

Root vegetables think tank

Dr Alison Anderson
ARRIS Pty Ltd

Project Number: VG09078

VG09078

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**Root Vegetables Think Tank,
Adelaide,
19th & 20th April, 2010**

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HAL Project Number VG09078

This final report details the outcomes of a one and a half day workshop held in Adelaide, 19th & 20th April 2010, where root vegetable growers, researchers, industry development officers, processors and consultants determined the priorities for future investment of national vegetable levy funds in root vegetable research and development (R&D) projects.

Arris appreciates the time given by growers away from their farms and consultants away from their businesses to contribute to the workshop. Arris also acknowledge State Departments of Primary Industries and Agriculture and other employers for granting their staff the time to attend the workshop to contribute their knowledge and expertise.

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MEDIA SUMMARY

The Root Vegetables Think Tank was held in Adelaide on the 19th & 20th April, 2010 and was funded by the National Vegetable Levy and Australian Government through HAL. Comprised of 13 growers/packers (carrots, parsnips, beetroot, radish, turnip), 8 researchers from State Departments of Primary Industries/Agriculture, 2 state vegetable organisation Industry Development Officers, 2 processing company representatives, 3 consultants/private research providers (including the facilitator), 3 representatives from the Vegetable Industry Development Program, 1 AUSVEG representative and 1 HAL representative, delegates discussed current and past HAL projects and issues facing the Australian root vegetable industry.

The Think Tank presented an opportunity to improve dialogue and working relationships between growers, research providers and other industry people.

Information was presented by research providers on current and recently completed HAL projects being undertaken on root vegetables. Delegates discussed issues facing the Australian root vegetable industry and determined the priorities for future research and development investment. These recommendations for future research and development investment in root vegetables will be communicated to HAL, AUSVEG, the Vegetable Advisory Groups and the Vegetable Industry Advisory Committee.

The following were considered by Think Tank delegates to be the most important issues that need to be addressed to ensure the sustainability of the Australian root vegetable industry:

1. An integrated national program approach to carrot R&D;
2. Seed quality;
3. Postharvest root rots;
4. Crown rot in carrots;
5. Alternative weed control methods for beetroot;
6. Linuron withholding period;
7. Seed dressings for beetroot and radish;
8. Soil health;
9. Value chain analysis;
10. People development through computer training (so as to be able to access R&D information online).

RECOMMENDATIONS FOR FUTURE R&D INVESTMENT

The issues identified for the Australian root vegetable industry were discussed and prioritised by Think Tank delegates. It is recommended that these priorities be used by HAL, AUSVEG, the Vegetable Advisory Groups and the Vegetable Industry Advisory Committee to determine Research & Development (R&D) investment in root vegetables.

Some of the priorities for R&D investment are root vegetable specific and others are general to all vegetables. It is likely that these general priorities would be considered a priority for R&D investment by the whole vegetable industry.

Many of the issues that were considered of highest priority for R&D investment (refer to Table 3 in the 'Identified issues for the root vegetables industry' section) were discussed in more detail than is presented in Table 3 by delegates and considerations for future projects in these areas are given below.

1. An integrated national program approach to carrot R&D (1st)

It was considered a very high priority to develop an integrated program for carrots as has been done for pathology and soil health and in the potato industry. A national plan for carrot R&D would be developed and other industries that have done such a program (e.g. potatoes) could provide input into program development. Such a program would allow efficient and effective knowledge management of carrot R&D outcomes and would involve large growers/key levy payers. It was suggested that a 5 year R&D program be developed and a facilitator such as John Gallagher (past Processing Potato R&D) be involved to help carry forward the idea. Other key points discussed by delegates include:

- Program with a range of projects;
- A program approach would address the lack of continuity of projects (priorities plus continuity of people) and the continuation of intellectual knowledge and provide certainty for research providers;
- Currently there is a lack of 'corporate' knowledge - memory and database of what has already been done;
- Growers and industry would be creating their own extension and communication by being involved;
- Growers need to be able to direct researchers on where the R&D gaps are;
- Research program to be put out to tender;
- Commitment from industry and providers;
- Look at other programs within HAL to find out about their structure (e.g. soil, communication, apples, potatoes, pathology) and what could be achieved for carrots, lots of examples to work from;
- Sweetpotato Association apply for their own projects, look at what they are doing and apply to carrots;
- Look into the celery group in Victoria and find out more about their activities and funding;
- Integrated programs should be considered for all major vegetable crop groups;
- Integrated programs maximise the dollars available for R&D;
- How do we work out the dollars allocated for each program;
- Growers need to take ownership of R&D programs – people do not put up their hands;
- Realistic budget is required;
- Priorities may link up with other programs.

Much discussion was had by the group as to who should drive the formation of an integrated program approach for carrots and coordinate a way forward, e.g. HAL and/or AUSVEG. Dianne Fullelove (People Development Subprogram of the Vegetable Industry Development Program, VIDP) offered to organise a meeting with HAL, AUSVEG, key carrot producers and packers, processors and other subprograms of the VIDP to discuss the development of such a program and program funding. Since the Think Tank some participants have contacted

Dianne and have scheduled the first meeting to be held in June or July in Melbourne, and to be facilitated by the InnoVeg Subprogram of the VIDP. Dianne, through the People Development Subprogram will manage the group. The aim of the group will be to instigate a more planned approach to carrot R&D, with service providers able to provide targeted research for carrot growers.

2. Seed quality (2nd)

Delegates considered seed quality a very high priority for attention. Key points made include:

- Labelling of seed is a major issue across the industry;
- Seed health projects have been submitted in the past but there are funding issues due to the cost and seed company benefit (industry issue but what can be done to address it?);
- Trial seed is not always what goes to market, e.g. open-pollination hybrid;
- Problems in embryo size (seed size) in carrots;
- A seed problem is a productivity problem;
- Seed size variability and how it influences plant establishment;
- Need a seed screening system (carrot growers cannot get enough large seed, but this cannot be fixed with R&D);
- Lack of seed varieties in carrots and parsnips;
- Availability of seed is a problem and seed companies need to better understand the industry's projections for seed requirements);
- There is variability in seed through sourcing;
- Seed companies have quality assurance programs but is there truth in labelling on seed;
- Growers have questioned seed companies about seed quality but do not really get consistent answers;
- Different names for the same variety around the world;
- A lot of seed is imported but need to know where it is coming from (right to know), label may say it is from Holland but it is not necessarily grown there;
- Need to import seed and evaluate new seed lines;
- No disease testing on local seed so cannot impose it on imported seed (it could have Alternaria for example);
- Left-over seed from the USA and Europe comes to Australia.

Delegates suggested that non R&D seed issues should be taken up by industry bodies so as to put pressure on seed companies and Government to address seed quality and labelling issues.

For parsnips white flesh parsnips sell better than cream fresh ones but they are more susceptible to canker/diseases. Parsnip growers in Victoria grow their own seed. A project to show growers how to select for seed should be considered (might be better than putting funding into disease management as a first point to address the problem). Industry should investigate educating growers about DOOR (do our own research), giving information to growers on how to conduct and evaluate their own research/on-farm trials (through for example an article in Vegetables Australia magazine, Vegenotes fact sheet, InnoVeg). See the simple statistical analysis tool developed for on-farm trials on the Fluid Fertilisers website: www.fluidfertilisers.com.au/index.php?page=on-farm-trials

Plant establishment issues in carrots were also discussed as they may not result from seed-related problems. Plant establishment can be a problem in summer under centre pivot irrigation (management practice that can be overcome).

3. Postharvest root rots in carrots (3rd)

The management of postharvest root rots in carrots was considered a high priority. Areas that need to be addressed include:

- Soft rots and blemishes;

- Black root rot – was put up as a priority after the IPM Stocktake, advertised by HAL as an industry priority, Tas/WA/SA submitted a project proposal but it has not been funded;
- Identification of cause, source and predisposing factors;
- Management strategies (regional variations, different diseases);
- Appropriate extension of past and new work.

Some research has been done in WA and delegates asked John Shannon and Figaro Natoli to find out more if possible.

Delegates suggested that postharvest rots seem to have come about from changes in practices (scrubbing of carrots) and are temperature driven.

4. Crown rot in carrots (=4th)

Crown rot management in carrots was considered a high priority. A project to address crown rot would need to include:

- Identification of causative factors, predisposing factors, pathogen involved and existing knowledge;
- Development of management strategies (regional variation and different pathogens);
- Appropriate extension.

Dr Hoong Pung (Peracto, Tasmania) has done research on crown rot but there are still questions about what is driving it – is it environmental, variety, a complex (more than one pathogen)? There is not the money to do pathogenicity tests through simple diagnostic services. Full pathogenicity work costs several thousands of dollars. Crown rot is predominantly a problem in Tasmania and it is mainly a problem in one variety, more than others.

5. Alternative weed control methods for beetroot (=4th)

The need for minor use permits and more alternatives for weed control in beetroot was considered a high priority by delegates. The lack of (pre-emergent) herbicides for beetroot is a major problem. The industry is losing access to Pyramid. An update on the situation from Peter Dal Santo was requested.

It was also suggested that alternatives for weed control and their costings be investigated (e.g. robotics) through a scoping study. This type of research would benefit all vegetable crops. Alternative weed control methods for all vegetable was voted as being =13th in priority.

6. Linuron withholding period (=6th)

The withholding period (WHP) for Linuron in carrots is a major problem. The current WHP needs to be decreased. Peracto is collecting data and delegates asked for Peter Dal Santo (Vegetable Minor Use Coordinator) to be contacted to find out what is happening with the dataset. Alison Anderson offered to email delegates Peter's response. Key points made were:

- Fund dataset generation to justify a shorted WHP;
- Need a lot of data for labels to be altered;
- What does the APVMA need to shorten the WHP.

7. Seed dressings for beetroot and radish (= 6th)

Seed dressings are needed for the control of Pythium, Rhizoctonia and Fusarium. An update of past research is required and could include other crops. Any seed dressing research needs to conduct Australia-wide trials and should involve Peter Dal Santo. Some key points made by delegates include:

- Bejo treats seed and are good with labelling;
- Some companies do not treat seed but it is a cost of seed issue and growers need to ask for it;
- There is a problem with the prices asked of growers to treat seed;

- Imported produce can be treated with anything but here to treat it has to be registered;
- Growers want seed companies to advise them about what their seed has been treated with;
- There is very little that can be used to treat seed in Australia (needs discussion with Peter Dal Santo);
- There are some seed options but the volumes in Australia are not enough for seed companies to invest;
- Investigations into seed treatment would be best part of a larger project, e.g. Pythium management in root vegetables rather than a project just investigating seed treatments for Pythium.
- Knowledge Management subprogram of the Vegetable Industry Development Program needs to communicate the outcomes of any seed treatment projects to industry.

