Horticulture Innovation Australia

Final Report

Vegetable Industry Education & Training Gap Analysis

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RMCG

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VG14061

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1 Summary

Overview

The project report for VG14061 presents a gap analysis of education and training for the Australian vegetable industry. The study included a review of education, training and learning in agriculture and the potential impact of training and education on profitability. We conducted an evaluation of previous studies to identify potential strategic gaps. Formal education and training courses, and education and training approaches taken by other industries were investigated. The results from these investigations were tested and validated through consultation with industry. This enabled us to complete the gap analysis and make suggestions for future training delivery. Our full report provides detailed outputs and outcomes, as well as a compressive synthesis and set of recommendations to Horticulture Innovation Australia.

The main recommendation is that, based on our analysis, vegetable levy payers should invest in targeted training for vegetable producing businesses. Based on an analysis of the training needs of vegetable businesses we identified that the previously proposed Vegetable Academy model does not fully meet the needs of vegetable levy payers. Following consultation and a review of approaches taken by other organisations we have proposed an alternative approach to education and training.

We identified that training has to be tailored to the needs of specific groupings within the industry, rather than using a 'one-size-fits-all' approach. The groupings and their needs are described in detail in this report. Relevance, ease of access, responsiveness, timing and flexibility are important overarching criteria.

We learned that a successful training initiative has to take a 'producer driven' approach. We therefore recommend a process that essentially mimics that used for determining RD&E projects to design and implement targeted training. This means i.e. vegetable producers, groups of producers, providers of formal or informal training and industry organisations on their own or jointly with producers may prepare proposals, which are Training Plans that meet specifically identified producer needs. Training Plans will need to meet principal criteria that have been identified in this report as critical for successful training. A national coordinator role should be created to manage the various aspects of initiative.

The following three sections summarise important outcomes and recommendations on the approach to be taken as well as training design and delivery.

In addition to this report, we prepared a MS Excel database that compiles information on the education and training services currently offered by universities, the VET sector and online. The database identifies whether courses on offer provide education or training in areas that are relevant to the vegetable industry.

Education *is commonly seen as a learning process that takes place before a person enters the workforce. In this study, the term 'education' is used for teaching graduate or postgraduate students, not school students. This is not meant to detract from the importance of including agriculture / horticulture subjects in school curriculums. It only means that primary and secondary education in agricultural subjects is outside of our scope. It is currently addressed by several initiatives, including by industry bodies and RDCs.*

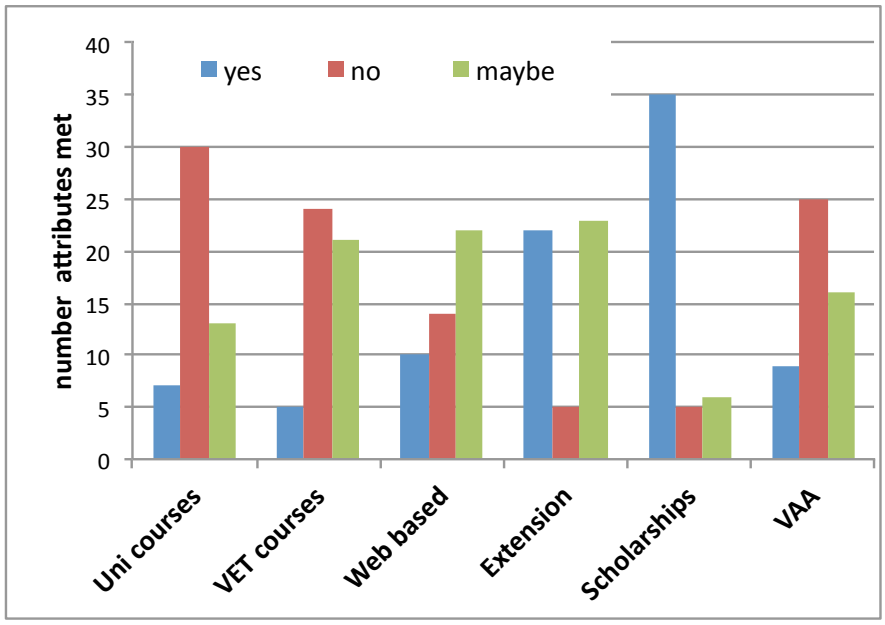
Training *is usually associated with 'the world of work', i.e. training activities are aimed at professionals or practitioners. For the purpose of this study, extension is considered as 'informal training', while formal training is delivered by registered training organisations (RTOs).*

Assessment of education and training approaches

Through our research we identified criteria of a training model required to meet the needs of vegetable levy payers. The below graph summarises our assessment of current training services / opportunities and the suggested Vegetable Academy (VAA) against 50 criteria established as important attributes of especially training via:

- Farmers' requests in general - from our literature review
- Vegetable producers' feedback - Macquarie Franklin 2012 and this study
- Other industries' or organisations' models (during consultation)
- Adult learning principles
- Gen Y learning principles

The graph indicates that top down, inflexible models do not serve the needs of a diverse, dynamic and future focussed vegetable industry well enough. Our report includes details the assessment criteria and ratings used to create the below graph.



Review of approaches taken by other industries or organisations

Our review of other RDC's and organisation's education and training initiatives provides important guidance for HIA on the principles that should underpin their investment. These are:

- Have clear goals and principles that align with the industry's vision and strategic direction
- Maintain ownership of the initiative and IP, use branding if possible
- Do not formalise training contents and delivery mechanism (e.g. as certified course offer under the TAFE system or other rigid structure) too early, if at all
- Seek feedback and react to it to maintain relevance and flexibility
- React to specific needs – consider regional needs, timing, business sizes or focus, prior knowledge and skills
- Fill gaps, do not repeat what is already out there, prioritise and focus
- Engage high quality, committed coordinators and trainers, maintain freedom of choice and seek feedback on the quality of trainers
- Train trainers or facilitate their professional development

- Explore on-line options for some audiences and suitable content
- Create and or promote education pathways and interesting jobs and careers
- Look after personal and leadership development
- Assess training outcomes and adapt as required to maintain relevance and impact
- Consider a 'knowledge and training passport' for vegetable industry members to allow for recognition of participation in informal training (e.g. under the Targeted Training Initiative or of other quality courses that are not certified); industry and Hort Innovation could develop criteria for courses that can be included in the 'passport'
- Continue to communicate with formal education and training providers to assist them in being relevant and providing 'industry ready' people (one of the main criticisms of current formalised training is the lack of industry readiness of graduates)
- Continue with and or commence programs with schools and media (e.g. ABC Rural) to improve the image of horticulture and especially the vegetable industry, potentially work together with other industries as appropriate (e.g. Cotton, Dairy).

Guiding principles for vegetable industry education and training

Based on our findings, we complied essential guiding principles and criteria for a levy funded, targeted training initiative for the vegetable industry.

We believe these fourteen guiding principles are the foundation of a levy funded vegetable industry education and training initiative.

