

VG05056

Tony Burfield

SARDI Entomology

September 2006

Providing support for National HAL Initiatives  
**National Vegetable IPM Stocktake and,  
Vegetable Protected Cropping Strategic Plan**



Medium Tech. House  
(Thi Vu 2003)



Low Tech. House  
(Thien Vu 2002)



High Technology House  
(Thien Vu 2006)

And continuing delivery of  
**Regional, and National Vegetable IPM extension**



Qld field capsicum grower  
Don Halpin  
Interview for IPM case history



Virginia GH capsicum growers  
Bill and Emmanuel Cafcakis  
Interview for IPM case histories

# ***PROJECT DETAILS***

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Project Title: *Providing support for National HAL Initiatives 1) National IPM Stocktake, 2) Protected Cropping Strategic Plan, and maintaining Regional and National IPM extension*

**Project Number:** VG05056

**Project Leader:** Tony Burfield, (08) 8303 9580, Mob. 0401 120 857

**Statement about the purpose for the project:** *The project had four key aims:*

- 1. to intensively support the NSW DPI led National IPM Stocktake,*
- 2. to assist the National Protected Cropping Committee (previously National Greenhouse Committee) in developing a national strategic plan for protected cropping.*
- 3. to intensively support key industry service providers in SA to more effectively and sustainably deliver IPM services,*
- 4. to maintain strategic communication with the 3 state WFT-IPM projects*

**Date of the report:** 30 September 2006

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# ***ACKNOWLEDGMENTS***

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The following people and organisations are gratefully acknowledged for their support of the project:

Dr. Sandra MacDougall (NSW DPI Yanko) for her leadership in the National IPM Stocktake

Simon Drum (HAL) his leadership in the National Protected Cropping Strategic Planning initiative

## **Funding providers**

- Horticulture Australia Limited – funding allocations for the National IPM and Protected Cropping strategic planning initiatives
- SARDI staff - strategic collaboration on IPM issues and ideas (Greg Baker, Glenys Wood, Peter Taverna, Dijana Jevremov, Dr. Peter Crisp)

## **Key growers & businesses**

- Greenhouse case history booklet subjects: Emmanuel Cafkacis, John MacVicar, Thi Vu (Virginia), Paul Humble (WA greenhouse grower)
- IPM case history interview subjects: Emmanuel Cafkacis, Paul Humble (WA greenhouse grower), Don Halpin (Qld field capsicum grower), Lachlan Chilman (WA consultant), Rob Wepler (Biological Services)
- Maria Yfantidis (SA greenhouse growers National Representative) and the National Protected Cropping Committee
- City of Playford Parks and Roadside maintenance teams for key support for the regional clean-up
- Biological services for their generous technical support for IPM adoption at Virginia
- The following local businesses for assisting with information dissemination and consultations:  
*Elders Virginia*

*P and P Agricultural Supplies*  
*E.E. Muirs*  
*Rijk Zwann Seeds*  
*Seminis seeds*  
*Syngenta seeds*  
*John Stafford (native grass consultant)*  
*Biotech Organics*  
*Stoeff Greenhouse supplies*  
*David George (Chemcert training provider)*

**Assistance with extension delivery**

- Craig Feutrill (SA Veg IDO) for assistance with networking, publishing and strategic support
- ARRIS publishing for graphic work and production of printed materials
- Domenic Cavallaro for a wide range of invaluable support in technology, extension and industry liaison and close involvement in project planning and review
- VHC staff Stacey Brouwers and Gavin Limbert for their key role in implementing and promoting the Regional Clean-up Program and facilitating trial 'on-farm' plantings of native vegetation

**Interstate IPM network**

- National Minor Use Gap Analysis, Peter DalSanto (AgAware)
- New South Wales: DPI IPM researchers Dr. Stephen Goodwin, Marilyn Steiner and Grant Herron, Extension officer Stacey Azzopardi, Veg industry IDO Alison Anderson
- Queensland: QDPI Entomologists Iain Kay, Bronwyn Walsh and Brendan Nolan, Virologists Dennis Persley and Murray Sharman, GROWCOM consultant Gary Artlett
- Western Australia: IPM consultant Lachlan Chilman, grower Paul Humble, Entomologist Sonya Broughton, IDO David Ellement

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# **1. SUMMARIES**

## **1.1 MEDIA SUMMARY**

Industry support for IPM technologies in vegetables is advancing nationally. The perspective of growers, consultants and researchers has shifted from emphasising the challenges and complexity of IPM to confidently planning and implementing targeted pathways for IPM development and adoption.

There has been an ongoing series of Levy funded R&D and Extension projects to drive these changes, including Horticulture Australia (HAL) project VG05056 (2005-06). This project contributed to four strategic areas including:

1. support for the NSW DPI led National IPM Stock-take,
2. support for key industry service providers in SA to increase their delivery of IPM services,
3. maintaining strategic communication with IPM extension projects in NSW and Qld, and
4. assisting the National Protected Cropping Committee in developing a national strategic plan for protected cropping.

Project activities maintained an IPM-focused industry base on the Northern Adelaide Plains (NAP), while linking with related projects in other States and with national strategic initiatives. NAP activities have connected the needs of growers with key service providers, retailers, local councils and researchers involved in other relevant projects. These partnerships were used to further expand a regional Clean-up Program for weeds, old crops and farm waste. Industry now attributes a sustained reduction in crop losses from Tomato Spotted Wilt Virus to improved farm hygiene resulting from these regional efforts. Overall support for IPM technology has become widespread, as is evidenced by a notable shift in grower preference towards chemical permits that are more compatible with IPM. There is now a sound industry base for wider adoption of IPM once an integrated and costed strategy has been finalised to suit the range of protected cropping systems.

