198	Pre-emptive breeding to combine superior eating quality in tropical super sweet corn with resistance to major diseases	VC	01-May-08	30-Nov-13	QLD Department of Primary Industries & Fisheries	Solomon Fekybelu	N/A
<b>COMPETITIVENESS – MINOR USE PERMITS</b>							
AH04009	Coordination of minor use permits for horticulture	Levy	01-Oct-04	30-Sep-07	AgAware Consulting Pty Ltd	Peter Dal Santo 03 5439 5916	46
MT07029	Managing pesticide access in horticulture	Levy	01-Jul-07	30-Jun-10	AgAware Consulting Pty Ltd	Peter Dal Santo 03 5439 5916	48
VG03002	Managing bean root and stem diseases	Levy	01-Jan-04	03-Aug-07	NSW Department of Primary Industries	Andrew Watson 02 6391 3100	45
VG03310	Minor Chemical Use (AGAL)	Levy	01-Jan-04	31-Aug-07	Horticulture Australia Limited	Brad Wells 02 8295 2300	N/A



Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
VG04071	Generation of pesticide residue data in vegetables to support minor-use permits – Region 1	Levy	05-Feb-05	31-Jan-08	Agrisearch Services Pty Ltd	Martin Collett 02 6362 4539	47
VG04084	Preparing desktop minor use applications for vegetables	Levy	15-Feb-05	31-May-08	AgAware Consulting Pty Ltd	Peter Dal Santo 03 5439 5916	N/A
VG05089	Vegetable minor use permit cost	Levy	01-Sep-05	30-Jun-08	Horticulture Australia Limited	Brad Wells 02 8295 2300	N/A
VG05096	Generation of pesticide residue data for vegetable minor-use permit applications – Agronico	Levy	01-May-06	30-Apr-08	Agronico Research Pty Ltd	Dale Griffin 0418 139 788	N/A
VG05097	Generation of pesticide residue data for vegetable minor-use permit applications – Serve-Ag	Levy	01-May-06	31-Jul-07	Peracto Pty Ltd	Ian Macleod 03 6423 2044	46
VG05098	Generation of pesticide residue data for vegetable minor-use permit applications – Agrisearch	Levy	01-May-06	31-Jan-08	Agrisearch Services Pty Ltd	Martin Collett 02 6362 4539	N/A
VG06046	Identification and management of parsley root rot	Levy	01-Jul-06	15-Aug-07	Victorian Department of Primary Industries	Elizabeth Minchinton 03 9210 9224	48
VG06111	Generation of pesticide residue data in various vegetables grown under protected cropping situations	Levy	15-Jun-07	31-Jul-08	Agrisearch Services Pty Ltd	Les Mitchell 03 5821 2021	N/A
VG06156	Generation of pesticide residue data for pesticide minor use permit applications in vegetable crops 2007 – Agrisearch	Levy	01-Jun-07	31-Dec-08	Agrisearch Services Pty Ltd	Les Mitchell 03 5821 2021	47
VG06161	Desktop preparation of pesticide minor use permit applications in various vegetable crops 2007 – competitive advantage	Levy	15-Jun-07	31-Mar-08	Competitive Advantage	Michael Tichon 0422 300 747	N/A
VG06162	Generation of pesticide residue data for pesticide minor use permit applications in vegetable crops 2007 – Peracto	Levy	12-Jun-07	31-Dec-08	Peracto Pty Ltd	Jane Floyed 0408 356 506	46
VG07203	Minor use desktop permit applications from the South Australian Horticulture Exemption Scheme – DAFF	VC	06-Jun-08	30-Jun-08	AKC Consulting Pty Ltd	Kevin Bodnaruk 02 9499 3833	N/A
VG07188	Generation of residue data for pesticide minor-use permit applications in vegetable crops 2008 – Peracto	Levy	21-Apr-08	01-Apr-10	Peracto Pty Ltd	Kate Allen 0408 163 882	46
VG07190	Generation of residue data for pesticide minor use permit applications in vegetable crops 2008 – Agrisearch	Levy	21-Apr-08	01-Apr-10	Agrisearch Services Pty Ltd	Les Mitchell 03 5821 2021	47
VG07194	Generation of residue data for pesticide minor-use permit applications in vegetable crops 2008 – Agronico	Levy	21-Apr-08	01-Apr-10	Agronico Research Pty Ltd	Dale Griffin 0418 139 788	47
<b>COMPETITIVENESS – MARKET ACCESS</b>							
MT06022	Generation of dimethoate and fenthion residue samples to maintain market access	Levy	06-Jun-07	30-Sep-09	Horticulture Australia Limited	Brad Wells 02 8295 2300	50
VG04031	Improving the market development for Asian vegetables	Levy	28-Feb-05	15-Feb-08	NSW Department of Primary Industries	Jenny Ekman 02 4348 1942	49
VG05019	Residue risk analyses and management option development for export vegetable crops	Levy	16-Sep-05	30-May-08	AKC Consulting Pty Ltd	Kevin Bodnaruk 02 9499 3833	49