1. The vegetable production context is increasing in complexity and risk and thus, demands growing sophistication and professionalism in the management of vegetable business operations. This means that trainers need to have high-level skills and knowledge. Training and learning must focus on advancing the capacity to successfully manage challenges and adapt to constant change.
2. **The most important attributes of training delivery and content for the vegetable industry are relevance, ease of access, responsiveness and flexibility**.
3. **A further imperative is that delivery and content are driven by the needs of those who want or need to learn, i.e. growers and their staff, and not by the needs of education and training providers or top down approaches** that do not sit well with adults, in general, and producers, in particular, or the next generation.
4. **Industry ownership and oversight of an education and training initiative (e.g. by a peer group of producers) is a key to its success** and thus, is no different to the requirements of an effective RD&E program. A structured producer driven approach can deliver this requirement.
5. Given the aim to progress the vegetable industry as a whole, a strategic initiative that supports an organised and sustained approach to education and training is desirable. **This should preferably be based on an agreed industry vision, i.e. as stated in the current strategic plan[1].**
6. **In spite of some shortcomings in delivering adequate services to the vegetable industry, existing training and education opportunities should be better communicated to industry.** Most providers could offer clearer, more inspiring information about course content and especially learning outcomes and career paths relevant to vegetable growers and their staff.
7. The concept of training and learning principles and processes, as well as the delivery mechanisms, and the expected results should be based on our current knowledge of the needs and gaps (e.g. as compiled in this report). **Periodic impact assessments should be undertaken to review and renew the approach to meet changing needs.**
8. For employers, industry readiness of newcomers to the industry, an ability to learn on the job and the 'right' attributes and attitudes (i.e. fit with the business culture) are often more important than education certificates or even specific theoretical knowledge. This should be communicated to

[1] "To be a cohesive, financially and environmentally sustainable, and highly efficient industry focused on growing demand profitably" from: Australian vegetable industry Strategic Investment Plan 2012 - 2017

formal education providers.

9. Training content can be based on the outcomes of this gap analysis, outputs and findings of the Vegetables R&D program, especially where the content addresses identified gaps (which is why the projects were done), and feedback from future training events, and or well-founded industry/grower group requests.
10. Most states have recognised skills shortages in the agricultural sector and are designing and implementing strategies to address these. Opportunities to develop links with the relevant initiatives and existing education and training programs should be explored and used, if they fit the criteria for programs under the vegetable industry training and education initiative.
11. Conversations with formal providers about programs and pathways for effective education and training, with suitable delivery formats and content for the vegetable industry, should continue. This report highlights preferred formats and summarises gaps in content. Innovative teaching methods, which are based on the latest neuroscience research findings about how adults learn, should be supported.
12. While reviewing education and training needs and gaps for the industry, **we identified a need for 'trainer training'. Learning outcomes depend greatly on the quality of teachers and trainers in conventional teaching and training situations.** It is also critical to success in informal, extension type settings. There is a need for technically qualified, innovative educators and trainers who understand 'the science of learning', i.e. the latest neuroscience research findings about how young people and adults learn.
13. **It is desirable to foster people in the industry who can mentor or coach new entrants to the vegetable industry or others who would benefit.** This could become an important part of up-skilling the industry, if it is not hampered by the competitive nature of the industry.
14. **Scholarships have been identified as especially appropriate and valuable.**
15.

Recommendations for a Vegetable Industry Education and Training Initiative

This report provides detailed recommendations on this approach, training design, delivery and content.

The education and training initiative requires a focus on a targeted training program aimed at effectively upskilling people at all levels in the industry.

Communication with formal education institutions should continue to encourage changes to some content and delivery of horticultural training to produce qualified, industry ready entrants to the vegetable industry

Targeted Training Initiative Program Coordination

A central, industry owned national coordination role (Target Training Initiative Coordinator) has to be established to manage the Targeted Training Initiative. The suggested function of the coordination role is described in this report.

Targeted Training Initiative Proposals (Training Plans)

We suggest the following criteria for proposals:

- Vegetable producers, groups of producers or providers of formal / informal training on their own or jointly prepare proposals, which are Training Plans (Plans) that meet specifically identified needs.
- Strong linkages and some overlaps may exist between some programs and some of the focus areas. Training Plans can go across programs and focus areas to meet a need.
- Training Plans can be designed for steady, advancing or progressive producer groups or staff with the depth and complexity, as well as the delivery methods selected accordingly. Plans must show content, delivery format(s) and costs.
- Clear goals, KPIs, expected outcomes and impact evaluation must be part of the Plans.

- Preferably, trainees / participants should work through a project that entails applying the learned content to their vegetable business whether employee or owner / manager (e.g. problem based learning).
- Existing knowledge, skills and preferences of targeted participants must be considered.
- Duplication of available training or extension services in the same region is generally not acceptable, but linkages or leverage with existing formal or informal programs is desirable.
- Use of available information developed in Vegetable R&D programs is desirable and may be specifically requested, rather than the use of general or generic information.
- Specific content should be determined with targeted trainees and meet an identified need.
- If a proposal is not directly driven by producers, then the trainees or trainee groups must be identified in the proposal and letters of support, or commitment may be included as part of the proposal.

Targeted Training Initiative Design and Delivery of Training

As mentioned, relevant training content for vegetable producers already exists in many cases so that a focus of training should be on design and delivery to meet the criteria of relevance, ease of access, responsiveness, flexibility, focus on outcomes and quality of training providers. Design and delivery must consider the principles of adult / farmer learning and those identified by the vegetable industry, as relevant to them.

Potential delivery formats and styles will depend on topics and may include, but not be limited to, one or more of the following: workshops, field days, study tours, web based training, short courses, master classes, as well as scholarships, internships, graduate training programs and coaching/mentoring. Different delivery methods will fit with different producer and staff needs and topics. Problem or project-based, active learning should be used as a preference for the different formats suggested above.

Training the Trainers

Our research and consultation highlights the important need for high quality trainers (and mentors). The more advanced the trainees, the more they expect from trainers. A producer driven approach will self-select the best trainers. Therefore, once a pool of trainers has been established through a round of training projects, educator/ trainer-training master classes should be run to further up-skill trainers in innovative delivery methods, to share the latest neuroscience research about learning, and exchange experiences and ideas.

Targeted Training Initiative Content

An important aspect of the producer driven approach is that even though program and knowledge areas have been identified and training gaps have been determined, the actual program and knowledge areas that will be delivered, will be mainly self-selecting based on demand and commitment by producers who actually want to do specific training. This means that there will be no predetermined 'training packages' or curriculum content. Training Plans should only be funded if levy payers' commitment to participate exists.

This is important given the experience that many 'top down' training programs offered, with predetermined 'one-fits-all' content, have not been taken up by producers. This has happened even when the topic was on the 'wish list' of topics producers wanted to know more about (e.g. WH&S, communication, business management) according to surveys.

Areas that may find levy payer support, if the training is designed and delivered according to the criteria set out in this report, are:

- New technologies to improve efficiency with a focus on spatial technologies, digital technologies and energy efficiency

- Protected cropping with a focus on soils, nutrition, pests and diseases and hydroponic systems
- Post harvest management with a focus on cool chains, pests, diseases and disorders, packaging and logistics
- Managing business risks with a focus on planning, decision making and good management systems
- Communication with a focus on managing staff

2 Keywords

Education, training, extension, database, knowledge, skills, gap analysis, vegetables, grower driven,

3 Introduction

RMCG conducted an industry education and training gap analysis for the Australian vegetable industry. The main objective of the project was to:

> *clearly articulate the needs, services, gaps and synergies across the agricultural training landscape, and provide a rationale for HIA and the vegetable industry to make a decision on how the education and training needs of Australian vegetable businesses should be effectively met. This includes addressing whether, why and how a separately funded unique vegetable academy, as recommended in a previous report to Horticulture Australia Limited (Stride Consulting, 2014)[2], or other suitable model would best meet the specific needs of the levy vegetable industry.*

Needs were identified by a previous study (Macquarie Franking, 2012)[3] and future training and education opportunities for both new and existing vegetable industry members were examined next (AUSVEG, 2013)[4].