Inputs to national HAL initiatives have included extensive R&D reviews for a national IPM stock-take, consultation on pesticide gaps and IPM-compatible options for minor use pesticide permits, and assisting development of strategic priorities for the protected cropping sector. This has assisted the formation of 1) priorities for integrating and improving insect and disease control in 10 minor crops, 2) a more efficient and “IPM friendly” approach to chemical permits, and 3) draft action priorities for key issues affecting the long-term sustainability of protected cropping. Progress has been made on establishing a national base for IPM adoption and management of the industry’s overall strategic priorities. This work will provide important support for the Vegvision2020 national industry plan produced by AUSVEG.

## 1.2 TECHNICAL SUMMARY

Industry support for IPM technologies in vegetables is advancing strongly with a shift in the perspective of growers, consultants and researchers from emphasising the challenges and complexity of IPM to planning and implementing priorities for IPM development and adoption. An ongoing series of Levy funded R&D and Extension projects have been a major force in driving these changes, including Horticulture Australia (HAL) project VG05056 (2005-06). This project contributed to four strategic areas including:

1. support for the NSW DPI led National IPM Stock-take,
2. support for key industry service providers in SA to increase their delivery of IPM services,
3. maintaining strategic communication with IPM extension projects in NSW and Qld, and
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Inputs to national HAL initiatives have included extensive R&D reviews for a national IPM stock-take, consultation on pesticide gaps and IPM-compatible pesticide options for the Minor Use Strategy (AH04009) and assisting development of strategic priorities for the protected cropping sector. This has assisted the formation of 1) priorities for integrating and improving insect and disease control in 10 minor crops, 2) a more efficient and “IPM friendly” approach to chemical permits, and 3) draft action priorities for key issues affecting the long-term sustainability of protected cropping. Progress has been made on establishing a national base for IPM adoption and management of the industry’s overall strategic priorities. This work will provide important support for the Vegvision2020 national industry plan produced by AUSVEG.

Established communication networks of growers, service providers and researchers will be a key component in the future expansion of commercial service provision through assisting monitoring of R&D priorities, adoption impacts and national IPM information resource requirements. It is therefore important to formulate an appropriate investment in maintaining and adapting these networks as a cost-effective asset for IPM development and adoption.

Effective development of the National Protected cropping Strategic Plan will take even more careful development and maintenance of strategic links than IPM. The strategy must be industry driven and tangibly address key issues through effective industry representational structures and processes. It will depend on development of consistent, improved outcomes from the Australian supply chain for our growers. There will need to be careful differentiation and integration of strategies to address the needs of both soil and hydroponic growers and adequate support for adoption of modern production technologies and comparable business management skills and practices. All of the above will need to be underpinned by improved access to information and training to enable industry to achieve its goals.

## 2. BACKGROUND

R&D investment in new pest management strategies has been historically driven by major episodes of chemical resistance by key pests like *Heliothis* and Diamondback Moth. Western Flower Thrips (WFT) has been of particular concern since the mid 1990's when it began establishing in Australian vegetable crops. It has been a major challenge because of its ability to develop resistance and to vector Tomato Spotted Wilt Virus (TSWV) at very damaging levels in a wide range of vegetable crops.

Concern over substantial crop losses, together with a lack of chemical control options, spurred efforts to extend research technology for improved control of WFT and TSWV to vegetable growers beginning with VG00085 at Virginia in late 2000 (SARDI-Tony Burfield). This work was successful at promoting basic aspects of pest and disease management, particularly improved crop hygiene and improved chemical use including monitoring based spray decisions, spray coverage and chemical rotation. Further funding (VG02040) was received in 2003 to extend this work into a more regional adoption strategy. This project sought to involve growers and industry services in implementing a "Clean-up" program and integrating a wider range of key pests into farm trials, information packages and training delivery. This project also had a component for supporting the establishment of two similar projects in the Sydney Basin and central Queensland vegetable growing areas.

Towards the end of VG02040 HAL identified the need for a national IPM stock-take and strategic planning for R&D investment in response to a NSW DPI project proposal (Sandra MacDougall - VG05043). SARDI (Tony Burfield) was invited to contribute support to this strategy through reviewing R&D final reports and assisting the collation of IPM tools and resources. A strategy to resource and mainstream IPM support by industry services at Virginia was included and HAL project (VG05056) was initiated. This project was recently extended (August-September 2006) to assist HAL with initiation of a 'national protected cropping strategic planning' exercise.

Co-location of VG05056 within SARDI with other IPM projects (Revegetation by Design, National Diamondback Moth project, and lettuce IPM trials (contracted by NSW DPI) has strengthened the formal and informal input to local and national activities by all projects. Close collaboration with the industry IDO (Craig Feutrill) has been integral to achieving positive outcomes in building partnerships and strategies and keeping industry informed through vegetable industry publications and meetings.



*A close working relationship exists with the Revegetation by Design project (HG02103). Native vegetation trial plantation at the Virginia Horticulture Centre's demonstration site.*

*(photo: Glenys Wood – SARDI)*

## **AIMS**

The project began with three aims and a fourth was added to provide support for a national protected cropping strategic planning exercise:

1. to intensively support the NSW DPI led National IPM Stock-take,
2. to assist the National Protected Cropping Committee (previously National Greenhouse Committee) in developing a national strategic plan for protected cropping,
3. to intensively support key industry service providers in SA to more effectively and sustainably deliver IPM services, and
4. to maintain strategic communication with the 3 state WFT-IPM projects.

## **3. ACTIVITIES**

### 3.1 NATIONAL IPM STOCK-TAKE

#### **Purpose**

- *To provide three months of intensive support (late 2005) for the National IPM Stocktake design, Dr. Sandra MacDougall (NSW DPI - VG 05043)*

Growers need practical and affordable strategies to get off the insecticide treadmill and meet evolving community standards.