8. Canker management in processing beetroot (= 13th)

Canker management in processing beetroot was considered important and a major problem for growers and processors in Queensland. It cannot be seen before the beetroot is cooked and it is not known what causes it or when the infection point occurs. Additionally it is not known if it negatively affects production. It is a problem in Queensland (October/November harvest) and not seen in Cowra (NSW). A project needs to address:

- When it develops;
- What are the conditions for onset;
- Development of a preventative management regime.

THINK TANK DELEGATE LIST

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Apologies

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THINK TANK DETAILS

Agenda

A summary of the think tank agenda is presented below and the agenda as sent to delegates prior to the think tank is given in Appendix 1.

1. Welcome, introductions and aims of the think tank, outcomes of past carrot R&D priority setting workshops
2. Introduction to the Vegetable Industry R&D Program and Vegvision 2020 (Will Gordon)
3. Introduction to AUSVEG communication activities (Andrew White)
4. An economic guide to the vegetable industry (Ian James)
5. Outline of the Vegetable Industry Development Program, VIDP (David Heinjus)
6. People Development Sub-program of VIDO (Dianne Fullelove)
7. Research summaries outlining key outcomes and gaps in knowledge
 - John Duff: Queensland DPI Root Vegetable Projects
 - Doug Jones: Golden Circle Root Vegetable Projects
 - Tim Kimpton: Applied Horticultural Research Root Vegetable Projects
 - Andrew Watson: Industry & Investment, NSW Root Vegetable Projects
 - Calum Wilson: Tasmanian Institute of Agricultural Research Root Vegetable Projects
 - John Shannon: WA Root Vegetable Projects
 - Oscar Villalta: DPI Victoria Root Vegetable Projects Part 1
 - Liz Minchinton: DPI Victoria Root Vegetable Projects Part 2
 - Trevor Wicks: SARDI Root Vegetable Projects
8. Break-out sessions in small groups to identify key root vegetables R&D issues
9. Discussion of identified issues and grouping
10. Voting to identify the priority areas for future R&D
11. Discussion about the top R&D priorities

Aims

The aims of the Root Vegetables Think Tank were:

1. Gain an understanding amongst participants of vegetable levy funded root vegetable (R&D) projects – past and present
2. Bring together growers and a diverse group of stakeholders who can best identify issues and R&D priorities throughout the value chain;
3. Identify strategic issues, needs and drivers for future leafy vegetable R&D in Australia;
4. Develop project definitions for R&D priorities;
5. Build relationships amongst think tank participants.

Expected Outcomes

The outcomes expected from the Root Vegetables Think Tank are:

1. The Vegetable Advisory Groups and the Industry Advisory Committee are clear on the priorities of the Australian root vegetables industry, leading to strategic R&D investment and more effective and efficient Advisory Group meetings (R&D plans from specific crop groups will enhance their knowledge and resources available to them);
2. Ownership and confidence in the R&D investment process by root vegetable industry representatives;
3. Research providers will understand the priorities and needs of Australian root vegetable growers;
4. Enhanced relationships between industry representatives from across the supply chain;
5. Industry representatives who are knowledgeable about root vegetables R&D projects, their outcomes and the process for R&D investment who can then communicate this information with other industry representatives in their regions.

Proposed Outputs

The key output of the Root Vegetables Think Tank will be strategic research recommendations for the Australian root vegetables industry.

Method

The facilitator (Alison Anderson, Arris Pty Ltd) invited delegates to the Think Tank based on their involvement in the Australian root vegetables industry. Input was given by research providers, industry associations, processors and root vegetable growers and packers as to suitable delegates. The aim was to obtain representation from each state and territory growing root vegetables and from across the supply chain. Additionally the aim was to involve growers who had not previously been involved in industry committees or workshops as well as growers who had representative experience. Originally it was hoped that up to 30 delegates would be able to attend the Think Tank. Due to a keen interest in the Think Tank from industry there were 33 delegates at the think tank (including the facilitator) and several apologies.

Industry representatives who were invited to the Think Tank, but were unable to attend were given the opportunity to provide input and their R&D priorities were considered alongside those that were raised at the Think Tank.

Each delegate was provided with the agenda, a list of current HAL vegetable projects and final report summaries of HAL root vegetable projects prior to the Think Tank. The final report summaries were for projects working in carrots, parsnips, turnips, radish and beetroot. Additionally, delegates were provided with a summary of previously identified carrot R&D priorities, from 2005 (Appendix 2).

Before proceedings started each delegate was asked to write on a piece of paper what they consider the number one issue to be on their farm, in their region or for the industry is. This was to gain an appreciation of key issues before delegates were provided information about current research and without discussing issues with a group. Individual ideas are a very important component of think tank outcomes.

At the Think Tank researcher providers were asked to give a 10 minute presentation outlining current or recently completed root vegetable project/s from their government agency, company or state, including key outcomes and identified gaps in knowledge. These presentations enabled delegates to gain an understanding of the type of projects that have been funded in the past or are currently funded and what the outcomes of these projects were, or are expected to be. Highlighting knowledge gaps also allowed delegates to begin considering what might be identified as issues and R&D priorities for the root vegetable industry in the future. Additionally delegates learned about the new Vegetable Industry Development Program through presentations by David Heinjus (Coordination), Dianne Fullelove (People Development) and Ian James (Economics).

Following project presentations delegates were divided into 4 groups for 90 minutes to discuss key root vegetable industry issues. The aim was to have a mix of research providers, growers and other industry representatives in each group and to not have a group with everyone from the same State. The facilitator of the Think Tank did not join a specific group. Group 1 consisted of growers whose predominant root vegetable crop was beetroot or radish. Each group was given the collated list of issues identified by individuals at the start of proceedings to assist with their discussions. The groups were as follows:

Group 1

Dianne Fullelove
John Duff
Nigel Hazell
Peter Lerch
Danny De Ieso
Lisa Crooks
Doug Jones
Andrew Watson

Group 2

Will Gordon
Ian James
Kent West
Phil Lamattina
Tony Kourmouzis
Oscar Villalta
Kevin Clayton-Greene
David Heinjus

Group 3

John Shannon
Luke Biocich
Mike Ertler
David Stirling
Calum Wilson
Phillip Loane
Barbara Hall
Dolf de Boer

Group 4

Andrew White
Barry Nicol
Robert Cirrilo
Figaro Natoli
Trevor Wicks
Tim Kimpton
Liz Minchinton
Slobodan Vujovic

To assist the groups they were asked to consider:

- Production – pests, diseases, soil health, integrated crop management, environment
- Consumers and Markets;
- Postharvest;
- Processing;
- People and business development;
- Communication and knowledge transfer.

The groups were asked to put each identified issue on a separate large sticky note (different coloured notes used for each group). Following group discussions, all of the issues were placed on one wall for delegates to discuss as a whole. Delegates were asked to group like issues.

Following grouping of issues delegates were asked to vote for the issues they thought were of the highest priority; that is those issues they would most like to see future R&D investment in. Each delegate received 5 votes. Votes made by growers and processors were identifiable from votes made by other delegates. The growers and processors were divided into two groups - those who had carrots as their main vegetable crop and those that had beetroot, parsnip or radish as their main vegetable crop.

Once the priorities for R&D investment were decided some discussion was had by the delegates on what would be included in a project to address those priorities. During this discussion delegates were asked to consider:

- What is the problem?
- How should it be investigated?
- What outcomes are we seeking?
- How should it be delivered?
- Who would investigate it and deliver the outcomes?
- How will it be implemented on-farm?

SUMMARY OF RESEARCH PRESENTATIONS

Below are the key points from presentations made by research providers at the Think Tank to give delegates a summary of current and recently completed HAL root vegetable projects. Of particular importance to the Think Tank were the research gaps and opportunities identified by the presenters. These gaps are summarised in Table 1. Also given are the key points from presentations about the Vegetable R&D Program and AUSVEG communication activities by Will Gordon and Andrew White and presentations about the Vegetable Industry Development Program (VIDP) by David Heinjus, Dianne Fullelove and Ian James. Alison Anderson and Will Gordon gave a summary of the Australian Vegetable Industry Domestic Market Development Strategy (DMDS) with information provided by Brand Story.

Queensland root vegetable projects

Presented by John Duff, Agri-Science Queensland, DEEDI

- What can be grown in Queensland: Beetroot, Carrots, Onions, Garlic, Leeks, Shallots, Potatoes, Sweetpotatoes, Radish, Parsnips, Turnips
- Improving the reliability and consistence of processing beetroot production (VG00084): reducing the length of growing window; disease indexing of individual fields (*Pythium* spp., *Aphanomyces* and *Rhizoctonia*); ensure appropriate seed dressings, e.g. Rizolex and Apron (best application methods for seed treatments, viability of seed treatments after prolonged storage, evaluation of biological control options, spray programs to control late disease outbreaks); crop rotations with non-host plants; use of monogerm varieties and continue varietal assessments and variety improvement.
- Better Beets 2: Improving reliability and consistency of processing beetroot production (VG04047).
- Project 2.1 Integrated management of soilborne pathogens (*Sclerotinia* in beans, lettuce, carrots, celery and others (VG07126): biocontrol agents, biofumigants, fertilisers, fungicides, crop rotations.
- Organics project: carrots as part of a rotation program
- Sweetpotato projects: Improving the management of sweetpotato soil insect pests (VG05037), Evaluating sweetpotato varieties to meet market needs (VG09009), Integration of crop and soil insect management in sweetpotatoes (VG09052)
- Other root vegetable projects: Daikon – a promising anti-cancer vegetable, a type of radish, use sprouts rather than the roots.
- Onions: onion thrips, downy mildew, options for managing onion white rot (VG98140).
- Potatoes: brown fleck, melon thrips, composts, irrigation, nutrition.

Golden Circle projects

Presented by Doug Jones, Golden Circle

- Development of integrated strategies for sustainable processing beetroot production (VG05083).
- Why the project was undertaken: The Queensland processing beetroot industry was suffering a decline in sustainability resulting from fluctuating yields and quality, plus rising costs; There was an absence of standard practices and no facility to share information between growers; The aim of the project was to identify the best production practices for processing beetroot and then document these into a best practices manual, which could be used as a point of reference to begin standardising growers across the industry through individual visitations and workshops.
- Key outcomes of the project: Standardised fertiliser programs for slice and baby beetroot; Evaluation of the causes of beetroot quality rejections; Standardised planting densities and geometry for sliced and baby grade beetroot; Recommended varieties specifically targeting quality, yield and seasonal requirements for both slice and baby beetroot.

- Gaps identified: The most severe quality issue for the industry is “canker”; Whilst samples of cooked beetroot consistently identified *Geotrichum* sp., this was not identified to the species level. It is however expected to be the more commonly occurring *Geotrichum candidum*; Further investigation is required to confirm its pathogenicity in relation to the “canker” symptom, but more importantly we need to identify at what stage of harvesting to processing infection is occurring.