The findings from the 2012, 2013 and 2014 studies provide a valuable insight into the current education and training challenges and potential answers for the vegetable sector. HIA decided that further work was necessary and commissioned this study to provide a thorough gap analysis that maps the complete industry training needs against the currently available education training options. Further aspects to investigate were the education and training models implemented by other agricultural industries and insights these can provide for the vegetable industry.

The overall agreed focus for education and training for the vegetable industry is to enable and inspire people working at all levels in the industry to better deal with the challenges affecting them and benefit from the opportunities open to them.

Therefore, this project builds on previous work of a similar type in agriculture / horticulture (including those conducted by Research Corporations (HIA, RIRDC, GRDC, Dairy Australia, and Meat and Livestock Australia), as well as various government bodies and industry associations, but especially aforementioned studies conducted for the vegetable industry.

> "The search for skilled employees is one of the key issues that the vegetable industry faces at present. The situation may not improve in the future because fewer students are graduating from tertiary institutions with agricultural based qualifications. With the size and complexity of today's farms, leaving school with a minimal qualification to take over and successfully run a farm business into the future is less likely."

[2] Stride Consulting 2014. Vegetable Industry Academy of Excellence. VG13029 Final Report to Horticulture Australia Limited

[3] Macquarie Franklin 2012. Review of skills and training needs in the vegetable industry. Final Report to AUSVEG

[4] AUSVEG 2013. Investigating future training and education opportunities for both new and existing vegetable industry members. VG12077 Final Report to Horticulture Australia Limited

4 Methodology

Introduction

The method used for this project involved seven steps. They were:

1. Reviewing the current status of education, training and learning in agriculture.
2. Reviewing previous studies in the vegetable industry and identifying potential strategic gaps.
3. Reviewing the currently available formal education courses relevant to the vegetable industry.
4. Investigating the approaches taken by other industries.
5. Consulting, validating and testing our findings with industry.
6. Undertaking a gap analysis.
7. Synthesising the findings and making recommendations.

Review of education, training and learning in agriculture

A first step was to establish a context around education and training for this study by examining the following information and trends, so we could ensure that our gap analysis was appropriately focussed and that our recommendations would be relevant to the future needs of the industry, as well as their current needs.

Those contextual issues were:

- The meaning of 'education' and 'training'
- Education in agriculture
- Farmers and learning
- The principles of adult learning
- 'Next Gen' attributes and learning
- Drivers of change for the vegetable industry

Thus, establishing the context was all about undertaking an analysis of the current and likely future situation in education and training in the vegetable industry, which is a necessary first step in any planning exercise.

Review of previous studies and identifying potential strategic gaps

A critical component of this study was to review the currently available information and the previous studies that had been undertaken for the vegetable industry. A significant amount of industry resources and effort has already been invested on the subject of improving education and training for the vegetable industry and there was no need to duplicate the work already completed. Therefore, the purpose of scoping and collating the information already available was to identify gaps and formulate key questions for the consultation stage of the project.

The following activities were undertaken in conjunction with the first stage of establishing the context:

- Review of relevant studies about education and training needs and services in agriculture
- Review of previous studies for the vegetable industry
- Review of relevant statistics for agriculture and the vegetable industry such as:
    - Attainment levels
    - Education and training participation
    - Business and wealth indicators in relation to education and training

Both the broader review of education, training and learning in agriculture and the review of previous studies in the vegetable industry allowed us to start identifying what might be the potential strategic or

conceptual gaps, i.e. the gaps in the BIG picture, rather than the detail. This focus was not so much on what was missing, but why it was missing. Thus, we really tried to hone in on what the real problem was and we developed a conceptual framework, which helped govern the rest of our investigations.

Review of formal education and training courses

A key output of the project was a database of the currently available education and training course for the vegetable industry. Our research for delivery of this output involved:

- Collation of education and training (E&T) services in a database:
  - Information about university courses relevant to the vegetable industry
  - Information about VET services relevant to the vegetable industry
  - Information about relevant correspondence courses
  - Information about 'informal' training e.g. (extension such as workshops, field days) conferences, industry directed training courses
- Comparison against principle knowledge requirements of:
  - Training needs identified in previous studies
  - Education and training (E&T) services in the database

When collecting information about education and training services for the database, we captured as much as possible:

- Content, delivery mechanisms, timing, length, costs, and communication of services
- Relevant, planned changes to services in the short or medium term
- Motivations, aspirations and the operating environment of education and training providers

We collated information from RuralSkills Australia, NFF, AgriFood Skills Australia, AgInstitute Australia, Agricultural Colleges, VET providers, RTOs, Universities and providers of informal training, e.g. extension providers and advisers, as well as state government initiatives.

Approaches taken by other industries

The collation of the currently available courses and their comparison with the information we had gleaned from both our reviews helped us validate our conceptual framework and started the process of thinking about what was needed to 'fill the gap' or 'fix the problem'.

At this stage, we believed it was important to learn from what other industries and organisations had done when faced with similar issues. We did not want to "reinvent the wheel". In particular, we wanted to learn from others, what had worked and what had not and why.

As a result, the following sectors and initiatives were investigated via conversations with people involved in the design or delivery:

- Cotton industry education and training programs and initiatives (Cotton CRC approach[5], Cotton Australia 'Cotton Classroom')
- Dairy Australia National Centre for Dairy Education
- Grain Traders Australia (GTA)
- Meat and Livestock Australia (MLA) initiatives: PROGRAZE®, 'Making more from sheep/beef'
- Apple and Pear Australia Limited (APAL): Future Orchards
- Peracto graduate training program
- Bayer CropScience Vegetable Soil Health Group
- AgSafe

[5] The Cotton CRC finished in June 2012, tools, resources are kept on line

- State based initiatives:
    - Horticulture Centre of Excellence at Department of Economic Development, Tatura
    - Skills Tasmania
- Vegetable industry extension programs Soil Wealth and Integrated Crop Protection

The following guiding questions were used to find out about the motivation, strategies and models other industries and organisations have used in education and training.

- What were the education and training challenges for your industry / organisation?
- Describe the chosen strategy / model
- Why did they choose the strategy / model they did?
- What is the specific role and what are the aims of the model they chose?
- How do they go about implementing the model / achieving aims?
- How has it gone? What has been achieved?
- What worked, what did not?
- Has the role and or strategies of the industry / organisation changed over time?
- How is success measured? Have KPIs been set at the start? Is there an impact assessment?
- If you could do it all again, what would you do:
    - Do the same?
    - Do it differently, why, what?
    - Do nothing?

The Citrus Australia and Top End Training Corporate Partnership training program was not discussed with Citrus Australia or the training provider, they did not respond to an invitation. Some information was gained from information about their partnership published via FreshPlaza (http://www.freshplaza.com/).

Consulting, validating and testing with industry

General approach and Project Reference Group

We used consultation with individual vegetable producers / businesses, other key stakeholders, such as some training providers and businesses that utilised training services regularly, and a Project Reference Group (PRG) to validate the needs, challenges and opportunities that we identified from the previous studies. We also used them to test the training principles for the vegetable industry that we were seeking to establish and the recommendations we were developing.

The comments and issues raised by the PRG and discussed with its members have been taken into consideration throughout this study. This applies especially to the issues raised and the recommendations we have made.

Our Communication and Consultation Plan guided our efforts in this area; it is included in Appendix 1. We have included the PRG terms of reference in Appendix 2.