Chemically based pest and disease management strategies are heavily challenged by resistance issues with key pests and further pressure is being applied by market trends and community expectations to reduce pesticide residues in food and the environment. These concerns have driven a major investment in Integrated Pest Management (IPM) strategies through HAL/AUSVEG projects over the past 10 years with funding in excess of \$43 million in plant health. However this investment has lacked clear priorities for improved coordination funding to achieve the most cost effective outcomes. More effective allocation of the R&D investment is vital to address these pressing issues with limited funding resources and an ever-reducing base of state expertise and resources.

To this end a strategic planning exercise was initiated by HAL beginning with a national meeting in Sydney in July 2005. It was decided to base a national IPM strategy on the newly funded HAL project VG05043 (Dr. Sandra MacDougall - NSW DPI). The objectives for the national IPM strategy were to:

1. review current IPM methods and tools that have been developed in major veg and non-veg crops that have the potential to be used, or modified for use, in minor vegetable crops,
2. obtain expert vegetable industry stakeholder feedback on the current status of, and barriers to, IPM adoption in a range of commodities and growing regions,
3. identify gaps in minor crops that would benefit most from R&D investment, and
4. assist formation of recommendations on strategies to promote IPM adoption.

SARDI project VG05056 (Tony Burfield) was commissioned to provide support for VG05043 by reviewing relevant IPM R&D reports and supporting Sandra MacDougall in planning and delivery aspects of the overall project.

#### **Work undertaken**

i) Preparation of R&D reviews to identify IPM resources, tools, impact and recommendations  
Fifty seven HAL R&D final reports related to IPM have been reviewed from the previous 10 years. Thirty-two of these have been reviewed in detail and 25 have only entailed a review of the technical summary and recommendations. Most of these reports are focused on insect pests in major crops (lettuce, tomato, sweet corn and brassicas). An additional nine minor crops are also featured (capsicum, cucumber, celery, beans, sweet potato, potato, melons, zucchini and egg plant). Some of

these reports (approx 6) have a significant or primary focus on disease management. Summaries of these reports have been collated on a crop-by-crop basis. (APP 1). IPM tools and recommendations have also been collated on an crop-by-crop basis under key IPM technology categories (APP 2).

ii) Participation in strategic planning meetings to present and discuss the 45 R&D reviews and contribute to collaborative development of the stock-take and related industry development initiatives (chemical gap analysis, strategic planning for protected cropping).

A summary of the results of the R&D reviews was presented to a national meeting of researchers, consultants, grower and HAL representatives held in Sydney in March 2006. This meeting also sought to:

- identify gaps in pest and disease management and best bets for minor crops (e.g. beetroot, beans, carrots, capsicum, celery, chinese cabbage, cucumbers, pumpkin, sweet potato and zucchini),
- evaluate available tools for generic vegetable use and specific crops, and
- nominate best-bet IPM tactics for 10 crops.

These reviews and associated meetings have produced a more informed picture of the current knowledge and perceptions of IPM technologies, their strengths and the issues associated with increasing their adoption. A subsequent meeting in HAL's Sydney offices refined this picture into identified key areas for IPM investment. A media summary outlining the priorities and the background to their creation was prepared (APP 3).

Participation in the Inaugural Vegetable Entomology Workshop in May 2006 in Brisbane contributed to collaboration on priorities and emphasised the importance of engaging more actively to achieve industry support for IPM priorities.

A range of communications outputs were used to keep stakeholders in touch:

*SA stakeholders:*

- Articles in industry publications (see Grower, Good Fruit and Vegetables)
- Ongoing contact with leading growers and resellers to gain feedback on issues, strategic planning and outputs (Greenhouse & Lettuce)

*National stakeholders:*

- Information exchange prior to national meetings via project and researcher network
- e-mails and phone calls to WFT project members and IDO's
- Articles in Good Fruit and Vegetables

Publications were prepared in collaboration with the SA vegetable industry IDO (Craig Feutrill) (list of publications - see APP 10)

## **Outcomes**

Growers researchers and various industry representatives have been engaged in three strategic initiatives through wide ranging consultations and meetings on the national IPM Stock-take, Minor Use Gap Analysis (Virginia August 2006, Sydney August 2006) and strategic planning for protected cropping (Sydney August 2006). Good communication flow about these three key strategic initiatives has assisted feedback and involvement from growers and commercial service providers (consultants and resellers). This has produced a high level of co-operative input and agreed outcomes from growers, consultants and researchers on their common goals and pathways to achieving them.

Specific benefits have been:

- Facilitation of minor use prioritisation at Virginia, especially in greenhouses and strong stakeholder input on priorities for a National Strategic Plan for the protected cropping industry.
- A crop-by-crop listing of levy-funded vegetable R&D reports and their summaries and collation of existing vegetable IPM tools, which is capable of being uploaded to a web page.

- Strong, and hopefully ongoing industry support for these three complementary initiatives.

Other IPM Stocktake outcomes have also been assisted ie:

- Identification of IPM gaps and priorities across a range of vegetable crops for the 2005/06 funding round, and
- A parallel review of non-vegetable crops and industry case histories for transfer of relevant tools and adoption lessons.

There has been a major improvement in the systematic capture of IPM information for development of a national IPM information resource.