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Project No	Project Title	VC or Levy	Start Project	Project Completion	Service Provider	Contact	Page
<b>INFORMATION</b>							
MT06040	Australian Vegetable Industry Conference 2007	Levy	01-Mar-07	30-Jul-07	AUSVEG Ltd	Toni Davies 03 9544 8098	54
VG06005	Publication of the bi-monthly vegetable grower magazine <i>Vegetables Australia</i>	Levy	01-Dec-06	30-Jul-09	AUSVEG Ltd	John Thompson 03 9544 8098	54
VG06066	LOTE (Language Other than English) Communications Program for the vegetable industry	Levy	10-Mar-07	20-Aug-09	AUSVEG Ltd	Hannah Burns 03 9544 8098	53
VG06127	Production of Australian vegetable industry <i>VegeNotes</i> series	Levy	01-Jan-07	30-Jul-09	AUSVEG Ltd	Toni Davies 03 9544 8098	54
VG07059	Economic Policy and Research Manager for the vegetable industry	Levy	14-Feb-08	30-Jun-08	AUSVEG Ltd	Ian James 03 9544 8098	52
VG07062	Vegetable Industry communications and password protected website, July – Dec 2007 (magazine and website and strategy)	Levy	30-Sep-07	31-Jul-09	AUSVEG Ltd	Toni Davies 03 9544 8098	51
VG07063	Financial performance of Australian vegetable farms	Levy	30-Apr-08	30-Aug-10	Australian Bureau of Agricultural & Resource Economics	Milly Lubulwa 0408 162 395	53
VG07073	Groundtruthing survey of vegetable industry statistics	Levy	01-Jan-08	31-Dec-08	NSW Department of Primary Industries	Peter Malcolm 02 45770600	52
VG07089	Benefit Cost Analysis: 10 years of vegetable levy investment	Levy	14-Apr-08	17-Oct-08	AEC Group Limited	Ashley Page 0427 022 896	51
VG07154	Industry development needs assessment for the vegetable industry	Levy	25-Oct-07	31-Dec-08	Horticulture Australia Limited	Richard Stephens 02 8295 2300	51
VG07900	Vegetable Partnership Agreement 2007/08	Levy	01-Jul-07	30-Jun-08	AUSVEG Ltd	Robert Lawler 03 9544 8098	56
<b>LEADERSHIP</b>							
VG06042	Australian hydroponic and greenhouse industry national conference 2007	Levy/ VC	01-Feb-07	30-Sep-07	Australian Hydroponic & Greenhouse Association	Stephen Goodwin 02 4374 1641	NA
VG06131	Vegetable Industry Development needs assessment and implementation program	Levy	01-Mar-07	31-Jan-08	AUSVEG Ltd	Robert Lawler 03 9544 8098	N/A
VG06142	Leadership development enabling growers to attend national greenhouse conference	VC	01-Apr-07	16-May-08	Australian Hydroponic & Greenhouse Association	Stephen Goodwin 02 4374 1641	N/A
VG07100	Nuffield Farming Scholarship	Levy/ VC	14-Nov-07	31-Mar-09	Nuffield Australia Farming Scholars	Jim Geltch 03 5480 0755	55
VG07101	Australian Rural Leaders Program	Levy/ VC	01-Jan-08	30-Nov-09	Australian Rural Leadership Foundation Ltd	Lesley Fitzpatrick 02 6281 0680	55
VG07103	Young Growers NZ tour	Levy/ VC	01-Sep-07	31-Jan-08	AUSVEG Ltd	Toni Davies 03 9544 8098	55
VG07141	Maximising the effectiveness of the vegetable industry R&D program (cont of VG03103)	Levy	30-Sep-07	01-Jul-08	AUSVEG Ltd	Robert Lawler 03 9544 8098	N/A
VG07173	AustSafe Super Growcom Queensland Young Leaders Study Tour to Perth May 2008	VC	14-Apr-08	30-Jul-08	Growcom	Alex Livingstone 07 3620 3844	N/A
VG07191	3rd International Biofumigation Symposium	Levy	20-Apr-08	30-Sep-08	CSIRO Plant Industry	John Kirkegaard 02 6246 5080	N/A
VG07196	Economic modelling of the vegetable industry	VC	15-Apr-08	30-May-08	Centre for International Economics	David Pearce 02 6245 7800	N/A
VG07197	Sectrariat for vegetable modelling project	VC	01-Apr-08	30-Jul-08	AUSVEG Ltd	Robert Lawler 03 9544 8098	N/A



# Vegetable Permits

At the time of printing all vegetable permit information was correct

Permit No.	Permit description	Date issued	Expiry date	States
<b>ALLIUMS</b>				
PER3850	Copper hydroxide / leeks / Downy mildew, Purple blotch	14-Sep-07	13-Sep-12	All states except VIC
PER5522	Totril EC / onions / wireweed	19-Jun-02	30-Sep-10	NSW
PER5956	loxynil octanoate / shallots / broadleaf weeds	13-Feb-06	12-Feb-11	All states
PER6308	Dimethomorph / leeks / Downy mildew	10-Oct-03	10-Oct-08	All states except VIC
PER6759	Tramat 500SC, Matrix 500/onions / volunteer potato	16-Aug-05	30-Jun-09	TAS
PER6914	Lannate L (methomyl) / spring onions and shallots / Western flower thrips	23-May-08	31-Mar-13	All states except VIC
PER6916	Fusilade post-emergence selective herbicide / shallots and spring onions / grass weeds	21-Jul-04	21-Jul-09	All states
PER6930	Ridomil Gold Plus / spring onions / Downy mildew	23-Jun-04	22-Jun-09	All states except VIC
PER7374	Secure 360 SC / spring onions and shallots / Western flower thrips	11-Oct-05	31-Jul-09	All states except VIC
PER7905	Phosphorous / lettuce (leaf and hydroponic), fennel and bulb (alium) vegetables / Downy mildew	4-Apr-06	30-Sep-12	All states except VIC
PER8170	500g/L Carbendazim / onion bulbs / fungal disease control	21-Sep-05	21-Sep-10	NSW
PER8172	Ridomil Gold MZ WG / onion bulbs / post harvest disease	21-Sep-05	21-Sep-10	All states except VIC
PER8231	Filan fungicide / alliums (other than onions) and carrots / Sclerotinia rot	31-Jul-06	30-Jun-09	All states except VIC
PER8240	Tebuconazole / bulb vegetables / White rot	1-Apr-05	31-Mar-10	All states except VIC
PER8323	Stomp XTRA / onion transplants / weed control	14-Dec-05	13-Dec-10	QLD
PER8432	Alpha-cypermethrin / onions / Onion thrips	6-Feb-06	5-Feb-11	TAS
PER8585	Dimethomorph / spring onions and shallots / Downy mildew and Purple blotch	11-Nov-05	31-Oct-08	All states except VIC
PER8762	Maldison / leeks, spring onions and shallots / Onion thrips	18-Apr-08	30-Sep-12	
PER9203	Alpha-cypermethrin / chicory, leeks, spring onions / Red legged earth mite	1-Sep-06	1-Sep-10	All states except VIC
PER9648	Diazinon / onions / Onion thrips	8-Jan-07	10-Jan-09	TAS
PER9666	Dimethomorph / spring onions and shallots / Downy mildew and Purple blotch	22-Jun-07	1-Jan-10	All states except VIC
PER9775	Chlorothalonil / beetroot, celeriac, parsnip, papaya, berries, spring onions, tamarillos / various diseases	14-Apr-08	31-Mar-10	All states except VIC
PER9895	Thimet 100G/leeks/onion maggot and thrips	21-Jul-07	30-Jun-12	All states except VIC
PER9904	Tribinul, Juggler 700, Tribunax 700 WP / leeks / broadleaf weeds	1-Aug-07	31-Jul-12	All states except VIC
PER9916	Ridomil Gold Plus / leeks, cucumber, radish, swede and turnips / Downy mildew, Purple blotch and White blister	7-Sep-07	30-Sep-10	All states except VIC
PER9921	Tribinil herbicide / spring onions and shallots / various broadleaf and grass weeds	16-Jul-07	15-Jul-12	All states except VIC
PER10088	Dithane Rainshield / leeks and shallots / Purple blotch and Downy mildew	30-Sep-07	1-Jan-12	
PER10105	Crop Care Synergy Insecticide Synergist and Crop Care Talstar 100 EC / cucurbits, tomatoes, beans, brassicas, lettuce / whitefly and Yellow leaf curl virus	18-Apr-08	31-Mar-10	
PER10111	Linuron / leeks / grass and broadleaf weeds	5-Jul-07	30-Jun-09	All states except VIC
PER10275	Fusilade Forte 128EC (fluazifop) / sweet potato, leeks and garlic / grass weeds	31-Mar-08	31-Mar-09	
PER10344	Various actives / leeks / grass and broadleaf weeds and various active / garlic / weeds (consolidated uses)	18-Apr-08	31-Mar-12	
PER10349	Azoxystrobin fungicides / alliums / White rot	18-Apr-08	30-Jun-11	
PER10376	Dithane (Mancozeb) / garlic / Downy mildew	23-Nov-07	1-Jan-12	
PER10377	Sertin (Sethoxydim) / garlic / rye grass and barnyard grass	9-Oct-07	31-Oct-12	