Questions explored during consultation

We used the consultation with informed industry contacts to more accurately defining the problem, test and validate the strategic gaps we identified from the reviews and explore the conceptual framework that we developed. In particular, we sought the views of informed industry contacts to help us turn the conceptual framework into a practical strategy and operational plan that would meet the objectives of the project.

Thus, the questions we explored during the consultations were:

1. Does the general information on education, attainment / skills levels and value of production (or profitability), as well the future outlook for agriculture apply to vegetable businesses? If yes, how can the recommended solutions from the various reports on the issue be used for the benefit of the vegetable industry?
2. If the general data does not apply, what is different and how is it different? Is there still a problem, what is it and what are the reasons for it?
3. If other agricultural and horticultural industries (e.g. dairy, grains, fruit, cotton) work hard on attracting people into the industry and into their own or general training programs, will that affect the vegetable industry?
4. Are people trained in other disciplines entering the vegetable industry? If yes, which disciplines and why? Could this be a positive trend that should be fostered?
5. What are the real gaps in knowledge and skills that are holding vegetable businesses back from running an economically sustainable business and meeting compliance requirements?
    a. At what level are the gaps, i.e. business owner/managers, employed managers, leading staff or 'shop floor' staff? (HOW) Does more knowledge mean making better decisions?
    b. Is adequate education and training offered in the 'gap areas' or not?
        i. If yes, are relevant services used? If not used, why not? How can this be addressed?
        ii. If not, why not and how can it be changed effectively?
6. Why do growers, despite them identifying topics as training needs, not take up education and training programs that have been especially designed for them (e.g. WH&S, communication and negotiation, business management) in great numbers?
7. How much time are vegetable businesses prepared to commit to (different types of) training for business owner/managers, employed managers, leading staff and 'shop floor' staff?

Gap analysis

We used the existing information and data, and the information collected throughout this study about (revised and updated) education and training needs and services (content and delivery / format) to arrive at a description (mapping) and appraisal of the current education and training landscape in the vegetable industry.

As a first step, we collated knowledge areas and themes (content) relevant to vegetable production. We then analysed different education and training services against this listing of relevant, desirable content. This analysis was captured in an Excel database and used in the gap analysis.

We unravelled the complexity of the education and training landscape, using the essential questions formulated as a result of our earlier findings and 'the landscape map', so that levy vegetable industry members, HIA and other stakeholders can easily understand the strengths, weaknesses, opportunities, challenges and gaps of different services and approaches. It will also help the industry determine what, if any, modifications would be required/could be made to these education and training services or specific courses to ensure suitability for the vegetable sector.

In the gap analysis we considered:

- What might be changing in the industry, its demographics and its operating environment
- The need for improved communication and engagement with industry members who speak a language other than English (LOTE)
- Specific needs in production and postharvest management, as well as business, logistics, marketing and people management aspects of the vegetable industry

- The context, challenges and limitations that exist for training providers

Synthesis and recommendations

Finally, we brought all of our findings together into a coherent story (synthesis) to describe what the industry needed to do to improve participation in education and training, and made a series of recommendations for the development of a Vegetable Industry Education and Training Initiative.

This was done by exploring the following scenarios to answer the fundamental question about the need for investment into education and training for the vegetable industry, the potential funding mechanisms that could assist industry in developing any new identified approaches or courses (if required) and likely demand.

Those scenarios and the questions explored were:

1. Current providers deliver training services that are mostly well aligned with industry needs.
    a. Do services need to be better communicated, e.g. provide better information about courses and learning outcomes to vegetable producers and their staff?
    b. Do services need tweaking to be more accessible or effective?
    c. How could that best be done?
    d. What are the challenges?
2. Current providers deliver training services that are not well aligned with needs, i.e. gaps exist.
    a. What should an effective future for education and training look like?
    b. What is the potential demand?
    c. What should it do for the vegetable industry?
    d. How should it be delivered?
    e. What are opportunities, challenges or risks?
    f. What are the priorities?
3. Is the proposed Vegetable Industry Academy of Excellence (VIAE) the best option to address gaps?
    a. What other models can be feasible and why?
    b. Who could manage the process of design, delivery and evaluation?
    c. What governance arrangements would be needed, what operational context?
    d. How would a new service link with existing and planned other services?
    e. What would the costs be?
    f. How can risks be management?
    g. What would a VIAE look like?

5 Output 1 – review of education, training and learning in agriculture

The meaning of 'education' and 'training'

Education and training is understood as capacity building, i.e. advancement of technical and personal knowledge and skills, as well as attitudes and aspirations.

Education is commonly seen as a learning process that takes place before a person enters the workforce. In this study, the term 'education' is used for teaching graduate or postgraduate students, not school students. This is not meant to detract from the importance of including agriculture / horticulture subjects in school curriculums. It only means that primary and secondary education in agricultural subjects is outside of our scope. It is currently addressed by several initiatives, including by industry bodies and RDCs.

Training is usually associated with 'the world of work' (Ollagnier, 2005)[6], i.e. training activities are aimed at professionals or practitioners. Following on from previous work (Macquarie Franklin, 2012)[7], and for the purpose of this study, extension is considered as 'informal training', while formal training is delivered by registered training organisations (RTOs).

Education in agriculture

Overview

The following overview summarises information from references used for this section of the report. References are provided as footnotes throughout the section.

- Education levels of farmers are improving but are still behind that of other occupations in 2011.
- The bulk of farming households (71%) were in the top 20% of the overall wealth distribution in 2010.
- 30% of farms produced about 82% of the estimated value of Australian farm production. The bottom 50% produced only 7% of the estimated value of production.
- The proportion of operators with a (University) degree was about one third higher (2004-05 to 2007-08 data) amongst the 30% of largest producers in terms of value compared to the bottom 50%.
- The trend for enrolments in university programs for agriculture was declining or stagnant between 2001 and 2010.
- The gap in attainment between agriculture and other occupations is greater for bachelor degrees and higher than it is for VET qualifications (i.e. agriculture is behind other occupations in levels of higher education).
- The agricultural industry faces an impending human resources shortfall in several sectors; this is due to an ageing workforce, skilled workers exiting to the resource sectors, and poor labour attraction and retention rates over an extended period of time.

The general agricultural data used for this analysis does not allow a close look at vegetable producers. Assuming the data and trends apply, vegetable producers may be faced with a shortage in skilled labour and this may be especially the case for the availability of people with university training (which traditionally is quite low). If the relationship between attainment levels and value of production is true for vegetable producers, a lack of suitably trained people may be a risk to future profitability. Overall skilled (or general) labour shortages will add to the challenge. This may be especially problematic as new and emerging skills will be required in a number of technology areas (e.g. all aspects of precision agriculture and spatial

[6] Ollagnier, E. 2005. Training. In: L.M. English (ed.) International Encyclopedia of Adult Education. Palgrave-Macmillan, Basingstoke, 2005.
[7] Macquarie Franklin 2012. Review of skills and training in the vegetable industry. Final Report. Horticulture Australia Limited

technologies, use of robotics, IT).