### **Next steps/recommendations**

The emergence of a strategic approach to IPM (in conjunction with the minor use pesticide strategy and the national protected-cropping strategy) has significantly raised awareness and support. The next step is to systematically review and then publish the information generated as follows:

1.1 Distribute collated IPM R&D information and IPM tools back to lead researchers and key consultants to ensure they are fully aware of this initiative and can clarify/provide feedback on the work they have/are contributing to,

1.2 Publish the collated IPM information bank from the Stocktake and other sources on an IPM web site covering IPM technology, minor use permit status in crops, and updates on HAL/AUSVEG initiatives driving this work forward. Promote this in industry publications and information networks (IDO's etc.),

1.3 Incorporate pathology R&D reviews into the IPM information bank, and

1.4 Ensure the effective engagement of vegetable virology expertise, notably Dennis Persley, DPI Queensland.

Two aspects of the Stocktake are still requiring completion:

- Listing and review of R&D reports from non-vegetable crops reviewed for transferable technologies/lessons
- Industry based case histories of IPM adoption (brassicac, sweet corn, capsicum etc.)

## **3.2 ASSIST THE NATIONAL PROTECTED CROPPING STRATEGIC PLANNING PROCESS**

### **Purpose**

Horticulture Australia has initiated a National Protected Cropping Strategic Planning process to help drive the VegVision2020 blueprint developed for the Australian vegetable industry by AUSVEG in 2005/06.

The changing expectations of major retailers, as well as pressure from overseas competitors, are putting heavy pressure on vegetable growers to remain viable. Currently the industry does not have the organisational structure, investment plan or expert support to deal with these changes. Yet there are opportunities to be realised by adapting to the challenge with modern farming techniques, including efficient hydroponic systems that are capable of generating high volume, high quality, minimal residue produce on a consistent basis to market specifications. The strategic planning process is looking to develop their priorities for a more sustainable future.

### **Work undertaken**

Simon Drum (HAL) requested support from vegetable industry IDO Craig Feutrill and Tony Burfield to assist development of the National Strategy for Protected Cropping.

A range of industry papers were reviewed and summarised by Tony for a national working group led by Simon. Tony, Craig and Domenic Cavallaro co-ordinated a meeting of 21 SA growers and service providers to develop their priorities for a more sustainable future. Major and minor priorities were identified as input at the national level. Craig, Alison Anderson (NSW Veg IDO) and Tony assisted Simon with recruitment of industry representatives for a HAL facilitated national meeting in Sydney of growers, consultants, IDO's and researchers from across Australia. The meeting generated a background paper and strategic priorities to create a document for further industry consultation. Major and minor priorities and key actions were identified in the following areas:

1. Structure and direction of key industry organisations
2. Industry communication and cooperation
3. Reviewing unsustainable cost structures
4. Developing marketing strategies for fresh produce
5. Business Management models
6. Matching technology investment to meet production and market requirements
7. Developing skilling pathways supported by effective information and training programs.
8. Developing a framework of national standards.
9. Developing a national bio-security strategy
10. Better management of urban planning, natural resources and utilities.

A second round of intensive industry level consultation on the draft document is underway until mid October at Virginia and in the Sydney Basin. (draft strategic plan – c/o Simon Drum HAL)

The plan is due to be finalized in November 2007.

### **Outcomes**

The vegetable industry sees itself as being limited by largely ineffective representational structures and processes leading to poorly defined communication, decision-making and priorities for investment and evaluation. It also sees the current structure of the supply chain and consumer awareness as very problematic for conducting a sustainable vegetable industry.

Issues that industry feels need to be advanced urgently under their direction are:

- Appropriate technology support for soil and hydro production systems and IPM strategies.
- Business management and financial support to identify and adopt the relevant aspects of the above improvements.
- A fairer deal in the supply chain to obtain more appropriate and stable returns supported by national standards.
- Market development from varieties and cultivation to consumer marketing and education.
- Independent market information to base short and longer term decision-making on.
- Information and training to assist all of the above.

The current initiative has enabled key representatives from all stakeholder groups to become aware of the initiative and provide input. State and national participants feel there has been a real opportunity to identify the industry's key issues and inform strategies to improve the viability of the industry.

### **Next steps/recommendations**

A final round of intensive industry consultation in SA and the Sydney Basin will fine-tune input to the strategic plan. Other States will be supplied with the draft plan via their IDO's and WFT extension project teams. This interim leadership network, which extends from HAL to key industry stakeholders in each State, will be kept informed and involved as the process progresses.

*The strategic plan must become an initial Operational Plan ASAP, which continues to be reviewed and updated using the stakeholder networks developed by this initiative within a nationally representative industry process. Outcomes must address the needs of both soil and hydro/aspiring hydro producers.*

### 3.3 SUPPORT FOR KEY INDUSTRY SERVICE PROVIDERS IN SA

#### **Purpose and previous context**

The previous project (VG 02040) identified grower needs and demonstrated to growers and industry services the value of moving toward IPM. It also helped to address some important gaps in technical information for controlling WFT and other key pests (especially whitefly and two spotted mite) and produced a resource package that was distributed to approximately six key businesses in the region. Key industry services state that they have been using published IPM resources and handouts and were keen to continue supporting the adoption process. There was still considerable room to promote IPM information access and adoption as a more mainstream item of service by resellers, consultants and other service providers. Potential avenues for greater uptake of the resources were (i) increased technical advice/support for IPM, (ii) delivery of IPM education and training, (iii) collaboration between IPM related projects in the region, (iv) receiving updates on IPM developments and R&D on new pest issues, and (v) involvement in consultations on industry needs and strategies.

Businesses and other industry service providers were consulted on how well existing resources (content and format) supported their service provision and what improvements or changes they would recommend. We also sought to build links between services where feasible, especially where they were not in direct competition with each other. Finally we sought to match remaining gaps in IPM technology and strategy against strategic IPM funding priorities emerging from the National IPM Stocktake.

#### **Work undertaken**

Key pest management themes established as effective in earlier projects (VG00085 and VG02040) have been maintained and extended through consultation and further resource development.