# Vegetable Permits

Permit No.	Permit description	Date issued	Expiry date	States
PER10379	Ridomil MZ 720 (Mancozeb and Metalaxyl) / garlic / Downy mildew and Purple blotch	22-Nov-07	31-Dec-12	
PER10384	Rover and Bravo (Chlorothalonil) / garlic / Downy mildew	9-Oct-07	31-Oct-12	
PER10481	Lambda-Cyhalothrin / garlic / thrips, mites, Onion maggot	30-Apr-08	31-May-13	
PER10484	Copper as Cupric hydroxide / garlic / Downy mildew	1-May-08	31-May-13	
PER10511	Surflan 500 Flowable herbicide (Oryzalin) / garlic / broadleaf and grass weeds	18-Mar-08	31-Mar-13	
PER10676	Pendimethalin / spring onions, shallots and radish / various broadleaf and grass weeds	16-Apr-08	30-Apr-13	
PER10714	Karate (Lambda-cyhalothrin) / bulb onions / Onion thrip	8-Sep-08	30-Sep-11	
PER10882	Diazinon / spring onions and shallots/ thrips (excluding WFT) and Onion seedling maggot	1-Jul-08	30-Jun-13	
PER10885	Filan (boscalid), Rovral (iprodione) and Bravo (chlorothalonil) / onion / Neck rot (Botrytis alli)	8-Aug-08	31-Mar-10	

## BRASSICAS

PER7678	Iprodione / brussels sprout / Grey mould	1-Aug-05	1-Aug-09	All states except VIC
PER8819	Filan fungicide (boscalid) / brassicas and brassica leafy vegetables, lettuce and beans / Sclerotinia rot	10-Oct-05	31-Oct-09	All states except VIC
PER8962	Copper oxychloride / broccoli, brussels sprout, cauliflower/ White blister rust	8-Nov-05	8-Nov-08	All states except VIC
PER9169	Lontrel / cauliflower / Capeweed and clover	21-Aug-06	1-Sep-11	WA
PER9184	Imidacloprid / lettuce, brassicas, beans / Silverleaf whitefly	2-Mar-06	30-Sep-08	NSW, QLD, NT, WA
PER10058	Bifenthrin / cucumber, brassicas, beans, lettuce, peppers, eggplant, pistachio, peas, cherries / various pests	15-Apr-08	30-Apr-10	
PER10152	Agri-Fos 600 / brassicas / Downy mildew	13-Feb-08	30-Jun-10	
PER10261	Azoxystrobin / broccoli, brussels sprouts, beans, lettuce and cauliflower / White blister and Sclerotinia rot	3-Jan-08	1-Jan-10	
PER10588	Iprodione / broccoli / Rhizoctonia	7-May-08	30-Apr-13	
PER10688	Alpha-Cypermethrin / cauliflower crops / Staphylinid beetle	1-May-08	30-Apr-13	
PER10674	Mancozeb + Metalaxyl-M / brassica vegetables, brassica leafy vegetables and rocket / Downy mildew and White blister	14-Apr-08	31-Mar-13	

## CORN

PER7677	Propiconazole / sweet corn / Northern corn leaf blight	25-Aug-05	31-Dec-10	ACT, NSW, QLD, SA, NT, WA
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## CUCURBITS

PER6552	Chlorpyrifos / pumpkin / African black beetle	18-May-05	30-Sep-09	ACT, QLD, SA, TAS, NT, WA
PER7916	Nuclear Polyhedrosis virus / watermelons / Heliothis	7-Aug-06	31-Mar-11	All states except VIC
PER7918	Methomyl / watermelons / Heliothis and Cucumber moth	7-Jul-06	31-Mar-11	All states except VIC
PER8249	Petroleum oil / capsicum, eggplant, tomato, okra and cucurbits / whitefly (Bemisia tabaci)	4-Aug-05	31-Mar-10	Qld, WA, NT
PER8321	Endosulfan / strawberries, cucumber, eggplant, peppers, tomatoes, ornamentals / Western flower thrips	11-Oct-05	30-Sep-08	All states
PER8765	Permethrin / cucurbits: rockmelons, watermelons, pumpkin and cucumbers/ Cucumber moth larvae (Phakelura Indica).	5-Jan-06	31-Dec-10	WA
PER8927	Amistar fungicide / cucumber (greenhouse) / Alternaria leaf spot (Alternaria cucumerina)	26-Jun-06	30-Jun-11	All states except VIC
PER8963	Applaud 440 SC / cucumber / Greenhouse whitefly and Silver whitefly	30-Jun-06	1-Jul-10	All states
PER9104	Pyranica / cucumbers / Two-spotted mite	3-Apr-07	2-Apr-12	WA, SA, NT
PER9160	Imidacloprid / potato, tropical fruits, celery, cucumber, peppers (field and protected), cape gooseberry / various pests (consolidated use patterns)	29-Nov-07	31-Dec-10	Various states



Permit No.	Permit description	Date issued	Expiry date	States
PER9178	Buprofezin / cucurbits, eggplant and tomato / Silverleaf whitefly	21-Apr-07	31-Mar-10	Qld, WA, NT
PER9227	Gaucho (imidacloprid) / cucurbits / aphids and wireworm	10-Oct-06	31-Oct-11	Ord River Irrigation Area of WA
PER9487	Maldison / cucumbers / Cucumber fly	16-Jul-07	30-Jun-10	All states except VIC
PER9826	Copper / cucumber / Botrytis rot	30-Jul-07	30-Jul-09	All states except VIC
PER9832	Methomyl / peppers, tomatoes, cucumber, eggplant and non-bearing ornamentals / Western flower thrips	17-Jan-07	30-Sep-08	All states except VIC
PER9916	Ridomil Gold Plus / leeks, cucumber, radish, swede and turnips / Downy mildew, Purple blotch and White blister	7-Sep-07	30-Sep-10	All states except VIC
PER9918	Switch fungicide / cucumbers, glasshouse capsicums, glasshouse lettuce / Botrytis rots	4-Feb-08	30-Jun-10	All states except VIC
PER9919	Euparen Multi 500 WG fungicide / cucumbers / Botrytis rot	7-Dec-07	30-Sep-10	All states except VIC
PER10058	Bifenthrin / cucumber, brassicas, beans, lettuce, peppers, eggplant, pistachio, peas, cherries / various pests	15-Apr-08	30-Apr-10	
PER10105	Crop Care Synergy Insecticide Synergist and Crop Care Talstar 100 EC / cucurbits, tomatoes, beans, brassicas, lettuce / whitefly and Yellow leaf curl virus	18-Apr-08	31-Mar-10	
PER10184	Products containing potassium salts of fatty acids @ 285g/L / glasshouse and hydroponically grown capsicums, lettuce and cucumbers / Glasshouse whitefly and Silverleaf whitefly	20-Feb-08	28-Feb-13	
PER10218	Acramite miticide / cucumbers, capsicums and tomatoes / various mites	3-Jun-08	30-Jun-10	
PER10219	Mancozeb / cucumbers / Grey mould	16-Apr-08	30-Apr-13	
PER10268	Lambda-cyhalothrin / cucumbers (greenhouse and field) / Heliothis, onion thrips, Rutherglen bug and loopers	4-Jan-08	31-Dec-08	
PER10279	Abamectin / cucumber, zucchini and squash / Two-spotted mite	22-Feb-08	30-Sep-13	
PER10311	Eco-oil (botanical oil) / greenhouse and hydroponic capsicum, cucumber and lettuce / Greenhouse whitefly and Silverleaf whitefly	7-Feb-08	30-Sep-13	
PER10345	Bupirimate / cucurbits and peppers / Powdery mildew	4-Oct-07	31-Dec-08	
PER10670	Abamectin / tomatoes, cucumber, eggplant, ornamentals, strawberries and Cape gooseberries / Two-spotted mite and Western flower thrips	1-Apr-08	30-Apr-11	
PER10764	Pyriproxyfen / cucurbits, eggplant and tomato / Silverleaf whitefly	1-Jul-08	30-Sep-12	