Education levels of farmers[8]

With the operation of farm businesses becoming increasingly complex, many farmers are coming to see themselves less as traditional farmers and more as managers with the same skills and responsibilities as any business manager (Cary et al, 2002[9]). This approach has seen many younger farmers pursuing formal educational qualifications. Over the three decades to 2011, for instance, the proportion of Australian farmers with non-school (tertiary) qualifications more than doubled, from 15% to 38%. The proportion of farmers with a certificate-level qualification doubled over this period, while the proportion with a bachelor degree or higher increased six-fold. *(NB: this overall trend appears to be more positive than that for the vegetable industry.)*

While the general trend towards formal education among farmers mirrors the shift across all occupations, the increase among farmers in proportional terms has exceeded that among other occupations (Figure 1). This increasing prevalence of non-school (tertiary) qualifications among farmers is partly due to the entry of younger generations of farmers. For example, in 2011 half of all farmers aged 25–44 years had tertiary qualifications, compared with just a third of those aged 45 and over. This indicates that the older than average age profile in the agricultural industry may be contributing to the fact that degree level education is lower than it is in the general population.

Interestingly, the increase in higher education levels of farmers occurred while enrolments and completions in undergraduate agriculture courses both fell by half in the ten years from 2001 and 2010. From 2001 to 2010, enrolments fell from 4900 to 2300, and completions from 900 to 400, according to yet unpublished DEEWR data (Allen Consulting Group 2012[10])

Still, farmers were still less likely than people in other occupations to hold non-school (tertiary) qualifications. More than 50% of people working in agriculture do not have a post secondary qualification, compared with 38% for other occupations. The gap in attainment is greater for bachelor degrees or higher levels, than it is for VET qualifications. For lower level VET qualifications, agriculture has a higher proportion of those than other occupations overall (Figure 2).

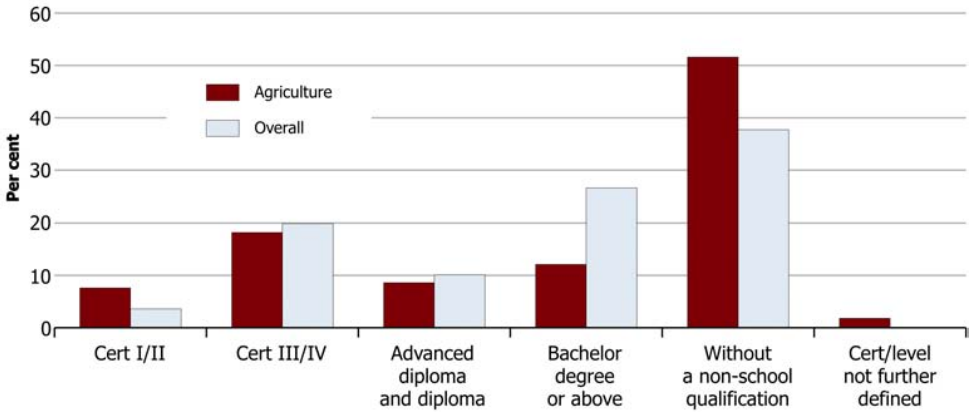
Source: ABS Census of Population and Housing

Figure 1: Non-school qualifications by occupation

[8] ABS 2012. 4102.0 - Australian Social Trends, Dec 2012: Australian farming and farmers

[9] Cary, Webb & Barr (2002). Understanding landholders' capacity to change to sustainable practices: Insights about practice adoption and social capacity for change. Canberra: Bureau of Rural Sciences

[10] Allen Consulting Group Pty Ltd, 2012. Rebuilding the Agricultural Workforce. Report to the Business/Higher Education Round Table



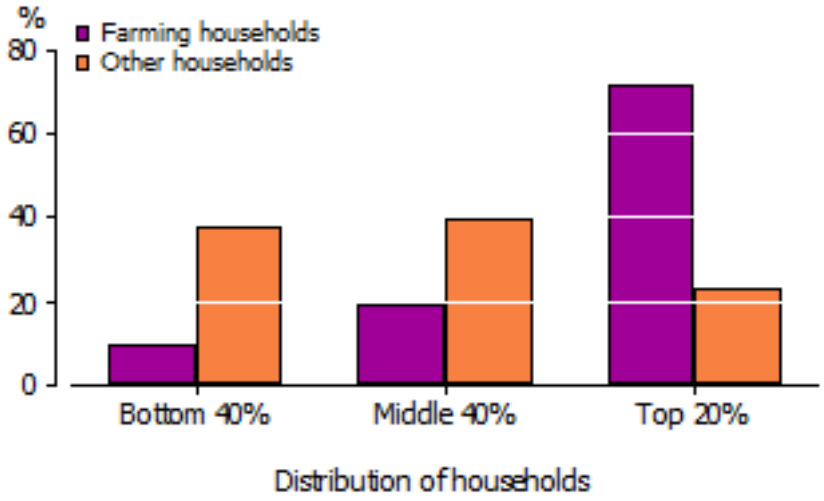
Source: DEEWR Job Outlook website / ABS

Source: Allen Consulting Group, 2012

Figure 2: Educational attainment in agriculture compared to other occupations overall

Education, income and value of production

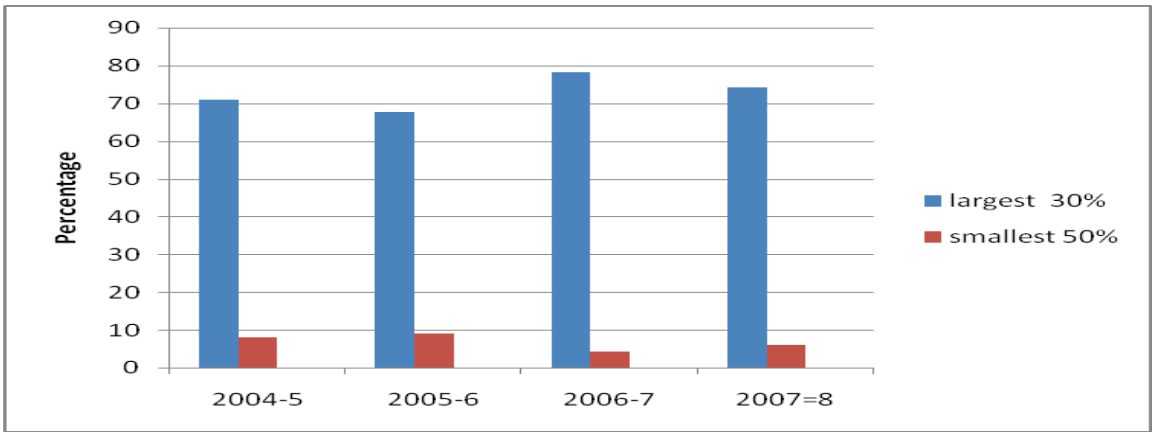
The relatively lower non-school (tertiary) training levels of farmers in general compared to occupations other than farming mentioned above is not generally reflected in lower incomes for farmers in ABS statistics (Figure 3). Only 10% of farming households could be classified as having relatively low levels of wealth (i.e. in the lowest 40% of the wealth distribution). However, the bulk of farming households (71%) were in the top 20% of the wealth distribution. The high levels of wealth explain why, despite relatively low income, only a fraction (5%) of farming households are classified as having low economic resources, compared with a fifth (21%) of other households.