They revolve around the following key strategy areas

- ❖ Get information on key pests & diseases
- ❖ Protect your crop from attack
- ❖ Plan and implement a monitoring program
- ❖ Make spray program improvements
  - Use insecticides effectively & safely
  - Spray if pests too high
  - Check plants after spraying
  - Rotate chemical groups to reduce resistance risks
  - Learn how to diagnose spray failures and understand key insecticide properties
  - Get expert advice on persistent problems
- ❖ Integrate beneficial insects into the strategy

These management areas have been compiled into an IPM booklet (see APP 8) currently being released to 30 growers and service providers for evaluation. They are represented as a management flow chart on the following page.

# THRIPS and VIRUS MANAGEMENT CYCLE

## 1. GET INFORMATION ON KEY PESTS AND DISEASES:

- ❖ Identification, life cycle, control options

## 2a. PROTECT YOUR CROP FROM ATTACK

- ❖ Clear weeds and old crops before planting
- ❖ Repair/improve greenhouse
- ❖ Obtain pest & virus (TSWV) free seedlings
- ❖ Choose the best time & place with less risk

## 2b. MAINTAIN CROP HYGIENE:

- ❖ Remove sick plants from crop
- ❖ Do not work from infested crops to 'clean' ones. Start with the cleaner one.
- ❖ Control vehicles and people entering your crops

## 3. PLAN AND IMPLEMENT A MONITORING PROGRAM:

- ❖ **Sticky trap/flower/leaf counts etc. to detect changes in pest levels**

## 4a. MAKE SPRAY PROGRAM IMPROVEMENTS:

- ❖ **Check chemical selection and rotation; check jets; correct pressure, pH and calibration, keep records etc.**

## 6. INTEGRATE BIOLOGICAL CONTROLS:

- ❖ *Learn about wild and commercially available beneficial insects that attack your pests*
- ❖ *Improve your monitoring program to include beneficial insect counts vs pests*
- ❖ *Modify your use of chemicals to protect beneficial insects*
- ❖ *Look at other ways to encourage beneficial insects to stay on your farm, e.g. suitable host vegetation*

## 5. GET INFO / ADVICE ON:

- ❖ Possible resistance
- ❖ Possible spray program errors

## 4c. CHECK PLANTS/FLOWERS THE DAY AFTER SPRAYING:

- ❖ if Nos. very low
- ❖ monitor plants & flowers for one week to see if they return quickly
  
- ❖ if Still high
- ❖ possible new flight, spray error or insecticide resistance

## 4b. SPRAY IF PESTS TOO HIGH:

- ❖ Spray when pests reach thresholds, including plant check day before and after to check effectiveness

### 1) Integrating IPM resources with delivery of technical advice/support to industry

Retailers and consultants were encouraged to integrate the available IPM resources as a key part of their service provision through:



Kaye Ferguson (SARDI foliar diseases), Grower,  
Than Nguyen (P&P, Reseller manager), Domenic  
Cavallaro (Hort consultant)

- Consultation with local chemical resellers, an organic products retailer and industry consultants (Domenic Cavallaro-private consultant, and Stacey Brouwers-VHC) to determine the current and potential fit for IPM in 'over the counter' and on-farm technical support given to growers.
- Inviting reseller staff to be involved in farm visits to grower clients of their choice with a horticultural consultant to review crop health issues. Options were then discussed for adapting their services to better meet growers needs for IPM and other crop health information, and to determine what support they would require to achieve this.

### 2) Output of IPM resources for information, education and training

Information and learning support to the industry was pursued by:

- Continuing to engage chemical resellers as key access points for obtaining IPM resources, i.e. the current IPM resource folder, various topical pest management handouts (e.g. TSM resistance to Vertimec) and clean-up campaign information.
- Developing an IPM booklet which will be provided for growers at retailers, and backed up by more detailed fact sheets on pests and chemicals via the VHC and a national IPM web page (under development). (see APP 8)
- Maintaining a shared communication effort with the SA Veg. IDO, including distribution of IPM case-history booklets, and topical articles in industry publications

### 3) Collaborating with other IPM projects to extend current and future capacity

Strong linkages with other SARDI IPM projects were maintained to enhance information output to local services and improve R&D planning/delivery as follows:

- Assisting the design and establishment of lettuce IPM trials on the NAP (VG05044)
- Close liaison with the Revegetation by design project to assist design of the lettuce IPM trials and planning and future greenhouse IPM research (HG02103)
- Assisting establishment of the IPM project on foliar diseases (VG02094)
- Communicating with the DBM project to develop a set of IPM case histories for the National Vegetable conference (May 2006) (VG04004)
- Communicating with the Kelly Citrus Thrips project concerning knowledge gained on the use of soil compost to improve levels of beneficial predatory mites (CT06006)
- Scoping discussions on a whole system approach to farm technologies for plant health and NRM with a range of researchers from soil health and native vegetation to plant pathology

### 4) Updating stakeholders on IPM developments - new pest issues, R and D etc.

A range of strategies were used to communicate more widely with stakeholders:

#### *State level*

- Handouts at retailers on local pest control issues, including resistance of TSM to abamectin and 2006 clean-up campaign flyers.
- Road signs, large posters and caps at four retailers etc. were used to promote the 2006 Clean-Up campaign.

- Direct contact with VHC, Playford council, Revegetation By Design and key revegetation consultants on the state of play in regional vegetation research and communication events.
- Articles in industry publications on regional clean-up and farm hygiene were prepared with the SA veg industry IDO (publications used: The Grower, Good Fruit and Vegetables, Soilless – see APP 10).

#### *National level*

- Articles in industry publications on the National IPM Strategy, Minor Use Gap Analysis and Protected Cropping Strategic Planning initiative were prepared with the SA veg industry IDO (publications used: The Grower, Good Fruit and Vegetables, Soilless – see APP 10).
- Most local retailers and service providers were kept up to date directly on these developments through e-mails, phone calls and invitations to industry consultation meetings.