#### FRUITING VEGETABLES

PER5815	Spinosad / eggplant / Melon thrips	11-Aug-08	31-Jul-13	All states except VIC
PER6650	Abamectin / eggplant / Two-spotted mite and Western flower thrips	22-Oct-03	16-Oct-08	All states except VIC
PER7560	Fluazifop-p as Butyl / eggplant or aubergine / various grass weeds	24-Oct-05	20-Oct-10	NSW, QLD, SA, TAS, WA
PER7561	Select Herbicide / eggplant or aubergine / various grass weeds	25-Oct-05	25-Oct-10	NSW, QLD, SA, TAS, WA
PER8249	Petroleum oil / capsicum, eggplant, tomato, okra and cucurbits / Whitefly (Bemisia tabaci)	4-Aug-05	31-Mar-10	QLD, WA, NT
PER8321	Endosulfan / strawberries, cucumber, eggplant, peppers, tomatoes, ornamentals / Western flower thrips	11-Oct-05	30-Sep-08	All states
PER8454	Success Naturalyte insecticide / pepino / Eggfruit caterpillar	23-Sep-05	1-Oct-10	WA
PER8489	Clethodim / chilli pepper, paprika, silverbeet and spinach / annual grasses	24-Oct-05	12-Oct-10	All states
PER8537	Helicoverpa Zea or Armigera / eggplant, snow peas and sugar snap peas / Helicoverpa spp.	7-Sep-05	7-Sep-10	All states
PER8743	Chlorothalonil / eggplant and radish / Alternaria / Downy mildew and Grey leaf spot	24-Apr-06	30-Apr-09	All states
PER8768	Zineb / eggplant, spinach and silverbeet/ Anthracnose (Colletotrichum spp.)	10-May-06	10-May-11	All states except VIC
PER8907	Sencor 480 SC (metribuzin) / tomatoes / weed control	9-Dec-05	31-Dec-10	WA

# Vegetable Permits

Permit No.	Permit description	Date issued	Expiry date	States
PER8929	Trifluralin / chillies, paprika and eggplant / various broadleaf and grass weeds	30-Mar-06	30-Mar-11	All states
PER9064	Methomyl / eggplant / Heliothis species	19-Apr-06	12-Dec-10	All states except VIC
PER9160	Imidacloprid / potato, tropical fruits, celery, cucumber, peppers (field and protected), Cape gooseberry / various pests (consolidated use patterns)	29-Nov-07	31-Dec-10	Various states
PER9178	Buprofezin / cucurbits, eggplant and tomato / Silverleaf whitefly	21-Apr-07	31-Mar-10	QLD, WA, NT
PER9241	Pirimicarb / almonds, pistachio, pitaya, eggplant / aphids (consolidated application)	23-Feb-07	31-Mar-10	All states except VIC
PER9501	Sumiclex 500 (procymidone) / peppers / Sclerotinia rot	12-Jan-07	31-Dec-08	All states except VIC
PER9632	Glyphosate / capsicums, snow peas, sugar snap peas / annual and perennial grass and broadleaf weeds	12-Feb-07	31-Dec-12	NSW, QLD
PER9832	Methomyl / peppers, tomatoes, cucumber, eggplant and non-bearing ornamentals / Western flower thrips	17-Jan-07	30-Sep-08	All states except VIC
PER9840	Chlorpyrifos 500g/L / capsicum / Cluster caterpillar	5-Mar-07	1-Feb-10	All states
PER9893	Methidathion / peppers and eggplant / Rutherglen bug	8-May-08	31-May-13	All states except VIC
PER9917	Pyrimethanil / glasshouse capsicums, lettuce and tomatoes / Botrytis rots	12-Sep-07	30-Mar-09	All states
PER9918	Switch fungicide / cucumbers, glasshouse capsicums, glasshouse lettuce / Botrytis rots	4-Feb-08	30-Jun-10	All states except VIC
PER9920	Flint 500 WG fungicide / capsicums (GH) / Powdery mildew	4-Sep-07	31-Dec-09	All states except VIC
PER10058	Bifenthrin / cucumber, brassicas, beans, lettuce, peppers, eggplant, pistachio, peas, cherries / various pests	15-Apr-08	30-Apr-10	
PER10105	Crop Care Synergy Insecticide Synergist and Crop Care Talstar 100 EC / cucurbits, tomatoes, beans, brassicas, lettuce / whitefly and Yellow leaf curl virus	18-Apr-08	31-Mar-10	
PER10184	Products containing potassium salts of fatty acids @ 285g/L / glasshouse and hydroponically grown capsicums, lettuce and cucumbers / glasshouse whitefly and Silverleaf whitefly	20-Feb-08	28-Feb-13	
PER10218	Acramite Miticide / cucumbers, capsicums and tomatoes / various mites	3-Jun-08	30-Jun-10	
PER10240	DuPont Vydate L insecticide / capsicums and tomatoes / Root knot nematode	17-Feb-08	30-Sep-09	
PER10265	Methidathion / peppers, ornamentals, eggplant and tomatoes / Western flower thrips	18-Mar-08	30-Sep-12	
PER10311	Eco-oil (botanical oil) / greenhouse and hydroponic capsicum, cucumber and lettuce / Greenhouse whitefly and Silverleaf whitefly	7-Feb-08	30-Sep-13	
PER10345	Bupirimate / cucurbits and peppers / Powdery mildew	4-Oct-07	31-Dec-08	
PER10555	Fenthion, dimethoate, chlorpyrifos and maldison / various fruit and fruiting vegetables / fruit fly outbreak and quarantine treatments	1-Apr-08	30-Apr-10	
PER10617	Talstar 250 EC (Bifenthrin) / eggplant and capsicum / Two-spotted mite	11-Jun-08	30-Jun-09	
PER10670	Abamectin / tomatoes, cucumber, eggplant, ornamentals, strawberries and Cape gooseberries / Two-spotted mite and Western flower thrips	1-Apr-08	30-Apr-11	
PER10695	Methyl Bromide / various fruit and fruiting vegetables / fruit fly and thrips	4-Jun-08	30-Jun-13	
PER10730	Abamectin (Vertimec) / chillies and paprika / Two-spotted mite	8-Aug-08	30-Sep-12	
PER10764	Pyriproxyfen / cucurbits, eggplant and tomato / Silverleaf whitefly	1-Jul-08	30-Sep-12	
PER10878	Trifluralin / peppers (sweet and chillies) / broadleaf and annual grass weeds	11-Aug-08	30-Sep-13	
PER10948	Abamectin / eggplant / Two-spotted mite	17-Oct-08	30-Oct-13	