Source: ABS 2009-10 Survey of Income & Housing

Figure 3: Equivalised household net worth by household type (Source: ABS 2009–10 Survey of Income & Housing)

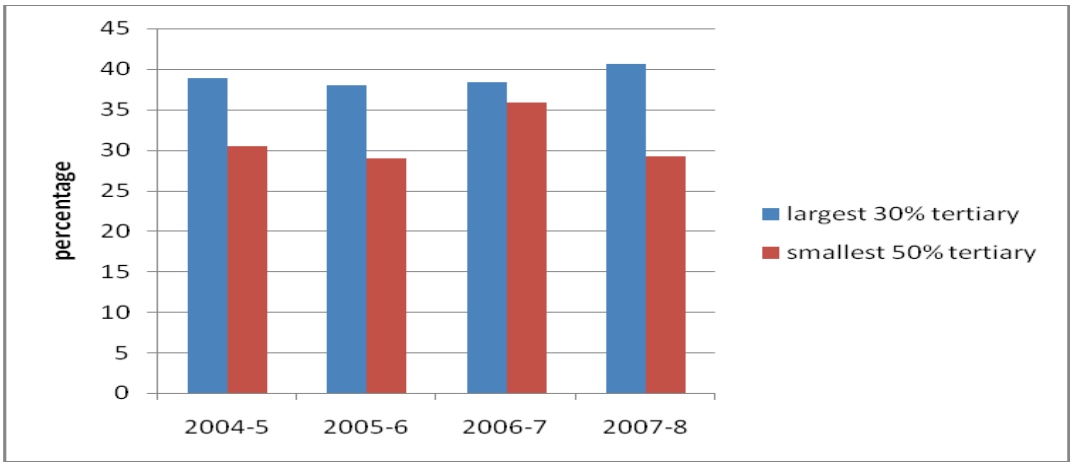
In contrast to wealth distribution, the Productivity Commission (2009[11]) report on drought showed that the top 30% of farms produced about 82% of the estimated value of Australian farm production. The bottom 50% produced only 7% of the estimated value of production (Figure 4).



Source: Productivity Commission, 2009 and ABARES, 2009

Figure 4: The annual estimated gross value of production contribution by the top 30% of farms and the bottom 50% of farms from 2004 to 2008

The Productivity Commission report compared the highest formal level of education of the operators of the largest producers with that of the bottom 50% of producers in terms of estimated value. The data showed that the proportion of operators with a (university) degree was about one third higher (over the 4 year period 2004-05 to 2007-08 (Figure 5) among the largest producers in terms of value. Graduate and postgraduate education seems to make a difference to value of production in the general farming population.



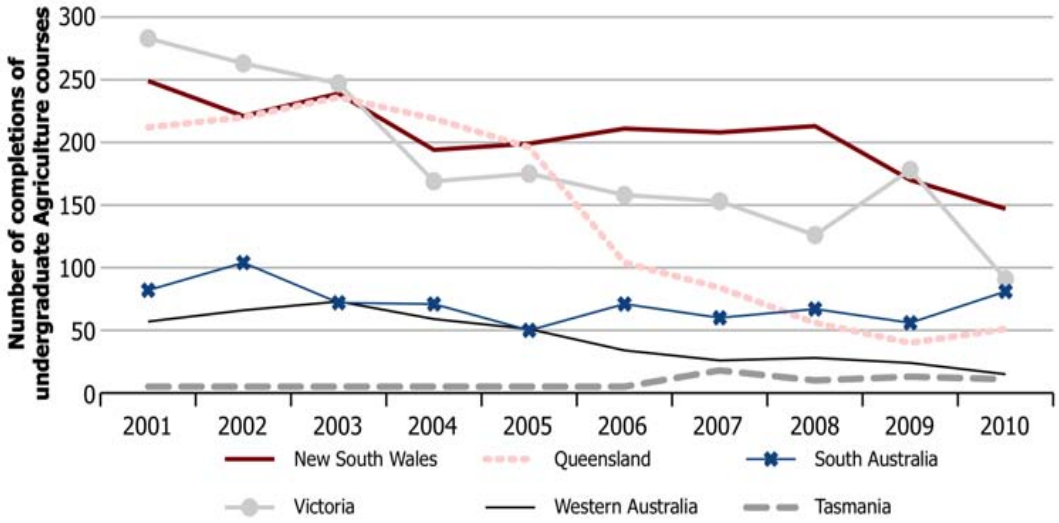
Source: ACDA, 2009[12] unpublished and ABARE 2009 ACDA, 2009 unpublished and ABARES, 2009

Figure 5: The proportion of farms with the highest qualification of operators being a university degree

[11] Productivity Commission (2009) Government Drought Support. Inquiry Report No. 46 Melbourne
[12] Pratley, JE and Hay, M (2009) The job market in agriculture. ACDA unpublished

Education trends

Allen Consulting Group (2012) (Figure 6) presented the trend of declining or stagnant enrolments in university programs for agriculture and argued that if the trend continued the viability of more of these programs would be threatened, undermining the capacity of the system to respond to the worsening shortage in well trained agriculturalists identified by the Australian Farm Institute (2010[13]). The declining trend in university course enrolments is also true for horticulture (Pratley, 2015[14]).



Source: Unpublished DEEWR data 2011

Source: Allen Consulting Group 2012[15]

Figure 6: Completions of undergraduate agriculture courses by state

The outlook for agriculture has also been reported as negative for the supply of skilled people with education levels below University degrees. Agrifood Skills Australia (2011[16]) stated that the agricultural industry faces a looming manpower crisis in several sectors due to the ageing of its workforce, skilled workers exiting to the resource sectors, and poor labour attraction and retention rates over an extended period of time. Suggestions are that the tipping point will occur between 2013 and 2018. "Within seven years, 56.2 per cent of our existing workforce will be over 55; half of our agricultural scientists are already nearing retirement."

Comments on education levels and trends

The data shows an overall declining trend in enrolments in agriculture and horticulture university courses on one hand and an increase in university graduates working on farms on the other. Therefore, given the data is from credible sources, the increasing number of graduates working on farms (e.g. as farm owners or managers) may have completed other degrees e.g. management, commerce, engineering, science, health, food technology, information technology, education, environmental or veterinary science. The apparent divergence in data may be due to the way statistics are arrived at and thus, we are missing a potentially positive trend for the future. If graduates and trained people from related disciplines would increasingly enter agriculture, this would be positive, but we do not know whether it would fill a gap (e.g. in the vegetable industry).

[13] Australian Farm Institute 2010, Towards a Better Understanding of Current and Future Human Resource Needs of Australian Agriculture, June 2010, Surry Hills.
[14] Pratley J.E. 2015. Agricultural education and damn statistics I: graduate completions. AG Institute Australia Journal 1/15
[15] Allen Consulting Group Pty Ltd, 2012. Rebuilding the Agricultural Workforce. Report to the Business/Higher Education Round Table
[16] Agrifood Skills Australia: 2011 Environmental Scan of the agrifood industry: Australia's Regions: Australia's Future. ISSN 1835-7539

The data suggests a link between attainment levels and profitability and therefore that formal education is desirable for sustainable businesses.

Farmers and learning

Farmers and how they learn has been the subject of many studies.[17] Here, we would like to summarise the main points.

Primarily, adult learning principles apply. Most farmers like a learning process that relies mostly on first-hand experiences. Depending on their background and reasons to learn, they are motivated by **saving time and money, learning from practitioners, learning about cutting edge research and new technologies, and engaging in the social aspects of education**. Most publications report that (not surprisingly) there are differences in training needs among categories of farmer groups; farmers enjoy learning from other farmers, they find value in participatory research, request more comprehensive training programs, and farmers want formal training providers to embrace the changing nature of agriculture and know about new technologies and future challenges.