#### 5) Involving industry in ongoing consultation to identify/clarify needs and strategies

Growers and service providers have been included in consultation on a range of industry needs and strategic initiatives as follows:

- Reviewing the suitability of the current IPM resource package by consulting with resellers and consultants likely to use such resources.
- Inviting growers and resellers to a consultation meeting on minor use needs for insects and disease pests in protected cropping (April 2006, Sept 2006).
- Inviting growers to identify their priorities for a national strategy for the protected cropping industry.
- Continuing liaison with leading growers (greenhouse and field) and resellers to gain feedback on issues (regional clean-up, resistance, lettuce aphid) and strategic initiatives (Revegetation by Design, National IPM Stock-take, Chemical Strategic Gap Analysis, Protected Cropping Strategic Plan).

#### **Outcomes**

##### Weed control and revegetation

The Regional Clean-up strategy retains support and momentum with information output via the resellers and a property clean-up service now provided by the VHC. There has been a notable year-by-year increase in the number of properties controlling weeds through herbicide use and cultivation.

There appears to be a parallel improvement in the key WFT- TSWV problem. The manager of the Virginia Nursery, which raises seedlings for a substantial proportion of the industry, recently advised that during the last year there had been a dramatic reduction in growers reporting problems with TSWV. He suggested three possible reasons for this change that he was aware of: (i) improvements in weed control and general crop hygiene, (ii) more growers completing Chemcert courses and implementing improved spray technology and (iii) an increase in the use of fine ‘insect-proof’ mesh on greenhouses. A local chemical reseller, who services mostly Vietnamese growers, has confirmed a dramatic reduction in the sale of insecticides, which he assumed was attributable to growers experiencing less difficulty controlling the key pest, WFT. These reduced sales have occurred in a year when commodity prices had been well above average, i.e., cash flow and difficulties funding pesticide purchases should not have been a problem for these growers. Interestingly, the reseller was not concerned about the decline in chemical sales because “it means there is an improvement in sustainable farming practices and lower pesticide sales are being made up by an increase in sale of fertilisers”.

It is very encouraging that the nursery and chemical reseller managers were aware of these reductions in crop losses and readily articulated possible causes for this improvement. Some caution is required, as their conclusions are not based on firm evidence that improved management practices are the primary cause of these improvements. They could equally be due to unfavourable seasonal conditions reducing pest pressure, especially from onion thrips, which is the primary initial vector of TSWV into these crops. However, there has been a clear trend of reducing crop losses over the last 3-4 years,

which, if maintained, would be strongly suggestive of being caused by improved management practices.

The Regional Clean-Up Program began as an area wide pest (WFT) and disease (TSWV) hygiene initiative of the WFT extension pilot (VG00085) in 2001, but is now increasingly connected with the experimental use of native vegetation being developed through the Revegetation by Design project that commenced in 2003. Trials at the GMP demonstration site and several farms have been expanded to a 500m roadside verge and several more greenhouse properties. The use of native vegetation is also planned as part of lettuce IPM trials beginning this year. A proposal to use native grasses as habitat for beneficial mites inside greenhouses has also been submitted to RIRDC. IPM extension projects VG00085, VG02040, and VG05056 have been key facilitators in this strategic overlap, through assisting collaboration within the SARDI research team and linking native vegetation research with growers and industry networks. These native vegetation sites are supporting advanced research into modifying plant habitats for pests and beneficial insects on the NAP, and ultimately will enable investigation of the movement and impact of beneficial insects on commercial crops.

Scoping trials (VG05056) on weed management and native grasses conducted by a private consultant (John Stafford) have been influential in motivating Playford Council to look further into roadside weed management using specialised machinery and non-chemical soil treatments that show promise for reducing weed germination and promoting native grasses. John's small-scale trials using soil amendments, including microbial cultures, are also of interest to SARDI soil researchers. John has also developed and implemented a roadside vegetation and topography mapping strategy to assist Playford Council's cost-benefit assessments on technology options for weed control (APP 7).

#### Pest management resources

New extension resources have been developed to add to resources used by retailers and industry service providers. They are being distributed via retail outlets, the state vegetable IDO and the VHC. These include:

- An 18-page IPM booklet covering the major aspects of IPM practice, with an emphasis on improved resistance management. The booklet contains contacts for additional information sources including pest fact sheets and detailed chemical use advice placed with the Virginia Horticulture Centre and on the Vegetable IPM Web Page.
- A booklet of four greenhouse IPM case-histories (developed in VG02040).
- A large regional pest habitat management poster integrating weed control, crop hygiene and native vegetation strategies (see APP 6)

Interviews with resellers and subsequent farm visits with reseller staff and a horticultural consultant (Domenic Cavallaro) have identified a major knowledge gap for many greenhouse growers in regard to plant physiology, plant nutrition, cold suppression, soil management and other basic crop care skills. Substantial crop health problems were frequently encountered that could easily be avoided/rectified with basic practices such as soil and leaf testing and relatively inexpensive remediation. Resellers agreed that this is a major issue that can be addressed through targeted information packages and an entry-level training program. Industry members estimate that 50+ new growers enter the industry each year. A Greenhouse Skills Adoption Training program developed by Robert Kennedy and Domenic Cavallaro in 2003/4 contains the key elements for such a program.