## LEGUME VEGETABLES

PER6611	Clethodim (select herbicide) / peas / Fops annual ryegrass and winter grass	13-Feb-06	12-Feb-10	WA
PER7354	Abamectin / snow peas and sugar snap peas / Two-spotted mite	16-Nov-04	31-Mar-09	All states except VIC
PER7359	Bravo fungicide (chlorothalonil) / Garden peas / Black spot	21-Oct-04	30-Sep-09	WA
PER7419	Lambda-cyhalothrin / snow peas and sugar snap peas / Pasture webworm, Cutworm, Rutherglen bug and thrips	11-Aug-08	31-May-13	All states except VIC
PER7523	Bacillus thuringiensis / snowpeas / Helicoverpa armigera and H. punctigera	12-Aug-04	31-Aug-09	All states



Permit No.	Permit description	Date issued	Expiry date	States
PER7897	Ridomil Gold MZ systemic and protective fungicide / snow peas and sugar snap peas / Downy mildew	17-Aug-05	17-Aug-10	All states
PER8187	Phosphorous acid / peas / Downy mildew	25-Jan-05	24-Jan-10	NSW, TAS
PER8537	Helicoverpa Zea or Armigera / eggplant, snow peas and sugar snap peas / Helicoverpa spp.	7-Sep-05	7-Sep-10	All states
PER8602	Basagran (bentazone) / green peas (processing) / broadleaf weeds	3-Nov-05	4-Nov-10	TAS
PER8608	Chlorothalonil (Bravo) / snow peas and sugar snap peas/ Downy mildew, Chocolate spot	15-Dec-05	31-Dec-10	All states except VIC
PER8790	Methomyl/ snow peas and sugar snap peas / cucurbits / cucumber moths and Western flower thrips.	3-Mar-06	31-Mar-11	NSW, SA, NT, WA
PER8828	Metribuzin / Asian root vegetables, snow peas, sugar snap peas / annual weeds	3-Mar-06	31-Dec-08	All states except VIC
PER9184	Imidacloprid / lettuce, brassicas, beans / Silverleaf whitefly	2-Mar-06	30-Sep-08	NSW, QLD, NT, WA
PER9288	Filan fungicide / snow peas, sugar snap peas and garden peas / Sclerotinia rot and Botrytis grey mould	27-Jul-06	31-Dec-08	QLD
PER9289	Switch fungicide / snow peas, sugar snap peas and garden peas / Sclerotinia rot and Grey mould	27-Jul-06	31-Dec-08	QLD
PER9290	Amistar WG fungicide / snow peas and sugar snap peas / Stemphyllium spp, Botrytis grey mould	27-Jul-06	31-Dec-08	QLD
PER9317	Chess insecticide / snow peas and sugar snap peas / aphids	26-Oct-06	31-Mar-11	All states except VIC
PER9632	Glyphosate / capsicums, snow peas and sugar snap peas / annual and perennial grass and broadleaf weeds	12-Feb-07	31-Dec-12	NSW, QLD
PER10058	Bifenthrin / cucumber, brassicas, beans, lettuce, peppers, eggplant, pistachio, peas, cherries / various pests	15-Apr-08	30-Apr-10	
PER10091	Acramite 480 SC / snow peas and sugar snap peas (field and greenhouse) / mites	3-Feb-08	31-Mar-11	
PER10092	Amistar WG fungicide (azoxystrobin) / snow peas and sugar snap peas / Stemphyllium spp. and Botrytis grey mould	1-Jan-09	30-Jun-10	
PER10105	Crop Care Synergy Insecticide Synergist and Crop Care Talstar 100 EC / cucurbits, tomatoes, beans, brassicas, lettuce / whitefly and Yellow leaf curl virus	18-Apr-08	31-Mar-10	
PER10149	Abamectin / snow peas and sugar snap peas / Two-spotted mite	1-Apr-08	30-Sep-10	
PER10261	Azoxystrobin / broccoli, brussels sprouts, beans, lettuce and cauliflower / White blister and Sclerotinia rot	3-Jan-08	1-Jan-10	
PER10691	Diflufenican / peas / broadleaf weeds	28-Apr-08	30-Apr-13	

#### LEAFY VEGETABLES

PER5776	Propachlor / lettuce / grass and broadleaf weeds	10-Nov-05	3-Nov-10	All states except VIC
PER6310	Dimethomorph / silverbeet / Downy mildew	9-Oct-03	9-Oct-08	All states
PER6762	Metiram (Polyram DF) / silverbeet and spinach / Septoria leaf spot	11-Sep-07	10-Sep-10	QLD
PER6886	Dual Gold / brassica leafy vegetables / broadleaf and grass weeds	1-Aug-05	1-Aug-10	All states
PER6920	Dacthal (chlorthal-dimethyl) / lettuce / Stinging nettle	24-Aug-05	24-Aug-10	WA
PER7416	Confidor 200SC (imidacloprid) / lettuce, chicory, endive and radicchio / Lettuce aphid	24-Mar-04	31-Dec-08	All states
PER7417	Iprodione / silverbeet and spinach / Sclerotinia rot and Grey mould	1-Aug-05	1-Aug-09	All states except VIC
PER7441	Agri-Fos Supa 600 systemic fungicide / Asian leafy brassicas / Downy mildew prevention	12-Jan-05	31-Dec-08	QLD
PER7586	Acrobat fungicide / spinach / Downy mildew	8-Apr-05	30-Sep-08	All states except VIC
PER7588	Lannate L insecticide / silverbeet / various insects	4-Feb-05	30-Jun-09	All states except VIC
PER7604	Alpha-cypermethrin / brassica leafy vegetables / Red legged earth mite and Plague thrips	2-Jun-05	30-Jun-09	All states except VIC
PER7631	Pirimor WG / brassica leafy vegetables / aphids	14-Feb-05	31-Mar-09	All states except VIC