Kilpatrick (2003)[18] reports that farm-management teams employ four different learning patterns when making changes to their management and marketing practices. She describes four learning patterns:

- Local focussed - learnt by accessing only local sources (including government extension services) or a single individual
- People focussed - preferred to learn principally by seeking information and advice on a one-to-one basis and from more than one person, most frequently experts, but often other farmers
- Outward looking – a varied but a less extensive range of sources than extensive networkers
- Extensive networkers accessed a large number of varied sources for learning

Bone (2005)[19] investigated the characteristics a training course would need for farmers to be prepared to participate. She allowed a free response to the question. The terms Top and Bottom refer to business performance based on the Sefton (2002)[20] Business Performance Indicator (BPI) tool. A mix of farming enterprises from Victoria and NSW were involved and interviewed face to face; 1/3 of the 308 participants were female and the average age was just below 50, representing the largest age group of farmers. The results are presented in Table 1.

Both, high and low performing groups ranked "proven value/relevant/outcomes identified" as the most important course characteristic. The top group then viewed "quality presenters" and "short/suitable timing" as the next two characteristics required for them to participate. The bottom group identified "short/suitable timing" and "hands on/practical experience" as their second and third preferences.

Respondents agreed that group learning with other farmers was not a highly favoured characteristic but courses must have sessions of short or convenient duration, so they can fit in between the busy farming periods. They also agreed that quite a few farmers would not enrol in formal courses because they were afraid of being asked questions that may embarrass them.

[17] An extensive list of references is provided under "References" and the heading "Farmers and learning"

[18] Kilpatrick S. 2003. How farmers learn: Different approaches to change. The Journal of Agricultural Education and Extension. Volume 9, Issue 4.

[19] Bone Z.2005. Farmers and learning: a critical interpretive analysis of the value perception of education and complementary factors to success. Extension Farming Systems Journal volume 1 number 1.

[20] Sefton C 2002, 'An Evaluation of a Farm Business Assessment Model that Combines Wealth Change and Profit based Indicators to Rank Relative Business Performance', Master of Philosophy thesis, The University of Sydney, Orange.

Table 1: Farmers' preferred course characteristics

Characteristic	Top 20%	Bottom 20%
Short/suitable timing	**12.6%**	**15.5%**
Flexible delivery & assessment	4.2%	4.7%
Small groups	1.4%	0.0%
Close by	7.7%	6.2%
Proven value/relevant/outcomes identified	**23.8%**	**29.5%**
Hands on/practical experience	**10.5%**	**12.4%**
Peers present/discussions	4.9%	5.4%
Quality presenters	14.0%	9.3%
Business focus	2.1%	1.6%
Production focus	4.9%	2.3%
Other	14.0%	13.2%

Principles of adult learning

Principles of adult learning are well known and still often neglected in the design of training and extension for adult audiences. Adult learners are autonomous, self-directed and goal orientated. They decide whether, when and how they learn and how much time and resources they spend on it.

Self-directed and focused

Unless learning is needed for compliance or to get a 'certificate of attainment' that is need for a job or job promotion, adults learn with a purpose in mind. They want to be able to apply the new information immediately to a problem they want to solve or an activity they want to undertake.

Relevant and appropriate

Adults have accumulated experiences and knowledge and the training has to build on it, not repeat it or belittle it. Adult learners are unlikely to take part in any learning opportunity that is not appropriate to their needs or is not relevant to their position or role. This means that it is important to establish the current knowledge and skill level of the learners to ensure that the information delivered is pitched at the correct level. The learner needs to know how the new information fits with existing knowledge so that they understand why the new skill or concept is being discussed. If information is irrelevant and the pitch is not appropriate, learners will not remain interested in the activity or information.

This means there cannot be a 'one-fits-all' approach for the diverse group of vegetable producers.

Support and respect

Adults will not continue with any learning experience if they do not feel respected by the facilitator or coach or other learners. It is essential to the learning process that learners are provided with a supportive environment where they can feel free to ask questions, make comments and take risks.

Motivating

Getting appropriateness, relevance and understanding barriers right are the first steps to achieving

motivation. If information is not relevant to the job, interest or motivation will wane quickly. The main aspects driving motivations for different types of people are (not all drivers apply to all people):

- Social relationships, meet like minded people
- External expectations, e.g. compliance, licensing requirements
- Personal advancement, e.g. getting a better job or making more money
- Escape / stimulation
- Cognitive interest, interest in the topic
- Appropriate level of difficulty

Barriers may include the conflicting demands on time, financial constrains, extensive travel demands, relevance, poor communication about content, timing during the season, or not being sure about the value of the learning experience, the topic or the way it is taught are too complex and difficult to comprehend.

Feedback (two way communication) and reinforcement

A learning experience should allow for interaction between the facilitators or coaches and the learners and amongst learners. Given feedback about the standard of performance and asking feedback about whether learners understand the information that is delivered and whether it is useful, is essential. Positive and negative feedback are important.

Reinforcement refers to the opportunity for the learner to confirm retention of information e.g. via summaries, informal questions or a quiz or rewarding the learner's performance

Learning by doing something relevant and interesting will improve motivation and retention of information. Adults working in agriculture are usually practical people, which means active learning opportunities are important. Using two or more senses is vital to maximising learner retention and caters for learners who learn better through other senses.

'Next Gen' attributes and learning

Design of education and training should not only consider the drivers of change but also plan for the training needs in a changed future (refer to the section on drivers of change). One aspect is to understand and adapt to the learning style of the coming generations. The relevant Gen Y and beyond have been born into a fast paced and quickly changing environment, while being raised in a relatively protective manner. The view is held that traditional ways of living and learning simply do not apply any more (Schofield and Honore 2010[21],Lau and Phua 2011)[22].

Some Generation Y attributes are:

- High expectations, demanding, impatient
- Materialistic, like instant gratification, follow short term want
- 'Digital natives', always connected, open to peer group influence
- 'Trophy kids' (grew up receiving praise just for participating and not necessarily for excelling)
- Care about the world, expect authenticity
- Creative, like new, exciting things, innovation, experimentation and being actively engaged
- Value relationships and emotional intelligence

Figure 7 suggests learning approaches that would fit Gen Y, the next generation of adults to cater for in education and training delivery. Some current concepts of formal education and training may have to be adjusted to cater for this generation (and the next). Flexibility in approaches, personal

[21] Schofield C.P. and Honore S. 2010. Generation Y and learning. The Ashridge Journal. Winter 2009-10.

[22] Lau A. and Phua L.k. 2011. Transforming Learning Landscapes for Generation Y and Beyond. 2010 International Conference on E-business, Management and Economics IPEDR vol.3 (2011) © (2011) IACSIT Press, Hong Kong

engagement and coaching of learners may have to be adjusted for a generation that is used to constant stimulation, instant feedback, interactive learning, experimenting, attractive 'packaging' of information and a freedom of choice. They will easily reject anything they do not like.