Development of a new processed carrot industry to export bioactive phytonutrients for juice and nutraceuticals

Presented by Tim Kimpton, Applied Horticultural Research

- VG06135
- Voluntary contribution project: key funding partners – SDS Beverages and HAL; other industry partners – SPS through their specialty seed subsidiary Excelexport provided genetics.
- Key trial site co-operators: Parilla Premium Potatoes (SA), NSW DPI Research Station (Dareton), Arnotts Vegetable Farms (Vic), Darren Pivato (Vic), NT DPI (Katherine and Darwin), QDPI (Bowen), Olive Grove (Vic), Premium Fresh (Tas).
- Project Aim: Develop a new export processing industry based on phytonutrient compounds in carrots; Improving the agronomy, production reliability and harvest quality of black carrots for juicing in Australia.
- Broad methods to achieve key objectives: Identify key agronomic problems and production limitations associated with growing purple carrots; Provide recommendations for best practice to address these problems (growing); Identify particular areas for improving product quality off-farm (breeding characteristics, post-harvest handling, etc.).
- Significant events: No commercial contracts for black carrot production were negotiated over the course of the project (between growers and SDS); SDS Beverages went into receivership September 2009.
- Key Outcomes – Genetics: Identified key areas breeding needs to be focussed to improve current varieties – Greatly reduced sensitivity to vernalisation leading to “early” bolting; More inbred, uniform carrots with a higher average weight, less tapering, less sensitive to forking and fibrous root production; Anthocyanin production levels already high under typical AU conditions provided crop grown to sufficient maturity.
- Key Outcomes – Maximising yield and quality using current varieties: Identified the best window for planting black carrots in Southern AU. Basic (Beta-test) model based on cardinal temperatures for vernalisation to predict best times for planting to avoid bolting. These should be applicable elsewhere (e.g. Northern AU); Crop life required to achieve satisfactory Brix and anthocyanin development; Basic watering recommendations; Basic nutritional requirements (especially N).
- Key Outcomes – Maximising yield and quality using current varieties: Optimum planting densities determined; Disease and herbicide tolerance are not more problematic in purple than conventional carrots; Plant growth regulators can reduce canopy vigour but high rates were required and yields were not improved. Further work may be warranted but not a high priority.
- Further Work – Purple Carrots: Variety screening (as improved lines become available); Determining the abiotic causes of “pinched” collar damage in newly emerged seedlings (hot weather); Reducing forking (especially with summer planting); Fine tuning bolting model; Better research higher value product opportunities in the emerging nutraceutical industry (current project focussed on juice concentrate production).
- Further Work – All Carrots: Improving Plant Establishment – Heat and moisture availability is severely affecting crops seeded in hot, sandy soils in summer under centre-pivot irrigation. These plantings can suffer very severe losses and frequently require replanting. How to maintain shallow moisture during first 10 – 14 days. Heat

Unit Accumulation Model for maximising yield – How late can major varieties be grown in late summer-autumn and still attain high yields?

NSW beetroot and carrot projects

Presented by Andrew Watson, Industry & Investment NSW

- Beetroot stand management (VG06117): Project team of Donald Irving and Alan Boulton; VC project with SPC Ardmona; Aims were to determine planting densities at different planting dates on size of beetroots for the processing industry and to determine the productivity of new cultivars.
- Beetroot stand management outcomes: Range of planting distances that give a higher percentage of beets in the 75 mm category (soil type dependent); Productivity of most cultivars similar, but there are differences that relate to shape of root and size of the root-stem junctions that determine ability to be pulled from the ground but still retain a rounded shape; Irrigation method can have a large impact on seedling survival, some varieties appear to be able to tolerate temporary waterlogging better than others (evaluation of new seed dressing required?); There is some indication that beets may be sensitive to some herbicide residues.
- Beetroot stand management future issues to be addressed: Industry contracting (NSW); Rhizoctonia; Evaluate new seed dressings; Market beetroot as a red vegetable with other coloured vegetables such as carrot and sweetpotato.
- Management of carrot powdery mildew (VG08044): Project team of Andrew Watson, Hoong Pung, Barbara Hall, Domenic Cavallaro; ends November 2011.
- Carrot powdery mildew background: New disease to Australia; Found in NSW (Riverina in 2007 (March), SA and Tasmania 2008; Two permits in place in 2007 (Amistar and Folicur); Sulfur available.
- Project aims: Conditions favoured by the fungus; Disease monitoring; Control options; Yield loss?; Host range; Cultivar resistance.
- Control: Once established powdery mildew difficult to control; Best options Sulphur, Amistar and Folicur; Others found to be successful include Cabrio; Overhead irrigation/rainfall will reduce disease levels; Yield loss only demonstrated in greenhouse trials; No other Apiaceae found susceptible; Varieties show similar disease susceptibilities.
- Root disease management in beans – mainly Aphanomyces and Black root rot (VG08043).

Recent and current R&D root vegetable activities at TIAR

Presented by Dr Calum Wilson, TIAR

- Major areas of activity: Plant Pathology; Entomology; Precision Agriculture; Soil Science; Crop Physiology.
- Management of vegetable diseases with silicon (VG06009): Foliar applications of potassium silicate increased marketable carrots (net benefit \$132 - \$235/ha) through reduction in misshapen and cracked carrots.
- Integrated viral disease management in vegetable crops (VG07128): Surveys for virus diseases within processing vegetable crops (including carrots); Few or no potyviral pathogens uncovered affecting carrot; Luteoviruses (carrot motley dwarf disease, carrot red leaf disease); Parsnip yellow fleck?
- Nematodes in carrots: Improved control of nematodes in carrot production (VG99020); Workshop to develop research, development and extension priorities for nematode control in vegetable crops (2006); Managing the nematode threat (MT09067, 2009 – 2013)
- Develop a package of management options for control of nematodes in vegetables to minimise impact of reduction in availability of nematicides: Deliver information to growers – DNA based pre-plant test, National survey of vegetable and potato fields to identify root knot nematode and site-specific risk factors; Management options for

control of nematodes including break crops, chemicals and soft chemicals, farming systems suppressive to nematodes.

- Plant pathology future opportunities: Nematodes remain an issue with decreasing access to nematicides; Carrot foliar diseases (e.g. powdery mildew) that may inhibit top-pull harvesting can be problems and there are limited fungicides available; Crown rot diseases remain a problem (parsnip yellow fleck??).
- Improved management of white-fringed weevils in potatoes (ARPD#2): Pest of several root crops in Australia; Aim to identify novel attractants/deterrents for monitoring and controlling root-feeding weevil larvae
- Entomology future opportunities: Reduce pesticide usage through the development of improved monitoring and control methods based on the identification of novel insect attractants/deterrents.
- Design and demonstration precision agriculture irrigation applied to different vegetable crops (VG08029): Travelling gun irrigator (precision pressure control system) – fitted with microprocessor, pressure control system to work with a variable speed drive (VSD); Linear move irrigator (Variable Rate Irrigation, VRI) – Solenoids vary flow rates.
- Precision irrigation economic impact study (Precision irrigation versus conventional irrigation): Cost benefit analysis to assess potential economic benefits – Information on capital costs, operating and energy costs, associated labour costs, water usage, crop yield and disease severity; Information on benefits will include crop quality and environmental benefits (e.g. water and energy efficiency).
- Precision irrigation future opportunities: Integration of precision irrigation with other precision agriculture systems (fertiliser, pesticides, etc.).
- Soil science and nutrition prior studies included: Potassium nutrition (for carrot quality); Cd uptake by carrots (possible requirement for follow up surveys).
- Controlled traffic farming (CTF): Controlled traffic farming systems for the Tasmanian vegetable industry (VG07058, completed 2008); Grower tour to European CTF workshop and related farms (VG08124, completed 2009); Development and demonstration of CTF techniques for production of potatoes and other vegetables (MT09040, 2010 – 2014); Economic and carbon emissions model for CTF in vegetables (VG09019, 2009 – 2011); Incorporating controlled traffic and direct drilling into intensive cropping systems in northwest Tasmania (C18001, 2008 – 2011).
- Soil science future needs: Very significant benefits to be gained in most aspects of production through the adoption of CTF; The major limitations at this time are: Recognition (by industry, RD&E funders & providers) of the full benefits of CTF – this requires further research and demonstration; Access to commercially available “CTF ready equipment” for some crops; Robust economic analysis to highlight the costs and benefits of change.
- Soil science opportunities: Demonstration of the value of controlled traffic to both the mitigation and adaptation aspects of climate change; Integration of other precision agriculture technologies, using controlled traffic as a base.
- Commercial implementation of innovative carrot production technologies (VG01095); Improving reliability of flowering in bolting resistant carrot seed crops (VG06115); Factors affecting insect mediated pollination of carrot crops (2009); Yield improvement in hybrid carrot seed crops (VG05064); Evaluation of taste characteristics in carrots (2008 – 2009); Improving Australian carrot seed quality.
- Carrot tap growth and harvest splits: Known association with irrigation, cultivar and nitrogen; Monitored diurnal pressures in tap root; Developed integrated management system involving partial defoliation 1 – 2 days prior to harvest.
- Reliability of flowering in carrot seed crops: Discovered that application of the growth regulator (herbicide) 2,2-DPA promotes flowering in carrot by reducing chill duration requirement for flower initiation; Extends the range of cultivars that flower adequately in warmer environments; Extends the sowing date cut off for bolting resistant cultivars in cool environments; Has little impact on synchrony of flowering of hybrid seed parent lines.

- Improving carrot seed quality: Two issues identified – embryo damage by Rutherglen bug feeding and immature embryos (poor germination).
- Immature embryos: Found link to time of cutting; Developed simple seed maturity test using chlorophyll content; Colour seed sorter can be used to remove immature seed.
- Other opportunities: Value Chain Analyses (expertise in VC system analysis, full or partial VC); Organic production (interest in support for large scale organic vegetable production, prior demonstration trial at Field Fresh Pty Ltd); Food safety (microbial safety of fresh and processed products); Novel breeding approaches – trait selection (Somaclonal cell selection techniques to efficiently select traits without loss of cultivar characteristics).