# Vegetable Permits

Permit No.	Permit description	Date issued	Expiry date	States
PER7905	Phosphorous / lettuce (leaf and hydroponic), fennel and bulb (alium) vegetables / Downy mildew	4-Apr-06	30-Sep-12	All states except VIC
PER7908	Acrobat fungicide / brassica leafy vegetables / Downy mildew	8-Apr-05	30-Sep-08	All states except VIC
PER8186	Agri-fos 400 and Agri-fos 600 / leafy vegetables / Downy mildew	25-Jan-05	24-Jan-10	All states except VIC
PER8489	Clethodim / chilli pepper, paprika, silverbeet and spinach / annual grasses	24-Oct-05	12-Oct-10	All states
PER8525	Pymetrozine / spinach and silverbeet / aphids, cotton / Melon aphid and Potato aphid	23-Sep-05	1-Oct-10	All states except VIC
PER8768	Zineb / eggplant, spinach and silverbeet / Anthracnose (Colletotrichum spp.)	10-May-06	10-May-11	All states except VIC
PER8819	Filan fungicide (boscalid) / brassicas and brassica leafy vegetables, lettuce and beans / Sclerotinia rot	10-Oct-05	31-Oct-09	All states
PER9103	Tilt 250 EC (propiconazole) / spinach / Leaf spot (Cercospora spp.)	4-Jan-08	30-Jun-11	All states except VIC
PER9127	Folicur 430 SC fungicide / lettuce / Sclerotinia rot	30-Aug-07	30-Aug-09	All states except VIC
PER9184	Imidacloprid / lettuce, brassicas, beans / Silverleaf whitefly	2-Mar-06	30-Sep-08	NSW, Qld, NT, WA
PER9203	Alpha-cypermethrin / chicory, leeks, spring onions / Red legged earth mite	1-Sep-06	1-Sep-10	All states except VIC
PER9318	VERTIMEC Miticide / insecticide / hydroponically grown lettuce / Two-spotted mite	4-Jan-07	4-Jan-10	QLD, SA, TAS, NT, WA
PER9576	Acrobat fungicide / brassica leafy vegetables / White blister	28-Feb-07	30-Sep-08	All states except VIC
PER9633	Amistar fungicide / brassica leafy vegetables / Alternaria leaf spot	26-Feb-07	30-Jun-09	All states except VIC
PER9669	Iprodione / brassica leafy vegetables / Sclerotinia, Grey mould, Alternaria leaf spot	30-Jun-07	30-Jun-12	All states except VIC
PER9859	BALAN (benfluralin) / lettuce / grass and broadleaf weed control	1-Apr-07	31-Mar-12	WA
PER9892	Pendimethalin / brassica leafy vegetables / weeds	2-Aug-07	30-Nov-10	All states
PER9917	Pyrimethanil / glasshouse capsicums, lettuce and tomatoes / Botrytis rots	12-Sep-07	30-Mar-09	All states
PER9918	Switch fungicide / cucumbers, glasshouse capsicums, glasshouse lettuce / Botrytis rots	4-Feb-08	30-Jun-10	All states except VIC
PER9932	Methomyl / lettuce / Helicoverpa spp., Cluster caterpillar and WFT	23-Mar-07	28-Feb-09	All states except VIC
PER10044	Permethrin / potted culinary herbs or leafy vegetables / quarantine usage	10-Jul-07	31-Mar-12	
PER10058	Bifenthrin / cucumber, brassicas, beans, lettuce, peppers, eggplant, pistachio, peas, cherries / various pests	15-Apr-08	30-Apr-10	
PER10095	Metalaxyl-M / lettuce / damping off	22-Jun-07	30-Jun-09	
PER10105	Crop Care Synergy Insecticide Synergist and Crop Care Talstar 100 EC / cucurbits, tomatoes, beans, brassicas, lettuce / Whitefly and Yellow leaf curl virus	18-Apr-08	31-Mar-10	
PER10184	Products containing potassium salts of fatty acids @ 285g/L / glasshouse and hydroponically grown capsicums, lettuce and cucumbers / Glasshouse whitefly and Silverleaf whitefly	20-Feb-08	28-Feb-13	
PER10261	Azoxystrobin / broccoli, brussels sprouts, beans, lettuce and cauliflower / White blister and Sclerotinia rot	3-Jan-08	1-Jan-10	
PER10311	Eco-oil (botanical oil) / greenhouse and hydroponic capsicum, cucumber and lettuce / Greenhouse whitefly and Silverleaf whitefly	7-Feb-08	30-Sep-13	
PER10335	Petroleum oil / lettuce (greenhouse and hydroponic) / various insects	18-Mar-08	31-Mar-11	
PER10416	Methamidophos / head lettuce / Western flower thrips	25-Mar-08	31-Mar-13	
PER10465	Betanal herbicide spray / lettuce / potato weed and nettles	16-Apr-08	30-Sep-09	
PER10674	Mancozeb + Metalaxyl-M / brassica vegetables, brassica leafy vegetables and rocket / Downy mildew and White blister	14-Apr-08	31-Mar-13	
PER10677	Propyzamide / chicory and endive / grass and broadleaf weeds	14-Apr-08	30-Apr-18	
PER10844	BALAN (benfluralin) / lettuce / grass and broadleaf weed control	29-Jul-08	31-Jul-13	
PER9355	Alpha-cypermethrin / silverbeet and spinach / thrips, Vegetable weevil and Red legged earth mite	23-Feb-07	31-Mar-12	