#### Greenhouse IPM technology development

This project has been conducted in close liaison with the "Sustainable integrated control of foliar diseases in Greenhouse Vegetables" project (VG02094 - Barbara Hall, Kaye Ferguson). It has assisted the recruitment of growers for farm-based research and worked jointly on input at state and national IPM meetings. Although the absence of specific insect pest funding has prevented any major progress on developing IPM strategies in greenhouses there has been some promising exploratory work conducted in SA without industry funding:

- A predatory thrips, *Haplothrips victoriensis*, which feeds on WFT and other pests, has been successfully lab reared at the Waite Institute, opening the way to investigate its potential as a commercial biocontrol-agent.
- The predatory *Microsmaris* mite, which was first noted for apparently controlling WFT in a 2005 capsicum IPM trial, is again evident in on-farm vegetation in 2006, indicating its potential as an endemic thrips predator.

#### Integrated crop care systems

The broad liaison that occurs within this project with a range of research work, has led to interest by SARDI researchers in collaborating on a whole system approach to crop health. This has been inspired by outcomes from the following activities:

- Good numbers of beneficial insects and low numbers of pests found in some native vegetation species by the Revegetation by Design Project (Glenys Wood - SARDI).
- The appearance of an abundant mite predator (*Microsmaris*) in a minimally-sprayed capsicum crop, and which is readily found on several native plant species (Tony Burfield - SARDI).
- Research in citrus crops demonstrating an increase in beneficial predatory mites and successful control of Kelly's citrus thrips when soil compost amendments are applied, and soil sampling from lettuce crops identifying the presence of several species of predatory mites that could assist vegetable IPM in a similar way (Greg Baker and Peter Crisp - SARDI).
- Grower reports of dramatic reduction in disease levels in lettuce and salad veg when compost additions are made.
- Trials of soil remediation to suppress weeds and promote native grasses (John Stafford – private revegetation consultant).
- A diverse range of soil research work currently being conducted at SARDI including compost technology and its horticultural benefits, and DNA diagnostics for nematodes and soil microbes (both pathogens and beneficials).
- A range of non-chemical crop protection products supplied by an 'organic' retailer in Virginia (John Norton) are of interest to SARDI's soil amendments researcher (Matthew Ayres).

There are now eight SARDI researchers (Greg Baker, Glenys Wood, Peter Crisp, Steve Barnett, Matthew Ayres, Ross Ballard, Ian Riley, Tony Burfield) who have expressed strong interest in developing whole system strategies that can be extended to industry via farm trials and demonstrations.

#### Communication and consultation

There has now been ongoing liaison and consultation with growers and other key stakeholders through an unbroken network of communication since November 2001 when VG00085 commenced. Direct contact with local businesses, the Playford council and other agencies, especially the VHC, has maintained support and input for local and national strategies like the Clean-Up program, Revegetation by Design project, National IPM Strategy, Minor Use Gap Analysis and Protected Cropping Strategic Plan.

There has been no formal review of communication impacts arising from this brief project.

#### **Next steps/recommendations**

Further work is required at Virginia that will:

- 3.1 Maintain and extend pest, disease and chemical use fact sheets to support the IPM booklet, ideally within a national IPM information bank
- 3.2 Support/encourage local resellers to promote updates on seasonal crop health issues.
- 3.3 Continue promoting the revised minor use strategy for sustainable crop protection options via a web page, articles and industry meetings. Use it to enable timely access to suitable reduced risk chemicals and approved products for IPM systems.

3.4 Maintain and further promote the regional Clean-Up program with community leadership awards co-ordinated by the VHC.

3.5 Develop funding and support for an entry level training program for unskilled growers that covers basic plant care and introduces IPM information and skills

3.6 Provide support for development and adoption of integrated crop care technology comparable to overseas best practice – i.e. optimising existing technologies and adopting best practice greenhouse design and practices for insect pests, diseases, soil and plant health

3.7 Work with resellers to develop a practical way to collate and evaluate information output and impact on grower practices including inquiries, use of products services, changes in practices and benefits.

3.8 Establish an annual industry consultation and review of all crop health issues.

### 3.4 MAINTAIN STRATEGIC COMMUNICATION WITH THE THREE STATE IPM PROJECTS

#### **Purpose**

- *Newsletters and activity fliers from the WFT extension projects have been posted on the Vegetable IPM web page*
- *Four e-mail newsletters have been prepared and distributed*
- *Liaison with NSW and Qld project teams has occurred through a visit to each state*

To maintain regular communication and support between State-based WFT extension projects in SA, NSW and Qld. This linkage will be vital to obtaining maximum benefit from IPM R,D and expenditure.

#### **Work undertaken**

A range of communication outputs were used to assist information exchange at the national level:

1. Direct liaison was maintained by phone and e-mail to keep projects updated and providing feedback on major national strategic initiatives, i.e. the IPM Stocktake, Minor Use Gap Analysis and national Protected Cropping National Strategic Planning.
2. Articles on all of these initiatives were published in Good Fruit and Vegetables
3. A vegetable IPM web page has been piloted and feedback invited from the state project teams on the format and content of the site
4. State IPM R&D project profiles have been introduced on the web page along with project newsletters and flyers
5. An IPM case-histories newsletter featuring greenhouse growers, and a second set of recorded IPM case histories featuring field and greenhouse growers and IPM consultants were distributed to projects and state IDO's (see APP 4)
6. A collection of six IPM case histories from field and greenhouse growers and IPM consultants was developed in conjunction with the Diamondback Moth project (Dijana Jevremov) and presented at the 2006 National Vegetable conference. (see APP 5)

#### **Outcomes**

The design and impact of these communication outputs has not been systematically assessed. Ongoing communication with the projects in NSW and Queensland support the following observations.

Discussion on project activities, i.e. extension, applied IPM strategies and progress of 'on-farm' trials has consistently found that building grower confidence in taking a dedicated approach to IPM has been the greatest challenge. Prospects for adoption would be assisted by (i) expanding the role of these projects beyond addressing control of WFT alone to a total IPM strategy with an effective package of non-chemical options and decision-making tools for the full range of key pests and diseases, and (ii) developing the role and availability of commercial consultants.