Snapshot of carrot research in WA 1990 – 2010

Presented by John Shannon, vegetablesWA (for Allan McKay, Department of Agriculture and Food, WA)

- Main carrot growing areas in WA are East Lancelin, West Gingin and Myalup.
- WA carrot industry: Year-round production on coastal sands using groundwater; Infertile sands of low water holding capacity; 95,000 tonnes total in 2008/09 (DAFWA estimate); Note: ABS production statistics are very unreliable, export statistics are reliable; Export focussed, 60,000 tonnes (\$41.3 million fob) exported 2008/09 (=90% of Australian carrot exports); Also supply WA market plus sales to Eastern states; Yield 60 to 80 tonnes/ha, high quality; Nantes or Nantes cross varieties, e.g. Stefano, Mojo.
- From 1990 to 2010 the major foci of research and extension in WA for carrots have been: Integrated disease management, mainly *Pythium* disease (e.g. cavity spot) and carrot virus Y; Improving crop productivity and quality including varietal evaluation, nitrogen and phosphorus management; Improved nematode control; Soil amendments, e.g. red mud, compost and clay; Improving water and nutrient use efficiencies.
- Cavity spot summary: Cavity spot, caused mainly by *Pythium sulcatum*, found in most carrot growing areas (all states); There are some areas in Victoria and SA along the Murray River with *Pythium violae*.
- Control of cavity spot: Crop rotation is important, hosts of *Pythium sulcatum* are carrots and other carrot family (Apiaceae) species; Tolerant varieties (e.g. Stefano) key to management; Liming gives useful suppression of disease, but also encourages enhanced biodegradation (breakdown) of soil applied chemicals, e.g. metham sodium (Mattiessen and Warton, CSIRO); Chemical control is not a long-term option because of enhanced biodegradation which was also identified for metalaxyl (Ridomil).
- Status of cavity spot: Cavity spot is still commonly observed however losses are far less severe than in the past.
- Carrot virus Y summary: Appeared in 2000, found in all Australian carrot growing areas in 2001-02 survey; Caused some serious crop losses; Not known to occur anywhere else in the world; All varieties susceptible; Spread by aphids.
- Control of carrot virus Y: Destroy volunteer crops; Avoid overlapping side-by-side plantings; Sow non-host barrier crop; Introduce 'carrot free' breaks with non-host crops or fallow.
- Status of carrot virus Y: Symptoms now rarely seen.
- Nematodes (one WA aspect of the national carrot nematode project, 2000 – 2003 with Frank Hay of TIAR as project leader): Chemical control – Nematicur and Metham ineffective on many farms in WA, Telone (1,3 dichloropropene) nematicide, Telone 35 (Telone + chloropicrin mix) general fumigant, Telone and Telone 35 registered in late 2001.
- Nematodes summary: Low level of root knot nematode damage carrots; Very low levels affect root quality; Telone and Telone 35 effective nematicides; Chemical control a short-term solution; Further work needed for long-term nematode management; New HAL national project on nematodes in carrots and potatoes led by Frank Hay (UTas/TIAR) commencing in 2010.

- Compost and carrots (Bob Paulin and Peter O'Malley): Generally compost gave higher or equivalent yields with up to 200 kg less fertiliser (\$700).
- Irrigation and nutrient management (Rohan Prince, Allan McKay, Peter O'Malley, Tim Calder and Rob Deyl – collaborative work with vegetablesWA): Aim has been to improve productivity and environmental outcomes by working on farm to deliver research-based irrigation training, advice and tools.
- Irrigation and nutrient management research foci: Development of crop factors for sandy soils (crop factors = evaporation replacement rates); Working individually with growers to improve irrigation systems and scheduling; Recommendations incorporated into 'Best Practice Guide' and irrigation website; Group extension activities included training, e.g. WaterWise on the Farm, Medina Research Station annual carrot field days and Carrot Conference Australia 2000 (Best practice demo sites funded by Caring for Our Country); Development of tools such as mobile phone SMS service delivers evaporation figures from online weather stations and the Vegetable Irrigation Scheduling System (VISS).
- Project pending on IPM for black root rot disease of carrots: Widespread postharvest problem for some years in WA, SA and Tasmania; Problem for the consumer; National priority listed in 2008; National project proposal developed and submitted in 2009; Proposal supported by HAL but not the Vegetable IAC; Resubmitted 2010.
- Future needs and opportunities: Whole farming system optimisation; Improved production efficiency; Improved water and nutrient use efficiencies; Improved field and postharvest disease management; Expanded market access for export root vegetables; Value chain analysis and competitor benchmarking; Further development of food safety systems and chemical use; Product differentiation in export and domestic markets, e.g. via QA, food safety, phytochemicals, flavour, health benefits and environmental assurance; Environmental assurance; Over-arching challenge to apply R&D findings to vegetable farming.

IPM Disease Program – Subprogram 2: Soilborne diseases

Presented by Dr Oscar Villalta, Department of Primary Industries Victoria

- Aim: To develop new IPM strategies (tools and systems) for the management of soil-borne diseases in vegetable production.
- Two projects: VG07126 Sclerotinia species (beans, lettuce and other susceptible crops) (Project Leader Oscar Villalta, includes DPI Vic, TIAR/UTAS, DEEDI Qld, Peracto Tasmania); VG07125 Other root rot pathogens (Pythium, Fusarium, Rhizoctonia, etc.) (Project Leader Caroline Donald, includes DPI Vic, La Trobe University, NT DPIFM, I&I NSW, DEEDI Qld).
- VG07126 includes: Novel treatments to reduce inoculums carry over; Alternatives to fungicides (nutrients, biocontrols, etc.); Disease forecasting tools; System management approach (crop rotation, beneficial practices, soil health, economics); Alternatives to Filan (fungicides for Sclerotinia control on lettuce, beans, cabbage).
- VG07125 includes: Hypovirulence; Sclerote deficient mutants; Melanin inhibitors; Fungal volatiles (endophytes); Surfactants; Systemic Acquired Resistance; Plant volatiles; System management approach (crop rotation, beneficial practices, soil health, economics); Chemical strategies; Grafting.
- In the long run, which management system minimises disease outbreaks, and is practical and cost-effective for on-farm use? Excel-based model for economic analysis (over 6 years) developed.

Identification of IPM strategies for Pythium induced root rot complex in Apiaceae vegetable crops

Presented by Dr Liz Minchinton, Department of Primary Industries Victoria

- VG08026 Aim: Use parsnip, parsley and coriander as the model hosts to identify strategies; Suspect Pythium spp may be pre-disposing parsnips to canker.

- *Pythium* spp.: 'Common cold'; Damping off, root rot, cavity spot; Favoured by low temperatures and high fluctuating moisture (winter); Complex of pathogen isolated (*Pythium* and *Fusarium*); Issues in parsley, coriander, Dutch carrots, carrots and celery; WA carrot research identified broccoli as a rotation crop.
- Project team includes DPI Vic and I&I NSW.
- Brief overview of 3 year project: Review (literature); Field trials (biological, chemicals, cultural controls, monitor field succession, interstate trials of parsnip in WA and Tas, carrots in WA and parsley in Qld); Laboratory (growth chamber studies of parsley); Hydroponics (biological controls looking at temperature and pH); Extension (communication activities).
- Soil analysis of parsnip and parsley sites: Sandy and medium clay soils; pH ranged from 6.4 to 8.3; Low to moderately saline (plant moderately tolerant crops); Low iron and potassium levels in sandy soils – No major deficiencies but lime with caution.
- Incidence of root rot on parsnips (May to October): Root rots developed faster on clay compared with sandy site; Same level of disease at end of season; Sandy site – harvest early to avoid disease.
- Succession of pathogens in parsnip crops (May to October): Only *Pythia* were isolated from both sites, early in the coolest period; Other pathogenic fungi entered crops after the cool period.
- Soil moisture and temperature: High soil moisture on clay site; Drop in temperature a fortnight before rot appeared on parsnips.
- Parsnip field trials: 30% reduction in rots (1 to 4 metalaxyl applications) = *Pythium* spp. a constant problem.
- Biological control of *Pythia* in hydroponics (biological control agents – root rot of coriander): Hydroponics system – controlled environment, Coriander – 11 species *Pythium* (*Pythium sulcatum*); SAR (Systemic Acquired Resistance) – no effect, phytotoxic; *Bacillus subtilis* (Fulzyme Plus™) – 3 week protection; *Pythium oligandrum* (mycoparasite) – no effect (home grown preparation).
- Previous projects: VG04025 Scoping study to investigate management of root rot diseases in parsley; VG06046 Identification and management of parsley root rot; VG05045 The extent and cause of parsnip canker.
- Project publications: 'Guide to Common Diseases and Disorders of Parsley' booklet and 'Major Diseases of Parsley' poster.
- Require: Alternative to metalaxyl; Good *Fusarium* fungicide or biocontrol; Parsnip agronomy and value adding; Hydroponic good scope for IPM; Mechanical harvester.
- Future project developments: SCM – include trials for parsley (our biological); Parsnips trials (control, *Bacillus subtilis*, Hilling, Follicur, 2 compost "blanket"); identify *Pythium* spp. *Phoma*; Growth chamber studies parsley; Combined inoculations on parsnip.

Root vegetable research in SA

Presented by Dr Trevor Wicks, SARDI

- Previous root vegetable research in SA – Carrot seedling establishment: VG98100 with SARDI; Identified *Alternaria radicina* as the major seed borne disease causing seedling losses; *Alternaria douci*, *Alternaria triticina*, *Sclerotium rolfsii*, *Cercospora carotae*, *Pythium violae*, *Pythium sulcatum*, *Pythium* sp., *Rhizoctonia solani*, *Fusarium flocciferum*, *Fusarium equiseti*, *Fusarium* spp., *Meloidogyne* sp., *Erysiphe* sp. also detected; *Alternaria radicina* attacked all stages of carrots from seedling to past harvest; Disease associated with high soil moisture; Higher levels of disease were associated with high soil and water salt levels.
- Previous root vegetable research in SA – Managing *Alternaria* blight in carrots: VG00014 with SARDI; Fungicide drenches of Rovral and Amistar on 6 – 8 week old seedlings reduced disease caused by *Alternaria radicina*; Effective seed treatments included steam, hot water, potassium permanganate and hydrogen peroxide; Fungal antagonist *Gliocladium* also effective; Some varietal resistance in smaller specialty

varieties (e.g. Amsterdam, Golfball, Imperator, All seasons); Imported seed often infected, some with Rovral resistant *Alternaria*.

- Previous root vegetable research in SA – Managing Carrot Virus Y (SA component of WA project): VG01016 with SARDI; CarVY detected after peak aphid flights; CarVY symptoms reduced with use of Imidacloprid seed treatment (37% to 13% infection), Feral carrots most likely reservoir; Tree barrier zones < 50 m not sufficient to prevent aphid spread.
- Previous root vegetable research in SA – Improving soil health for carrot quality: VG02119 with Domenic Cavallaro, PIRSA and SARDI; Cover crops (e.g. cereal rye corn, millet) were cost effective treatments to increase soil organic matter; Organic carbon alone did not influence levels of disease in the soil; Cavity spot reduction was achieved by a combination of maintaining organic carbon and CEC (K/Ca + Mg) in the correct range and then introducing microbes specific to the disease; This process takes between 3 to 5 years.
- Current root vegetable research in SA – Investigations and developing management systems for carrot powdery mildew, Monitoring mildew development in SA (SA component of NSW project): VG08044; Powdery mildew common in Northern Adelaide Plains; Only low levels observed in spring 2009 crops due to dry season; Not detected in South East or Mallee areas; NAP grows continuously, whereas Mallee and SE have long breaks between crops.
- Proposed root vegetable research in SA: IPM of black root rot in carrots (*Thielaviopsis basicola*) – Joint WA, Tasmania and SA project, submitted in 2009, resubmitted 2010, SA component to investigate infection in washing plants and develop management strategies.
- New root vegetable research in SA: Carrot – Integrated fungicide programs for powdery mildew and *Alternaria* blight; Root knot nematodes; Extension of carrot virus Y project; Parsnip – Epidemiology and management of cankers; Radish/turnip – *Albugo*, *Streptomyces*.