Permit No.	Permit description	Date issued	Expiry date	States
<b>ROOT VEGETABLES</b>				
PER5851	Chlorpyrifos / sweet potato / Sweet potato weevil, Bean spider mite, wireworm	12-Feb-07	12-Feb-12	NSW, QLD, WA, NT
PER6137	Propachlor / radish, swede, turnip / grass and broadleaf weeds	25-Aug-03	31-Dec-08	All states except VIC
PER6503	Glyphosate / Asian root vegetables / grass and broadleaf weeds	8-Jan-04	31-Jan-09	All states
PER7083	Copper present as copper oxychloride / radish, swede, turnip / White blister rust, Black spot, Peppery leaf spot, Ring spot, Downy mildew	20-Feb-04	31-Dec-08	All states except VIC
PER7422	Methomyl / radish, swede and turnip / Cabbage white butterfly, Heliothis, Cabbage centre grub, cutworm, Cluster caterpillar and looper	23-May-08	31-Mar-11	All states except VIC
PER7530	Pymetrozine / beetroot / Green peach aphid and Potato aphid	6-Jan-05	31-Mar-10	ACT, QLD, SA, TAS, NT, WA
PER7559	Pirimicarb / sweet potato / Green peach aphids	21-Feb-05	1-Jan-09	NSW, QLD, NT, WA
PER7564	Prometryn / carrots / broadleaf weeds	24-Oct-05	20-Oct-10	QLD
PER7603	Rovral Aquaflo fungicide / Iprodione / beetroot / Alternaria leaf spot, Sclerotinia rot and Grey mould	21-Apr-06	20-Apr-11	All states
PER7607	Alpha-Cypermethrin / radish / Red legged earth mite, Cabbage white butterfly, Cluster caterpillar and Heliothis	27-May-05	30-Jun-09	QLD, SA, TAS, NT, WA
PER7632	Triadimenol / Parsnips, radish, swede and turnip / Powdery mildew	8-Aug-05	31-Dec-09	All states
PER7849	Azoxystrobin / carrot / Sclerotinia rot and Black rot	7-Apr-06	30-Sep-08	SA, WA
PER8231	Filan fungicide / alliums (other than onions) and carrots / Sclerotinia rot	31-Jul-06	30-Jun-09	All states except VIC
PER8305	Ethofumesate / beetroot / grass weeds	3-Apr-06	2-Apr-09	WA
PER8333	Iprodione / carrots / suppression of Black rot	15-Jun-07	30-Sep-08	SA, WA
PER8490	Chlorpyrifos / swede and turnip / African black beetle and wireworms	7-Feb-06	6-Feb-11	All states
PER8572	Lambda-cyhalothrin / beetroot / loopers, vegetable weevil, thrips and Rutherglen bug	6-Sep-05	1-Sep-10	All states except VIC
PER8694	Azoxystrobin / radish / White rust, White blister	26-Jul-05	30-Sep-08	All states except VIC
PER8743	Chlorothalonil / eggplant and radish / Alternaria / Downy mildew and Grey leaf spot	24-Apr-06	30-Apr-09	All states
PER8766	Pendimethalin / beetroot and horseradish / annual grasses and broadleaf weeds as per label	4-Nov-05	30-Nov-10	All states
PER8788	Metolachlor / celeriac/ annual grasses and broadleaf weeds	22-Mar-06	21-Sep-08	All states
PER8813	Trifluralin / parsnips / Wintergrass	10-Aug-07	9-Aug-12	All states
PER8828	Metribuzin Asian root vegetables, snow peas, sugar snap peas / annual weeds	3-Mar-06	31-Dec-08	All states except VIC
PER8928	Score Foliar fungicide / beetroot / leaf spot	30-Aug-06	30-Aug-11	All states except VIC
PER8960	Fluazifop (Fusilade) / parsnips / rye grass, wild oats, barley grass	1-Feb-06	31-Mar-09	All states
PER8971	Chemagro Dalapon / carrot crops (for seed) / promotion of bolting and grass weed control	14-Mar-06	30-Nov-09	All states
PER9063	Regent 200 SC / sweet potato / White fringed weevil and wireworm	21-Mar-06	1-Dec-11	NSW, QLD, NT, WA
PER9125	Select 240 EC / radish / control of grasses	17-Jul-06	16-Jul-11	All states
PER9130	Tilt 250 EC / beetroot / Leaf spot	2-Jun-06	30-Jun-11	All states except VIC
PER9134	Alpha-cypermethrin / potatoes / Garden weevil	31-May-06	31-Jan-11	WA
PER9160	Imidacloprid / Potato, tropical fruits, celery, cucumber, peppers (field and protected), Cape gooseberry / various pests (consolidated use patterns)	29-Nov-07	31-Dec-10	Various states
PER9186	Chlorothalonil / radish / White blister (Candida albugo)	1-May-06	1-May-11	All states
PER9228	Tecto Flowable SC or Storite / sweet potato / field rots of seed roots caused by scurf (Monilochaetes infuscans) and root rot (Fusarium spp)	12-Oct-06	31-Oct-08	All states except VIC
PER9229	Karate with Zeon technology / radish / Diamondback moth and looper	8-Sep-06	31-Mar-10	All states except VIC
PER9694	Lorsban / taro / African black beetle	6-Mar-07	5-Mar-12	All states except VIC

# Vegetable Permits

Permit No.	Permit description	Date issued	Expiry date	States
PER9775	Chlorothalonil / beetroot, celeriac, parsnip, papaya, berries, spring onions, tamarillos / various diseases	14-Apr-08	31-Mar-10	All states except VIC
PER9916	Ridomil Gold Plus / leeks, cucumber, radish, swede and turnips / Downy mildew, Purple blotch and White blister	7-Sep-07	30-Sep-10	All states except VIC
PER10089	Chlorpyrifos / parsley and potato / Vegetable weevil and Black beetle	12-Feb-08	30-Sep-13	
PER10197	Amistar 250 SC / carrots / Powdery mildew	31-Aug-07	30-Sep-09	NSW, SA, TAS
PER10198	Folicur 430 SC / carrots / Powdery mildew	4-Sep-07	30-Sep-09	NSW, SA, TAS
PER10273	Bifenthrin / sweet potato / Sweet potato weevil and Bean spider mite	22-Feb-08	30-Sep-13	
PER10275	Fusilade Forte 128EC (fluazifop) / sweet potato, leeks and garlic / grass weeds	31-Mar-08	31-Mar-09	
PER10301	Mancozeb + Metalaxyl / carrots and parsnips / Pythium spp. and Phytophthora spp.	1-Apr-08	31-Mar-13	
PER10427	Fipronil (Regent 200 SC) / swede and turnip / Diamondback moth	24-Jan-08	31-Jan-10	
PER10431	Methomyl / beetroot / Helicoverpa spp., loopers, webworm	30-Apr-08	30-Apr-11	
PER10441	Agpro Propazine 500 / carrot crops / Nightshade, Fat Hen and wireweed	10-Nov-07	31-Dec-12	
PER10460	Phorate (Thimet 100G) / sweet potatoes / aphids, thrips, Jassids and Organophosphate susceptible Two-spotted mite and wireworm	2-Jan-08	1-Jan-13	
PER10468	Linuron / celeriac / weeds	23-Apr-08	30-Apr-10	
PER10469	Prometryn / celeriac / weeds	16-Apr-08	30-Apr-10	
PER10676	Pendimethalin / spring onions, shallots and radish / various broadleaf and grass weeds	16-Apr-08	30-Apr-13	
PER10762	Dupont Vydate L (oxamyl) / sweet potato / nematodes	11-Aug-08	31-Mar-12	
PER10829	Maleic Hydrazide / carrots / to prevent spring bolting of carrots stored in the ground	17-Jun-08	31-Dec-09	
PER10971	Tecto Flowable SC or Storite / sweet potato / field rots of seed roots caused by scurf (Monilochaetes infuscans) and root rot (Fusarium spp)	1-Nov-08	30-Sep-10	

## STEM & STALK VEGETABLES

PER5957	Methomyl / celery / thrips	5-Dec-03	30-Nov-08	All states except VIC
PER6062	Linuron / celery / range of weeds	27-Oct-03	31-Oct-08	All states
PER6064	Solicam DF herbicide (norflurazon) / asparagus / Nut and Johnson grass	23-Jul-03	31-Dec-08	QLD
PER6647	Score Foliar fungicide (difenoconazole) / asparagus / Stemphylium leaf spot	27-Oct-03	31-Dec-08	QLD
PER6918	MCPA 250 selective herbicide / rhubarb / broadleaf weeds	5-Sep-06	4-Sep-11	All states
PER7428	Dual Gold herbicide (S-metolachlor) / rhubarb / various weeds	24-Aug-05	24-Aug-10	All states
PER9052	Score Foliar fungicide / celery / Cercospora leaf spot and Septoria spots	9-Aug-07	31-Aug-10	All states except VIC
PER9161	Esfenvalerate / celery / Helicoverpa armigera	19-May-06	31-Mar-16	QLD
PER9255	Propiconazole / almonds, celery / Blossom blight, Anthracnose, Septoria spot, Early blight	22-Dec-06	30-Jun-11	All states except VIC
PER9325	Ambush insecticide / rhubarb / Green peach aphid, Green looper, Light brown apple moth and budworms	5-Apr-07	31-Mar-12	All states except VIC
PER9425	Fipronil / asparagus / Garden weevil	4-Oct-06	30-Jun-11	WA
PER9506	Ridomil Gold 25G / asparagus / Phytophthora Crown rot	8-Dec-06	31-Dec-09	NSW
PER9839	Permethrin (Ambush) / celery / Heliothis and looper	20-Feb-08	31-Mar-13	All states except VIC
PER9894	Imidacloprid / rhubarb / aphids	2-Aug-07	30-Jun-11	All states except VIC
PER9922	Phos acid / rhubarb / Downy mildew	3-Aug-07	1-Jul-12	All states except VIC