The National IPM network commenced in July 2004, and contributed to two national IPM meetings in 2005 which preceded, and in part motivated, the National IPM Stock-take initiative. This network presumably provided the Stock-take with a stronger initial base as it has set priorities (May 2006) that focus on many of the issues faced by the projects, but formal input has not been organised directly from the projects themselves.

Phone and e-mail feedback received on the web-site layout has been useful and essentially positive, but not in depth. There has been some limited comment on content, mostly to do with crop scouting. The content is still too basic to promote it widely as a functioning resource until detailed information gathered in the IPM stock-take is integrated into the site.

Comments on the IPM case histories (printed and recorded) have been very positive. The greatest level of feedback has come from a commercial consultant in Western Australia (Lachlan Chilman).

#### **Next steps/recommendations**

There should be a national meeting including the new WA project late in 2006/early in 2007 to:

- 4.1 assist the establishment of the new WA project,
- 4.2 plan co-ordinated input by all projects on key national strategic initiatives (National IPM Strategy, Minor Use, Protected Cropping),
- 4.3 identify key issues and support needs for the remainder of their funding period, and
- 4.4 formulate a clear succession plan for current projects supporting the national IPM adoption effort.

Efforts should be made to:

- 4.5 establish the involvement of a vegetable virology expert, notably Dennis Persley (Qld DPI), in the national IPM R,D&E network.

## SUMMARY

### 1. Key events in the progress of National vegetable IPM

IPM programs, particularly for Diamondback Moth in Brassicas and Heliothis in a range of field crops have been underway since the early 1990's. These programs have achieved considerable sustained success and commercial adoption in the affected crops. In the mid 1990's the arrival of Western Flower Thrips opened a major new front of endeavour in a wide range of vegetable and horticultural crops for IPM R & D. This led to the establishment of the National Western Flower Thrips research program networking researchers in most states. A National Communication program based at Knoxfield was linked to the research effort. This strategy was primarily newsletter based until the WFT Extension project (VG00085) was piloted in 2000-2002 at Virginia.

The Virginia project had significant outcomes in gaining industry acceptance and widespread improvements in insecticide use amongst many greenhouse growers (spray coverage, chemical rotation, crop scouting) and improvements in farm hygiene practices. This news motivated an expansion of the SA program (VG02040) and the establishment of similar projects in NSW (VG03109) and Queensland (VG03099). A key aspect to industry adoption was a close working involvement with receptive growers and other expert stakeholders on conducting workshops with on-farm follow-up and farm-based demonstrations. This approach was also recommended by the DBM project "Sustainable Cropping Systems in Brassicas (VG213 Sue Heisswolf QDPI) in 1996. An additional key objective became the promotion of commercial IPM service delivery as an outcome of these projects.

During the same period the growing influence of commercial IPM consultant, Dr. Paul Horne, has helped to promote a holistic approach to IPM strategies in various crops (e.g. potatoes, brassicas, celery and lettuce) that goes beyond reacting to one pest at a time. Paul's approach is an indicator of the type of commercial delivery that is likely to be successful in addressing pest (and disease) problems through IPM. A new consultant in Western Australia (Lachlan Chilman) is similarly providing an innovative, holistic service to an expanding grower clientele.

The next major development was in July 2005 when a National IPM Strategy that was initiated by HAL through an IPM Stocktake coordinated by Dr. Sandra MacDougall (VG 05043) and assisted by VG05056. Priorities were developed for R&D allocations in 2005/06 in minor crops and extended where required in major crops. IPM tools were also collated for wider and more systematic extension that is likely to be supported by a national IPM Information Bank. Consultation has also focused on expanding the role of commercial consultants in IPM adoption which now awaits commissioning of a scoping project to develop specific recommendations.

The developing national strategy for IPM R, D&E has formed a useful platform of priorities and strategic communication for two other national vegetable industry initiatives: 1) the Minor Use Strategy (Peter DalSanto - AH04009) and 2) the National Protected Cropping Strategic Plan. The ongoing WFT-focused IPM extension networks in NSW, Queensland, and SA have been vital in enabling all of these strategic initiatives. There is now a new WFT-IPM extension project approved to commence in 2006 in Western Australia.

Current communication networks of growers, service providers and researchers will be a key asset for the future expansion of commercial service provision through assisting monitoring of R&D priorities, adoption impacts, and national IPM information resource requirements. It is therefore important to formulate an appropriate investment in maintaining and adapting these networks as a cost-effective asset for IPM development and adoption.

This requires an early national meeting of state based WFT extension projects (SA, NSW, Qld, WA) to focus on recommendations 4.1 - 4.5 and give input on the national IPM strategy (1.1 - 1.4).

Recommendations 3.1 – 3.8 on promoting the role of service providers at Virginia may also assist this meeting.

#### Advancing the National Protected Cropping Strategic Plan

The HAL initiated “National IPM Strategy” has in many respects paved the way for their establishment of a “National Protected Cropping Strategic Plan”. Development of sustained communication and consultation links between growers, commercial providers, researchers and national industry bodies has been of crucial importance. These linkages have grown into strategic partnerships as past, present and future IPM strategies are brought into focus through them.

The success of the protected cropping initiative will depend on a similar level of sustained communication and cooperation between stakeholder groups as is occurring to advance IPM adoption. However this is a much more complex undertaking.

Development of this strategy will take even more careful development and maintenance of strategic links between key stakeholder groups than IPM. The strategy must be industry driven and tangibly address the following major issues:

- Development of consistent improved outcomes from the Australian supply chain for our growers
- Differentiation and integration of strategies to address the needs of both soil and hydroponic growers
- Adequate support for adoption of modern production technologies and comparable business management skills and tools
- Development of effective industry representational structures and processes
- Improved access to information and training to support all of the above