The National Vegetable R&D Program

Presented by Will Gordon, HAL

- Advisory Structures and Investment Process; Vegvision 2010; Annual Investment Plan.
- Advisory Structures and Investment Process: Industry Advisory Committee (IAC); Advisory Groups which reflect the core elements of the strategic plan, Vegvision 2020 (Consumers and Marketing, Production, Dissemination and Information Technology, People Development and Leadership); Working Group (IPM, Chemicals, Protected Cropping, Environment, Biosecurity, Other); Focus Groups (Export, Mechanisation, Leaf, Root and Brassica, etc.); Peak Industry Body (AUSVEG).
- IAC – 3 Key Responsibilities: Prepare a Strategic Investment Plan (3 – 5 years) for submission to HAL (This establishes the strategic direction for HAL's investment of R&D and marketing funds for the industry including communications plan to levy payers – Vegvision 2020); Prepare an Annual Investment Plan (1 year) for submission to HAL (This plan determines the annual expenditure required to achieve the outcomes detailed in the Strategic Investment Plan); Ensure an Annual Report is produced for submission to industry and HAL that details the outcomes achieved from the expenditure outlined in the Annual Investment Plan.
- Other Advisory Groups provide input into IAC deliberations.
- HAL Program Planning Calendar: Continuous cycle including Review Strategic Plan and set priorities by September → Industry Call Submission period October – November → IAC Annual planning meetings December – March → General Call Submission period January – March → Submit Annual Investment Plan to HAL mid March → Industry Call Results April → General Call Results June.
- Vegvision 2020 Investment Priorities: Delivering to changing consumer preferences and increasing demand; Market recognition for Australian quality, safety, reliable supply and innovation in products and services; Internationally competitive Australian

vegetable supply chains; Advanced industry data and information systems to meet future needs; Visionary leadership and change management.

- Industry Annual Investment Plan – Key Investment Areas: Communications; Industry Development Plan; Domestic Market Development Strategy; Production related issue (IPM, soil and nutrient management, environmental, etc.); Biosecurity, market access and chemical.

AUSVEG communication activities

Presented by Andrew White, AUSVEG

- AUSVEG is the national peak industry body representing the interests of 9,000 Australian vegetable and potato growers.
- AUSVEG assists growers by working to ensure the National Vegetable Levy and Potato Levy are invested in research and development that best meets the needs of the industry.
- AUSVEG delivers national projects in the areas of communication and environment on behalf of the industry.
- The National Vegetable and Potato Levies are collected by the Levies Revenue Service (LRS), an agency within DAFF and are matched dollar-for-dollar by the Australian Government.
- Communications: Marked increase in the flow of information to members and growers in the past 12 months; Potatoes Australia and Vegetables Australia magazines with large national distribution; Regional seminars and workshops; Regular and open communications with industry and Government; Enhancement of print and electronic communications, including a website upgrade which is currently underway as part of the Vegetable Industry Development Program.
- Media Profile: Dramatic escalation in media coverage.
- Communications Initiatives and Events: The AUSVEG Weekly Update – offers frequent reporting by AUSVEG on a range of issues; Industry Events – Zebra Chip Mini-Summit, EnviroVeg Climate Change workshops, Soil health workshops and regional seminars; Substantial increase in media and communications activities.
- Vegetable Industry Development Program: AUSVEG involved in providing communications support to the Knowledge Management programme – an electronic system for rapidly and effectively delivering R&D outcomes and insights to industry and involves creating new AUSVEG website which is more user friendly; Veginsights – weekly newsletter including content on consumer insight and market behaviours; Veginsights, The Market Q4 2009 – indepth quarterly report due to be released shortly, profiles vegetable industry for the last quarter of 2009.
- AUSVEG National Convention: 27 – 30 May, 2010.
- Advocacy: Food labelling; Imports/Prices.

National Vegetable Industry Development Program (VIDP)

Presented by David Heinjus, Rural Solutions (National Coordination of VIDP)

- The 2008 Strategic Review of Industry Development in Horticulture identified a critical need for investment in: Understanding consumers and competitors in target markets; Global cost competitiveness, innovation and continuous improvement; Developing a culture of collaboration on issues and opportunities.
- Research: Investigating an issue of importance for the industry; Providing evidence and data to explain what has been observed.
- Development: Taking the research findings and making them commercially useful to “industry” at the regional scale; Products/information packages that establish technical and commercial feasibility and are easily adopted.
- Extension: Promoting the R&D products to encourage adoption.
- Examples of development may include: Proof on concept trials; Business case demonstrations; Case studies; Benchmarking; Critical analysis of the value chain;

- Evidence of market need, want and capacity to pay; Capacity building requirements to increase the probability of technical and commercial success in implementation.
- VIDP objectives: Industry is more informed and therefore better able to communicate the benefits and qualities of Australian vegetable products to consumers; Market driven decision making; Growers actively seeking to evolve their business models to meet new challenges and opportunities posed by the market; Increased application of market and technical R&D; Industry using research to formulate policy and promote industry; Create a new generation of leaders to lead and capture gains across the industry; Levy payers are better able to provide feedback into the National R&D system.
 - VIDP structure: National Co-ordination (VG09144) – Rural Directions; Sub-programs – Knowledge Management, VG09147 (Freshlogic), Consumers and Markets, VG09146 (Freshlogic), People Development, VG09145 (Dianne Fullelove & Associates), Economics, VG08040 (Industry Data Economic Analysis), InnoVeg, VG09149 (RMCG), IPM (Scholefield Robinson Horticultural Services).
 - How will industry development help vegetable growers: Practical technical and commercial screening and development of research that translates into better business decisions (Knowledge Management System); A practical understanding of consumers and competitors in existing and new markets and how to respond in a cost effective way; Develop industry capacity through training opportunities in leadership, business, innovation and entrepreneurship; Increased global cost competitiveness due to awareness of successful business models; Insights into how innovation and continuous improvement can be applied in a practical and cost effective way; A culture of collaboration on industry issues and opportunities.

People Development in the Vegetable Industry

Presented by Dianne Fullelove, Dianne Fullelove & Associates Pty Ltd (People Development Sub-program of VIDP)

- VG09145, “Vegetable Industry Development People Development Sub Program”.
- The major components are: Leadership programs to build leaders and mentors; Growing Business program to increase skills in finance and staff management; Business Clubs for vegetable growers to improve linkages and networks scaffolded by opportunities for business improvement; An on-line knowledge and information source of case studies, programs, courses and training accessed via the AUSVEG website.
- Leadership: Growing Leaders – National Vegetable Industry Leadership Program (In 2010, Growing Leaders will be held in Brisbane 2 – 4 March, Melbourne 8 – 10 June, Canberra 31 Aug – 2 Sept); Nuffield Farming Scholarship (farmers who are 28 – 40 years old, 2 candidates in 2010 and applications taken in June 2010); Australian Rural Leadership Program (58 days commitment, 1 participant per year, applications taken in June 2010).
- Mentoring future leaders: Program of experienced industry members who are able to guide new leaders; Mentors are lead through the role and acquire a broader understanding of the industry; Mentorees gain an insight into the vegetable industry through the eyes of experienced people.
- Business Clubs: Groups of vegetable growers who discuss industry issues and achieve better results in their businesses; Improved linkages and networks within the vegetable industry; Opportunities for business improvement; Group leaders to facilitate the Business Club; Meet regularly – with guest speaker and discussion session; Teleconferences – to further discuss industry or business issues; Skill development – leadership, business management and innovation.
- Growing Business: Business skills program designed specifically to ensure learning is practical with industry case studies to develop real life scenarios; There are 2 X 2 day workshops (business and finance and managing staff); Available in all regional areas; Cost is reimbursed to primary producers through the FarmReady grant; For all other supply chain participants the cost is \$792.

- Learning resources: Skill Audit – analysis checklist to determine learning needs in people and business skills; Skills report on individual learning needs; Searchable database for learning resources – workshops, courses, workbooks, online programs.

Thinking outside the box

Presented by Ian James, Vegetable Industry Economist (Economics Sub-program of VIDP)

- VG08040, “Economic Research Services for the Vegetable Industry”.
- Snapshot of the Australian Vegetable Industry: The vegetable industry is Australia’s fourth largest agriculture industry with production valued at \$3.36 billion in 2007/08; The industry is 45% bigger than the wool and lamb industries, more than double the size of the wine and poultry industries, and almost triple the size of the sugar and cotton industries; Compared to other cropping industries vegetable production is domestically focussed; Vegetables with value of production in excess of \$100m are potatoes, tomatoes, mushrooms, onions, carrots, lettuce, capsicums and Asian vegetables; Official statistics show 6,360 growers with 70% deriving the majority of their income from vegetables and 20% producing undercover; Qld is the largest vegetable producing state with 30% of the national figure by value.
- The vegetable export market is dominated by root vegetables.
- Reflecting cost competitiveness (Cash cost per tonne including imputed labour costs 2007/08): Carrots (213), Potatoes (240), Cabbage (242), Onions (361), Beans (549), Lettuce (629), Pumpkins (661), Cauliflowers (727), Tomatoes (764), Broccoli (1113).
- Data for 2008 (Production in tonnes, Planted in hectares, Value in \$AUS): Carrots (272601, 4934, 188); Beetroot (43331, 1577, 13); Parsnips (11568, 500, 16); Swedes and Turnips (6016, 301, 9); Radish (2588, 231, 11).
- Cash receipts in 2005/06 were \$431,133 (86% from vegetables), 2006/07 \$569,549 (88%) and 2007/08 \$570,089 (83%).
- Cash costs/Farm cash income/Farm business profit in 2005/06 - \$303,084/\$128,049/\$46,043; 2006/07 - \$397,555/\$171,994/\$82,292; 2007/08 - \$403,992/\$166,097/\$74,889.
- Farms with negative cash income/Farms with negative business profit in 2005/06 – 18%/54%; 2006/07 – 17%/59%; 2007/08 – 13%/56%.
- Rate of return ex capital gain/Rate of return inc capital gain in 2005/06 – 2.5%/9.8%; 2006/07 – 4.2%/7.7%; 2007/08 – 4.0%/4.1%.
- Threats to profitability include imports and pricing.
- Imports: Imports of fresh vegetables remain low and generally of a counter seasonal nature (except garlic); Fresh root vegetable imports are small and almost entirely from NZ; But growers producing for the processing sector particularly potato and tomato growers have been under pressure from a strong surge in imports; Other canned processed vegetables have also been rising up from \$27.6 million in 2007/08 to \$31.6 million in 2008/09; Global sourcing of vegetables is here and likely to accelerate.
- Pricing: Vegetables are dirt cheap and long term retail prices have not kept pace with other food and goods in the economy; Vegetable growers can provide endless supplies of vegetables at cheap prices; Vegetable growers operate in a classical economics free market where the market determines price; If anything vegetable growers are squeezed between a concentrated retail sector and near monopoly control over inputs; So vegetable growers need to look closely at markets in order to get better rates of return.
- Policy issues for the industry include: Key input issues; Climate change and the carbon issue; Market access; Consumers right to know.
- Biosecurity and market access: Increasing globalisation increases the threat of the incursion of an exotic pest or disease; All countries reviewing biosecurity arrangements so industry needs data to be prepared (carrot export market to Taiwan); While there is open access to vegetable imports tariff barriers apply to our exports; Bi-lateral Free Trade Agreements are often not ‘free’ with the removal of tariffs on Australian vegetable exports phased out over a long period of time.