Permit No.	Permit description	Date issued	Expiry date	States
PER10270	Select Herbicide / rhubarb / grass weeds	15-Nov-07	31-Dec-08	
PER10316	Avatar insecticide (indoxacarb) / celery / Heliothis, Light brown apple moth, Lucerne leaf roller and vegetable weevil	3-Mar-08	30-Sep-12	
PER10946	Linuron / celery / range of weeds	1-Nov-08	30-Apr-12	
<b>VEGETABLES – GENERAL</b>				
PER6337	Maldison / various situations / Queensland and Papaya fruit fly	14-Feb-05	31-Mar-10	SA
PER6338	Dichlorvos / various situations / Mediterranean fruit fly	21-Feb-05	31-Mar-10	SA
PER6641	Maldison and dichlorvos / fruit fly traps / targeted insects	28-Feb-05	31-Mar-10	QLD
PER7988	Diazinon and Chlorpyrifos / vegetable crop debris (post-harvest prior to incorporation) / Stable fly	1-Jan-05	31-Dec-08	WA
PER8538	Products containing copper / various vegetable crops / various diseases	4-Nov-05	31-Oct-10	All states except VIC
PER9448	Dichlorvos, Malathion / monitoring of fruit fly / fruit fly	29-Jul-06	31-Mar-10	NSW
PER10309	Dimethoate / various fruit and fruiting vegetables / Queensland fruit fly	1-Oct-07	30-Sep-10	QLD
PER10373	Regent 200SC and Termidor Residual Termiticide (fipronil) / market and domestic vegetable gardens / Red imported fire ant	29-Nov-07	30-Sep-11	
PER10534	Dimethoate (reduced rate) / post harvest dipping and flood spraying of various fruit and vegetables / Queensland fruit fly	1-Apr-08	30-Apr-10	
PER10555	Fenthion, dimethoate, chlorpyrifos and maldison / various fruit and fruiting vegetables / fruit fly outbreak and quarantine treatments	1-Apr-08	30-Apr-10	SA
PER10695	Methyl bromide / various fruit and fruiting vegetables / fruit fly and thrips	4-Jun-08	30-Jun-13	
PER10699	Methyl bromide / post harvest fumigation / fruit fly	4-Jun-08	30-Jun-13	



Photo courtesy of AUSVEG



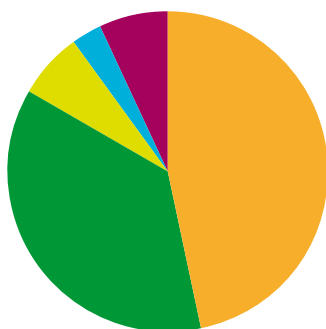
# Investing in Australian Horticulture

## AUSTRALIAN GOVERNMENT PRIORITIES

As part of the Australian Government's commitment to rural research and development, horticulture industries can access matching Commonwealth funding through HAL for all research and development activities.

The Australian Government's Rural Research and Development Priorities aim to foster innovation and guide R&D effort in the face of continuing economic, environmental and social change. HAL's operations are closely aligned with these priorities.

### Percentage by value of Vegetable Projects



- Productivity and Adding Value (46.8%)
- Supply Chain and Markets (36.6%)
- Natural Resources Management (6.8%)
- Climate Variability and Climate Change (2.9%)
- Biosecurity (6.9%)

This chart shows the percentage of expenditure in HAL's vegetable R&D program against each of the Australian Government priorities for rural research and development. Full details of expenditure across all industries is available in HAL's annual report at [www.horticulture.com.au](http://www.horticulture.com.au)

## RELATIONSHIPS AND ROLES RELATING TO HAL PROGRAMS

Horticulture Australia Limited (HAL) is a not-for-profit industry owned company. Its role is to manage the expenditure of funds collected by the Australian Government on behalf of horticulture industries.

HAL invests \$85 million annually in projects that benefit horticulture industries.

An Industry Advisory Committee (IAC) is established for each industry with a statutory levy and annual income exceeding \$150,000. The IAC is a subcommittee of the HAL Board. It makes recommendations to HAL on the expenditure of funds.

The Peak Industry Body (PIB) for an industry is responsible for recommending to HAL the establishment of, and any changes to, statutory levies. The PIB for an industry with a statutory levy recommends membership of the IAC to HAL and must demonstrate how the skills required on an IAC are met by the persons they recommend for appointment to the committee.

For more information please visit [www.horticulture.com.au](http://www.horticulture.com.au)

### Productivity and Adding Value

Improve the productivity and profitability of existing industries and support the development of viable new industries.

### Supply Chain and Markets

Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the whole supply chain, including to consumers.

### Natural Resource Management

Support effective management of Australia's natural resources to ensure primary industries are both economically and environmentally sustainable.

### Climate Variability and Climate Change

Build resilience to climate variability and adapt to and mitigate the effects of climate change.

### Biosecurity

Protect Australia's community, primary industries and environment from biosecurity threats.

In 2007/08 AUSVEG acted as the service provider on twelve projects.

Full details can be found on page 58 of this report.

## CONSULTATION FUNDING

Consultation funding is paid by HAL to cover costs for IAC meetings, annual levy payers' meetings and costs within the partnership agreement between HAL and the member industry that are specified as consultation, for example R&D program consultation. In 2007/08 \$535,138 of consultation funding was provided to AUSVEG.



# FINANCIAL REPORT

## VEGETABLE INVESTMENT SUMMARY

YEAR ENDED 30 JUNE 2008

	Marketing 2007/08	R&D 2007/08	Combined 2007/08
<b>Funds available 1 July 2007</b>		8,294,785	8,294,785
<b>INCOME</b>			
Levies Received		6,314,644	6,314,644
Commonwealth Contributions		6,396,864	6,396,864
Other Income		669,897	669,897
<b>Total Income</b>	<b>N/A</b>	<b>13,381,405</b>	<b>13,381,405</b>
<i>Budget</i>		14,152,293	14,152,293
<i>Variance to Budget</i>	<i>N/A</i>	<i>(770,888)</i>	<i>(770,888)</i>
<b>PROGRAM INVESTMENT</b>			
Levy Programs		11,260,262	11,260,262
Service Delivery Programs by HAL		1,533,467	1,533,467
Across Industry Contribution		130,561	130,561
Levy Collection Costs		257,055	257,055
<b>Total Investment</b>	<b>N/A</b>	<b>13,181,345</b>	<b>13,181,345</b>
<i>Budget</i>		18,005,998	18,005,998
<i>Variance to Budget</i>	<i>N/A</i>	<i>4,824,653</i>	<i>4,824,653</i>
Annual Surplus/Deficit	<i>N/A</i>	200,060	200,060
<b>Funds available 30 June 2008</b>	<b>N/A</b>	<b>8,494,845</b>	<b>8,494,845</b>



**FOR MORE  
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