- Key input (water and labour): The vegetable industry has some economic clout on the water issues as rates of return per megalitre of water is high for vegetables; It has less clout on the labour issue but maintaining flexibility in labour arrangements is critical for business viability; In the longer term there has to be a concentration on driving down labour costs through judicious use of mechanisation and technology.
- Climate change and the carbon issue: Forget the politics and own views on climate change (from a business perspective this is a risk management issue); Vegetable production has low carbon emissions mainly through the use of nitrogen fertiliser; But growers will be impacted by increased input costs if a price is put on carbon emissions with economic modelling suggesting increases in costs of production between 2% and 4%; Costs will vary depending on the nature of operations – field, greenhouse, packing houses, processing; Vegetable growers will benefit by recognition for storing of carbon in the soil and in the future there may be big money to be made from carbon reducing activities; Carbon footprinting is likely to be an increasing requirement by retailers and consumers.
- Consumers right to know: The fundamental economic underpinning of an efficient market is the assumption of informed consumers; To this end the vegetable industry has fought long and hard to have country of origin labelling on vegetable products so that consumers know the source of the vegetable they are buying; This now applies to 'whole loosely displayed products' (but did you know that a processed vegetable can be labelled "made in Australia" even if the vegetable is imported from overseas?); Non inclusion of country of origin labelling is unacceptable as is the "and/or" clause regarding Australian and imported product on packaged vegetables; We have no issue in consumers choosing product from overseas in preference to Australian product but we strongly believe that the consumer needs to make an informed decision.
- Industry challenges and opportunities – Marketing: There is a mismatch between supply and demand in the vegetable markets; Greater understanding of markets is required if growers are to receive better rates of return; Vegetable growers will gain most by a whole of supply chain approach that promotes the vegetable industry; At present only 10% of the population intake the recommended 5 vegetables per day, with the national average closer to 2 vegetables per day; Growing obesity and declining health provide a great market opportunity for the promotion of fresh vegetables; Vegetables are not sexy and the industry needs to promote cultural change and to consider how to do this in conjunction with health authorities which have a vested interest in promoting vegetables; Understanding the consumer and targeting markets will assist returns – demographics, organic, local.

Table 1. Identified research and development gaps and opportunities from current and recently completed HAL root vegetable projects.

Research Area	Knowledge Gap/Opportunity
Diseases	<ul style="list-style-type: none"> • Integrated pest management of black root rot in carrots (was identified as a national priority in 2008 but a project to address the problem has not been funded yet) • Limited fungicides available for carrot foliar diseases (e.g. powdery mildew) that may inhibit top-pull harvesting • Crown rot diseases remain a problem (parsnip yellow fleck??) • Improved field and postharvest disease management • Need alternatives to metalaxyl for control of root rot (<i>Pythium</i>) • Require good <i>Fusarium</i> fungicide or biocontrol
“Canker” in processing beetroot	<ul style="list-style-type: none"> • Further investigation is required to confirm pathogenicity in relation to the “canker” symptom (<i>Geotrichum candidum?</i>), but more importantly at what stage of harvesting to processing the infection is occurring needs to be identified
Purple Carrots	<ul style="list-style-type: none"> • Variety screening as improved lines become available • Determining the abiotic causes of “pinched” collar damage in newly emerged seedlings (hot weather) • Reducing forking (especially with summer planting) • Fine tuning bolting model • Higher value product opportunities in the emerging nutraceutical industry
Beetroot	<ul style="list-style-type: none"> • Evaluation of new seed dressings • Consider marketing beetroot as a red vegetable with other coloured vegetables such as carrot and sweetpotato
Carrot establishment and development	<ul style="list-style-type: none"> • Improving plant establishment – heat and moisture availability severely affects crops seeded in hot, sandy soils in summer under centre-pivot irrigation (plantings can suffer very severe losses and frequently require replanting, how to maintain shallow moisture during first 10 – 14 days) • Heat Unit Accumulation Model for maximising yield – how late can major varieties be grown in late summer-autumn and still attain high yields?
Parsnips	<ul style="list-style-type: none"> • Value adding
Farming systems	<ul style="list-style-type: none"> • Whole farming system optimisation • Improved production efficiency • Parsnip agronomy
Nematodes	<ul style="list-style-type: none"> • Nematodes are a continuing issue and there is decreasing access to nematicides
Insect management	<ul style="list-style-type: none"> • Investigate possible reductions in pesticide usage through the development of improved monitoring and control methods based on the identification of novel insect attractants/deterrents
Value chain analyses	<ul style="list-style-type: none"> • Develop expertise in value chain system analysis (full or partial value chain) • Undertake value chain analysis • Competitor benchmarking
Food safety, quality assurance and environmental assurance	<ul style="list-style-type: none"> • Microbiological safety of fresh and processed products • Environmental assurance • Further development of food safety systems and chemical uses
Novel breeding approaches (trait selection)	<ul style="list-style-type: none"> • Somaclonal cell selection techniques to efficiently select traits without loss of cultivar characteristics
Organic production	<ul style="list-style-type: none"> • Large scale organic vegetable production • Demonstrations
Export	<ul style="list-style-type: none"> • Expanded market access

Research Area	Knowledge Gap/Opportunity
Product differentiation in export and domestic markets	<ul style="list-style-type: none"> • Differentiate products via quality assurance, food safety, phytochemicals, flavour, health benefits and environmental assurance
Controlled traffic farming	<ul style="list-style-type: none"> • Recognition (by whole of industry including funders and research providers) of the full benefits of CTF requires further research and demonstration • Access to commercially available “CTF ready equipment” for some crops • Robust economic analysis to highlight the costs and benefits of change • Demonstration of value of CTF to both the mitigation and adaptation aspects of climate change • Integration of other precision agriculture technologies, using controlled traffic as a base
Irrigation and fertiliser	<ul style="list-style-type: none"> • Integration of precision irrigation with precision fertiliser, pesticide, etc. application • Improved water and nutrient use efficiencies
Extension	<ul style="list-style-type: none"> • Over-arching challenge to apply R&D findings to vegetable farming

IDENTIFIED ISSUES FOR THE ROOT VEGETABLES INDUSTRY

Issues identified by delegates at the beginning of the Think Tank (before any presentations or group discussions) are given in Table 2. Ideas from individuals give a good range of issues that are important at the farm or regional level as well as for the whole industry. The individual issues were collated and provided to each of the four groups for their discussions.

Table 2. Issues identified by individuals at the beginning of the Think Tank.

Information technology transfer; research to paddock	Controlling size and maintaining yield in carrots
Better information and processes to get information to those who are involved in extension and industry development about R&D	Precision agriculture and controlled traffic farming
Improved plant establishment in carrots	Biosecurity
Business development skills (2 replies)	Organic production
Downy mildew in radish	Seed quality
Better defined research priorities	Need to get all R&D data out to growers
Crown rot in carrots	Improving germination in the hot weather and wind in summer
Carrot postharvest diseases – black root rot	Seed problems (supply) with carrots
Crop production management systems	Herbicides for parsnips
Control of powdery mildew in carrots	Reclaimed water quality
Herbicides for use in carrots to control potatoes – withholding periods	Root rot diseases in intensive vegetable production
Water availability and quality (2 replies)	Consistency of supply to processor
Access to new chemicals	Chemical withholding periods
Improved chemical access in beetroot	Availability of good size and quality seed
Lack of profitability and how to sustain business in the future	Overseas competition – chemical residues in overseas products?
Soil-borne diseases of beetroot – Rhizoctonia; seed dressings and possible new ones available	Integration of industry development with existing programs and how VIDP can add value to growers
Weed control in beetroot	Funding availability for research issues
Staffing for research projects	

Issues as identified by each group and by individuals prior to the Think Tank are given in Table 3. There were some issues identified by more than one group and they have been listed together in Table 3. The group/s which identified each issue have been indicated in Table 3. The issues have been prioritised based on the votes given to each issue. Total votes given to each issue are shown as well as how many votes were given by “growers” (including packers, processing company representatives and consultants involved in on-farm agronomy and management decisions) and by “other” workshop delegates (research providers, other).

The 3 issues that were of the highest priority by all delegates are:

1. An integrated national program approach to carrot R&D
2. Seed quality
3. Postharvest root rots in carrots

The issues that were of the highest priority to growers, packers, processors and on-farm consultants who have carrots as their main root vegetable crop are:

1. An integrated national program approach to carrot R&D
2. Seed quality
3. Postharvest root rots in carrots (Equal 3rd)
4. Linuron withholding period in carrots (Equal 3rd)

The issues that were of the highest priority to growers and processors who have beetroot, parsnip or radish as their main root vegetable crop are:

1. Alternative weed control methods for beetroot
2. Seed dressings for beetroot and radish (Equal 2nd)
3. Seed quality (Equal 2nd)
4. Soil health (Equal 2nd)
5. Alternative weed control methods (Equal 2nd)

The issues that were of the highest priority to research providers, industry association representatives and others are:

1. An integrated national program approach to carrot R&D
2. Seed quality
3. Postharvest root rots in carrots

The research and information needs of the root vegetables industry are spread over a range of issues that if addressed will help improve competitiveness.

It is important to consider priorities of both growers and other industry stakeholders. Varying skills and day-to-day activities allow different groups to be able to identify a range of requirements for future R&D by the root vegetables industry, all equally valid.

All participants were given five votes each, and there was no restriction on how votes were distributed, allowing more than one vote per person per issue.

Table 3. Identified issues and their rankings.

¹ Grower/packers and processors with carrots as their main root vegetable crop

² Grower/packers and processors with beetroot, parsnip or radish as their main root vegetable crop

Note: Numbers in brackets indicate which group identified the issue (Ind = issue identified by an individual prior to the think tank; All = additional points/issues were added by delegates when the groups reported back on the issues they identified)

Issue	Grower votes ¹	Grower votes ²	Other votes	Total votes
<p>An integrated national program approach to carrot R&D (2):</p> <ul style="list-style-type: none"> • An integrated program such as has been done for pathology and soil health and in the potato industry • National plan for carrot R&D • Knowledge management • Involvement of large growers • Key levy payers brought together to develop program • Lack of funding • Get other industries involved in program development that have done such a program, e.g. potatoes • Investment dollars available to be based on carrot GVP • Facilitator to carry forward the idea (involved in industry, analytical, unbiased, e.g. John Gallagher – past Processing Potato R&D) • 5 year R&D program • Leverage opportunities 	23	0	20	43

Issue	Grower votes ¹	Grower votes ²	Other votes	Total votes
<p>Seed quality (2, 4 & All):</p> <ul style="list-style-type: none"> • Identify germination, pathogens and production issues • Carrot and parsnip lack of seed varieties, plant establishment issues (not necessarily seed related), embryo size (seed size and seed viability), need to import and evaluate new seed lines from overseas • For parsnips white flesh parsnips sell better than cream flesh ones but they are more susceptible to canker, need project to help farmers to improve on-farm varietal selection of seeds • A lot of seed is imported but need to know where it is coming from (right to know), label may say it is from Holland but it is not necessarily from there (truth in labelling) • No disease testing on local seed so cannot impose it on imported seed (it could have Alternaria for example) 	14	3	17	34
<p>Postharvest root rots in carrots (3):</p> <ul style="list-style-type: none"> • Soft rots/blemishes • Black root rot • Collate existing knowledge • Identify cause, source, predisposing factors • Management strategies (regional variations, different diseases) • Appropriate extension 	5	0	7	12
<p>Crown rot in carrots (3):</p> <ul style="list-style-type: none"> • Identify causative factors, predisposing factors, pathogen involved and existing knowledge • Develop management strategies (regional variation and different pathogens) • Appropriate extension required 	4	0	3	7
<p>Alternative weed control methods for beetroot (1):</p> <ul style="list-style-type: none"> • Need minor use permits • Need more alternatives • Work with Peter Dal Santo 	1	6	0	7

Issue	Grower votes¹	Grower votes²	Other votes	Total votes
Linuron withholding period (WHP) (3): <ul style="list-style-type: none"> • Minor use issue • Fund dataset generation to justify a shorter WHP • Peracto has just conducted some trial for data generation in WA (need to follow this up with Peter Dal Santo) 	5	0	1	6
Seed dressings for beetroot and radish (1): <ul style="list-style-type: none"> • Needed for Pythium, Rhizoctonia and Fusarium • Update of past research required • This could include other crops • Needs to be done in Australia-wide trials • Ask Peter Dal Santo for input 	0	3	3	6
Soil health (1): <ul style="list-style-type: none"> • Soil health and management training for growers (and the impact of soil health on the prevention of disease) • Controlled traffic farming • Improvement of soil structure to prevent clodding in processed beetroot soils • Extension required from project being undertaken by Tony Pattison (VG06100) • Future work should link with VG06100 • Note: soil management resources (soil ute guide booklet and DVD and associated training course) have been developed – booklet was mailed to all levy payers in 2007 but course could be delivered more widely 	0	3	2	5
Value chain analysis (3): <ul style="list-style-type: none"> • Identify different systems • Identify opportunities for improvement • Cost benefit analysis 	1	0	4	5
People development in the use of computers (4): <ul style="list-style-type: none"> • Many growers are not familiar and able to use the internet to access R&D information • Course needed to train growers in the use of the internet to source R&D information 	0	0	5	5

Issue	Grower votes¹	Grower votes²	Other votes	Total votes
Control of white blister in radish (1): <ul style="list-style-type: none"> • Range of methods required (chemical, environmental and cultural) • Race differentiation of white blister on radish (has this been done?) 	0	2	2	4
Need regional flexibility in R&D funding (3)	1	0	3	4
Alternative weed control methods (1): <ul style="list-style-type: none"> • Need to look into alternatives such as robotics • Scoping study is required to look at available technology 	0	3	0	3
Canker management in processing beetroot (1): <ul style="list-style-type: none"> • When does it develop? • What are the conditions for onset? • Preventative management regime needs to be developed 	0	2	1	3
Promotion levy for carrots/vegetables (Ind): <ul style="list-style-type: none"> • Investigate a promotional levy • Promote the nutritional and health benefits, recipes • Investigate health benefit research for carrots as has been done for brassica vegetables (VG03086) so that the outcomes can be used in promotion • Investigate what is done by the celery committee in Victoria (they engage in promotion at the regional levy through production of flyers, radio advertisements and information in local papers) 	0	0	3	3
Training and skill development (1): <ul style="list-style-type: none"> • Crop production • Marketing • Disease and pest identification for staff • Sourcing professional advice • Should this be in a central database? 	0	2	0	2
Study tour for beetroot growers (1): <ul style="list-style-type: none"> • Investigate new varieties, production techniques, agronomy, harvesting 	0	0	2	2

Issue	Grower votes¹	Grower votes²	Other votes	Total votes
Health benefits of root vegetables (Ind): <ul style="list-style-type: none"> Do we have scientific proof of anti-cancer benefits or other health benefits that can be used to promote consumption of root vegetables (like the work done for brassica vegetables, VG03086)? Need R&D on the nutritional benefits of root vegetables 	0	0	2	2
Variety trials (1): <ul style="list-style-type: none"> Variety trials for all vegetables, before new varieties are adopted Trials should be over time and at a range of locations – to show disease incidence in different scenarios Communication of outcomes to all growers 	0	0	2	2
Extension (3): <ul style="list-style-type: none"> Needs to be done at the whole of production system level Develop delivery of current knowledge 	0	0	2	2
Revegetation by Design (1): <ul style="list-style-type: none"> Current research being done by CSIRO and SARDI Extension of current research required Extrapolate information already generated to other areas and crops 	0	1	0	1
Chemical harmonisation (All): <ul style="list-style-type: none"> Need national harmonisation of chemical control of use 	0	0	1	1
Training growers in seed selection techniques to produce their own open-pollinated seed supplies (1): <ul style="list-style-type: none"> Technology/skill transfer 	0	0	1	1

Issue	Grower votes¹	Grower votes²	Other votes	Total votes
Chemical registrations (4): <ul style="list-style-type: none"> • Need to be done more efficiently • Need chemical availability to be higher across the vegetable industry (e.g. the herbicide Carotex) • Lengthy time delays in getting permits or registrations • Registered products for use on carrots is a major issue (cost of registering products is high) 	0	0	0	0
Alternatives to nematicides (3): <ul style="list-style-type: none"> • Identify potential augmentatives • Collate existing knowledge • Options and cost/benefit of practical applications • Appropriate extension 	0	0	0	0
Volunteer management (carrots) (3): <ul style="list-style-type: none"> • Identify factors • Management techniques within cropping system • Appropriate extension to industry 	0	0	0	0
Business systems (1): <ul style="list-style-type: none"> • Processes/manuals for staff (field, shed) • Generic systems that can be customised on-farm 	0	0	0	0
Ethical audits (4): <ul style="list-style-type: none"> • Retailers QA • Need a project that develops audit manuals to assist growers through their audits 	0	0	0	0
The vegetable industry needs to assist researchers better target their funding submissions (3)	0	0	0	0
Marketing (1): <ul style="list-style-type: none"> • Investigate combined packs of vegetables • Parsley, radish, spring onions • Beetroot, carrot, sweet potato 	0	0	0	0

Issue	Grower votes¹	Grower votes²	Other votes	Total votes
Marketing (1): <ul style="list-style-type: none"> • Development of ready-to-serve vegetables as products 	0	0	0	0

FUTURE ROOT VEGETABLE THINK TANKS

The Think Tank participants agreed that meeting to discuss and set priorities for root vegetable research and development was a good idea.

Some participants felt that future R&D priority setting could be done as part of the suggested (Priority 1) Integrated Program for Carrot R&D.

In a discussion at the conclusion of the Think Tank comments were:

- good to meet in person every 1 to 2 years;
- helpful to get away from the workplace so that you can relax and think about other things;
- very well organised;
- very beneficial to meet others in the industry;
- well run and valuable;
- need to be better prepared next time so I know what has already been done and what results have been achieved and where do I find that information (note that summaries of past root vegetable R&D projects were distributed before the meeting and the Vegetable Industry Development Program will ensure that it is easier for growers to find this information in the future);
- good for beetroot growers to work with carrot growers because there are issues that affect both crops.

Based on general comments from the previously held Brassica and Leafy Vegetable Think Tanks and the Root Vegetable Think Tank growers felt that it was important that representatives of the different crop groups meet regularly (every 2 years) to network and set priorities for future R&D investment (ownership by industry of the Vegetable R&D Program).

It was also important to hear about past research outcomes, however there was mixed feelings about the formal presentations from research providers (the Brassica Think Tank attendees were the most supportive of this part of the proceedings). The discussions between research providers and growers and the resultant two-way flow of information was a very valuable outcome of the Think Tanks. There is a benefit from growers getting to know research providers personally and talk with them about their issues. This leads to better targeted research proposals.

Attendees also commented that it was very important that they received feedback from HAL, AUSVEG and the IAC about what actions were taken as a result of the Think Tanks and the identification of key R&D investment priorities.

In the future these activities could be a component of an Integrated R&D Program for all of the major vegetable crop groups. The Think Tanks and priority setting of issues (from regions, then to state, and then to a national level) could also be coordinated and facilitated through the Vegetable Industry Development Program.

APPENDIX 1: MEETING AGENDA



Root Vegetables Think Tank Agenda
Monday 19th April & Tuesday 20th April, 2010
Meetings Rooms 1 and 2, SARDI Plant Research Centre,
Waite Institute, University of Adelaide



Monday 19th April: 2 – 5 pm

- 1.45 pm Arrive (a light lunch will be available from 1.30 pm)
- 2.00 pm Welcome, introductions and aims of the think tank, outcomes of past carrot R&D priority setting workshops
- 2.30 pm Introduction to the Vegetable Industry R&D Program and Vegvision 2020 (the Australian Vegetable Industry Strategic Plan): Will Gordon (HAL)
- 2.40 pm Introduction to AUSVEG communication activities: Andrew White (AUSVEG)
- 2.50 pm An economic guide to the vegetable industry: Ian James (Vegetable Industry Economist)
- 3.30 pm Afternoon Tea
- 3.45 pm Root Vegetable project summaries – key outcomes and knowledge gaps (10 min presentations + 5 min question time)
John Duff (Qld DEEDI): Queensland Root Vegetable Projects
Doug Jones (Golden Circle): Golden Circle Root Vegetable Projects
Tim Kimpton (Applied Horticultural Research): AHR Root Vegetable Projects
Andrew Watson (Industry & Investment NSW): NSW Root Vegetable Projects
- 4.45 pm Outline of the Vegetable Industry Development Program, VIDP: David Heinjus (Rural Directions)
- 5.00 pm People Development Sub-program of VIDP: Dianne Fullelove (Dianne Fullelove & Associates)
- 5.15 pm Wrap up for day 1
- 5.30 pm Taxis to accommodation (Old Lion Apartments, 9 Jerningham St, North Adelaide, 08 8334 7799)
- 6.30 pm Drinks and dinner at Lion Hotel (corner of Melbourne St & Jerningham St): we have a table booked in the courtyard

Tuesday 20th April: 8.00 am – 3 pm

- 7.20 am Check-out of hotel
- 7.30 am Taxi pick-up out the front of hotel
- 8.00 am Arrive
- 8.15 am Root Vegetable project summaries continued – key outcomes and knowledge gaps (10 min presentations + 5 min questions)
Calum Wilson (TIAR): Tasmanian Root Vegetable Projects
John Shannon (vegetablesWA): WA Root Vegetable Projects (for Allan McKay)
Oscar Villalta (DPI Vic): Victorian Root Vegetable Projects Part 1
Liz Minchinton (DPI Vic): Victorian Root Vegetable Projects Part 2
Trevor Wicks (SARDI): SA Root Vegetable Projects
- 9.30 am Morning Tea
- 9.45 am Identification of key research themes (e.g. soil, IPM, marketing)
- 10.00 am Break into groups to identify R&D priorities for root vegetables in Australia
- 11.30 am Group leaders to report back to whole group
- 12.00 pm Collation of R&D priorities (group similar priorities)
- 12.30 pm Lunch
- 1.00 pm Voting on key R&D priorities
- 1.30 pm Develop project ideas for the top 5 – 10 R&D priorities
What is the problem?
How are we going to investigate it?
What outcomes are we seeking?
Are there related projects?
How will we deliver it?
How will it be implemented on-farm?
- 2.30 pm Identifying root vegetable R&D priorities in the future
- 2.45 pm Wrap up and close
- 3.00 pm Taxis to the airport

APPENDIX 2: IDENTIFIED CARROT R&D PRIORITIES, 2005

VG09078: ROOT VEGETABLES THINK TANK 19 – 20 APRIL, 2010 IDENTIFIED CARROT R&D PRIORITIES, 2005



Carrot R&D priorities were identified in 2005 through the 'Western Australian Carrot Industry: Industry Plan 2005 – 2010' developed by CARD (Carrot Association for Research & Development) and two Carrot Industry Strategic Planning Meetings facilitated by AUSVEG.

A summary of the plan and meeting reports is given below so as to provide a start for discussion for identifying priority issues for the Australian carrot industry in 2010 and developing ideas into projects.

CARD Major Issues for Action

CARD identified 12 priority strategies/issues that if addressed were likely to produce the greatest benefits to industry. The strategies (with actions and measures) identified were as listed below. Actions completed are indicated as such.

Strategy 1: Develop niche markets, new products and/or product differentiation

Action 1 – Develop project brief and seek funding with desk top scoping study

Action 2 – Employ a qualified food scientist/market researcher to investigate opportunities

Action 3 – Viable opportunities are commercially developed

Measures – New market or product opportunities found and commercially developed.

Strategy 2: Product differentiation for the Australian carrot industry on food safety issues against key competitors – Food safety – pesticide and heavy metal residues

Action 1 – Organise funding for residue testing of Australian and competitor product (locally and overseas)

Action 2 – Undertake analysis and review data to determine whether suitable basis for product differentiation

Action 3 – Develop communication/action plan to hand information in appropriate manner

Measures – Report of Australian and competitor residue data and outline of possible product differentiation.

Strategy 3: Document Australian industry cost structure; i) Determine the most effective supply chain structures in the carrot industry (domestic and export, ii) Provide industry with a detailed analysis of the supply chain cost structure

Action 1 – DAWA to prepare cost structures for various carrot supply chains

Action 2 – Fund and undertake benchmarking study of various carrot supply chains (seek funding through HAL and other funding sources)

Action 3 – Communicate and encourage adoption of efficient supply chain models

Measures – Report of supply chain costs and identification of areas of efficiency gain

Strategy 4: Develop a competitor analysis of freight costs for all major markets and options to reduce costs

Action 1 – Identify and fund a freight industry expert to collect information and review options

Action 2 – Link information into carrot cost structure analysis

Action 3 – Industry wide approach to possible reduction in freight costs

Measures – Report outlining competitor analysis of freight costs

Strategy 5: Develop a national industry biosecurity plan

Action 1 – Determine WA members attending PHA national meeting (completed)

Action 2 – Briefing paper distributed to WA members attending PHA and DAWA before national meeting (completed)

Action 3 – Review draft national plan

Measures – Timely delivery of national carrot industry biosecurity plan

Strategy 6: Opportunities and requirements to supply new markets via international supply chains

Action 1 – Market analysis to determine the potential to supply Europe and other new markets

Action 2 – Hold a workshop on potential new markets and market requirements

Action 3 – Assist industry in adopting appropriate standards in meeting new market requirements

Measures – New markets realised

Strategy 7: Develop an improved understanding of customer requirements and determine domestic market segment opportunities and growth areas

Action 1 – Scoping study to determine WA carrot consumer preferences and demographics (in store promotion) (completed)

Action 2 – Develop a national project to improved understanding of customer requirements

Action 3 – Determine key growth market segments for domestic carrot industry

Measures – Industry report of customer requirements and potential market growth areas

Strategy 8: Knowledge collection, transfer and dissemination

Action 1 – Carrot industry workshops

Action 2 – Carrot news articles in WA grower

Action 3 – Targeted industry information disseminated

Action 4 – CARD: Hold industry leader meetings

Measures – Number of industry articles and attendance at industry field days

Strategy 9: Understanding competitor position and global influences

Action 1 – Select and industry expert to package relevant information for CARD to disseminate to the carrot industry

Measures – Report of global market influences

Strategy 10: Guaranteeing quality and reliable performance of seed

Action 1 – Address variety trueness to type

Action 2 – Hold workshop on seed quality (completed)

Measures – Information available on factors affecting seed quality

Strategy 11: Varietal improvement – disease screening and quality evaluations

Action 1 – Program development and costing

Action 2 – Seed company support

Action 3 – Prepare HAL funding proposal (completed)

Action 4 – Undertake project (dependent on proposal outcome)

Measures – Annual carrot field days and varietal performance reported

Strategy 12: Environmental Assurance System to meet market and consumer needs developed

Action 1 – Participate in HAL EMS project including trial farms in WA

Action 2 – Collect data and information relevant to WA

Action 3 – Assemble base EMS system

Measures – Relevant base environmental assurance system available to carrot growers

Outcomes of the Carrot Industry Strategic Planning Meeting, March 2005

At the meeting attendees (grower representatives from each state, HAL, AUSVEG and WA Department of Agriculture representatives and Vegetable Industry Development Officers) were told that the amount of R&D conducted for the carrot industry had been fairly small considering its size and importance. Carrot R&D projects had historically focussed on production-related issues such as: Cavity spot (*Pythium*); Nematode management; Carrot

virus Y; Alternaria diseases in seedlings; Alternative herbicides; Crop management (in WA); Re-using washing water.

Attendees discussed priority issues which were subsequently grouped into 5 key groups and then prioritised as given in the table below. The groups of issues are listed from the highest to lowest priority.

1. Marketing	Marketing - many aspects discussed
	Levy - devote a portion to promotion, or introduce a promotion levy
	Consistency of product, particularly flavour
	Organic carrots - what is the market opportunity
	Need data on consumption patterns
	Domestic consumption is slowly reducing
	Trade barriers exist in some situations, such as quarantine issues for carrots from Qld and NSW to Taiwan
	Overseas market intelligence ranges from in-depth to very little
2. Profitability	Returns going to growers are diminishing - need to improve cost of production
	Improving packout percentages
	R&D needed for the Coral 2 variety grown in Tas for the Japanese market
	Domestic market needs to be competitive to resist importation of carrots from overseas

3. QA / EMS	Access to chemical products via registrations and minor use permits - carrots classed as a Major crop by APVMA which complicates permits
	Food safety - an opportunity for Australia to differentiate its produce (for a while at least, but China is likely to catch up)
	Biosecurity planning - WA has a plan, and a national vegetable industry plan is under development
	QA and EMS - the industry needs to be on the front foot with these issues
4. Communication	Effective knowledge collection, transfer and dissemination is vital
	Should we form a National carrot industry association, like CARD in WA?
5. Across-industry	Water quality and quantity - varies from region to region
	Continuity of water licences
	Seed quality - need independent trials?
	Labour - difficulty in finding good employees, and other issues such as OH&S, insurance
6. Other issues	Regional R&D projects are not being well developed and funded
	Quality of applications for funding is poor - they often fail due to a poor application, not a poor issue

Outcomes of the Carrot Industry Workshop #2, November 2005

At this workshop there were 8 carrot growers, AUSVEG and HAL representatives, 1 Vegetable Industry Development Officer and representatives from Produce Marketing Australia, Market Equity, Supply Chain STO and the Australian Mushroom Growers' Association who were invited to give presentations.

From the workshop earlier in the year attendees were told that the priority areas for R&D in the short term were:

1. Investigate current consumption patterns
2. Research what influences purchasers' decisions to buy/not buy carrots
3. Establish baselines of current consumption

Presentations were given on:

- Consumer market research – Fiona Guest (Market Equity)
- How the mushroom industry manages supply and marketing initiatives – Greg Seymour (AMGA)
- How the apple industry was managing market and supply information through the AFFCO 'Well informed grower' project – John Baker (Produce Marketing Australia)
- How the fresh potato industry had looked at the supply chain – Tom Rafferty (Supply Chain STO)

The workshop agreed to develop a similar approach to what had been done in the AFFCO apple well informed grower project. Information to be sought from industry included:

- Demand forecasting [Demand = Sales + Lost Sales] (by volume)
- Pricing and volume sold (wholesale markets? supermarkets? broken down by use, including all sizes that are sold?)
- Loose versus prepacked (and pack size / weight)
- Use (export, domestic, processed)
- Planting and production by State
- Timing – anecdotal information
- Crop predictions by region (hectares, volume, quality, variety)
- Weather conditions by region
- International developments
- Potential opportunities (domestic and export)
- Competitive products
- Domestic developments (i.e. consolidation of retailers; movements in processing)