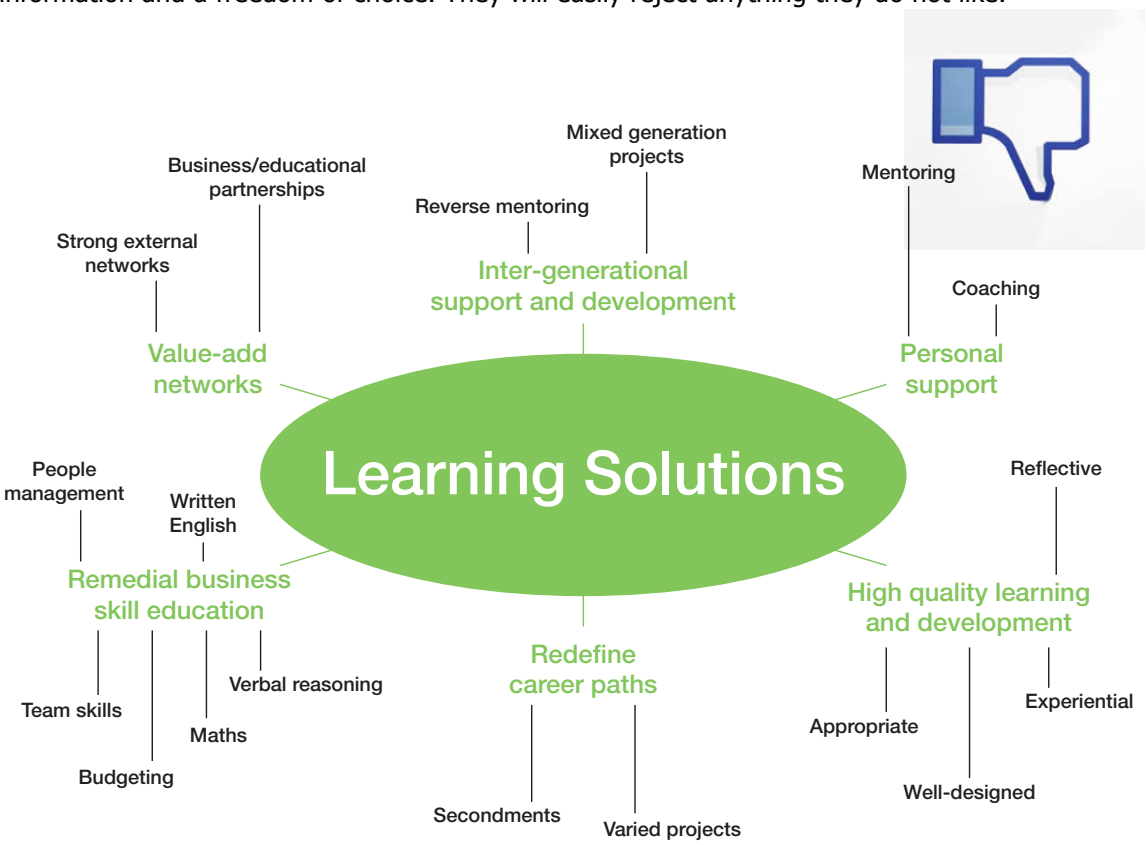


Figure 7: Learning solutions for Gen Y [23]

Experiential learning and exciting career opportunities and pathways will be important. This generation will take to concepts like on-line classrooms, opportunities for virtual field trips and other creative methods of e-learning. Virtual learning hubs offering online links with a range of education and training providers and other potential partners could provide choices. For pre-employment education, industry linkages and work placements within the agricultural businesses would be an essential, integral part of learning, proving the link to reality that current agricultural education approaches are mostly lacking.

Drivers of change for the vegetable industry

Agriculture White Paper

The 2015 Agriculture White Paper states that the agriculture sector needs access to the most advanced technologies and practices to continue to 'farm smarter'. It therefore allocates funds relevant to education and training to:

- Focusing on better training through the $664.1 million Industry Skills Fund
- Extension of the Rural R&D for Profit Programme to 2021–22 to get research onto the farms ($100 million)
- New RD&E priorities to direct levy funds to areas that will improve farm gate returns
- Establishing a new Ministerial Advisory Council on Skilled Migration to review the list of occupations available for sponsorship under the 457 visa.

[23] Schofield C.P. and Honore S, 2010. Generation Y and Learning. The Ashridge Journal, Winter 2009-2010

An overall implementation of the White Paper will drive changes in the vegetable industry through hopefully tax reform, fairer competition on the domestic market, and better market access, less red tape (better regulation), improved infrastructure and drought risk management and support.

The White Paper talks about support for the "creation of learning hubs or centres of excellence in regional Australia". The main objective for these is to keep (young) people in rural areas by offering education and training.

Vegetable industry outlook

Considering drivers of change and trends that will impact on the vegetable industry is essential for developing an understanding of a potential problems and solutions related to education and training.

The following macro and micro-trends that can reasonably be predicted should be considered:

Macro-trends

- Demographic trends such as the ageing in the 'western or western orientated' countries and the 'youth bulge' and westernisation in Asia and developing countries.
- 'Next Generations' having very different styles of learning and demands
- A hunger for training and education in Asia and developing countries; people with a wide range of aspirations will come to Australia to study and work, including in the vegetable industry this will affect social and cultural changes amongst the Australian population that change values, attitudes, fads and fashions.
- A lack of tertiary educated agriculturalist leading to 'importing' of well trained people for overseas e.g. Asia and Europe.
- Culturally driven changes in the eating and recreational behaviour of both developed and developing countries.
- Major markets will generally remain volatile, price driven and increasingly demanding premium quality without price differentials.
- The integration of supply chains especially vertical integration; producers have to be more integrated with the supply chain through quality and safety systems.
- A continued attention on the consumer driving the focus of wholesalers, processors and retailers.
- The quest for economies of scale is driving the concentration of retailers and they in turn are seeking larger, more stable, brand-less commodity producers, driving a requirement for economies of scale in production.
- Use of smart production technology (precision farming, robotics) is becoming increasingly required to supply the quality and product characteristics required by the consumer/retailer and maintain margins.
- The number of full time farmers whose sole or major source of income is from farming will continue to decline while the average size of businesses will increase.
- Improvements in production management are emphasising precision, scale, uniformity of quality which all requires high management and employee skill levels.
- Consumer driven environmental and food safety concerns influence management techniques further towards a triple bottom line perspective.
- Food security considerations influence the nature of the food and fibre supply chains. Overseas food security considerations influence land purchases.
- Climate change will have variable effects dependent on the location and production systems, however there are both positive and negative effects.

Micro-trends

- Generally increasing competition from countries that either have cheaper cost structures or are

subsidised. This lack of competitiveness is based on higher labour and production input costs and small scale of production units. For vegetables, competition will be more internally focused between Australian businesses but essentially will be driven by the same principles; scale, cost, quality and customer focus

- Increasing imports of cheaper foreign farm commodities into Australia. For example, imports of frozen vegetables
- An increasing employment of specialised contracting firms to carry out many of the agronomic production processes because contractors offer significant increases in efficiency
- The increasing specialisation of labour as farm businesses grow in size and division of labour occurs. However, the employees of the emerging industry will need to be more highly skilled, probably with higher-level VET type qualifications or university degrees, and will be attracted by salaries, career structures and conditions that will be competitive with careers in other non agricultural industries
- Rapidly advancing technologies that have the potential to fundamentally change industry and society such as nanotechnology, biotechnology and biomedicine, functional foods, advanced computing and information technologies; robotics, cognitive neuroscience, and new materials.
- The choice between niche/speciality and commodity based production will become more pronounced.

6 Output 2 – review of previous studies and identifying potential strategic gaps

Introduction

The education and training needs of the sector have been the focus of several previous projects. The key studies are briefly summarised here. They provide valuable background information on the education and training needs of the sector and possible mechanisms to implement industry specific training.

The specific vegetable industry studies reviewed were:

- Macquarie Franklin's 2012 review of the skills and training needs in the vegetable industry[24]
- AUSVEG's 2013 investigation of future training and education opportunities[25]
- Stride Consulting's 2014 scoping study of a Vegetable Industry Academy of Excellence[26]

We also examined a number of recent studies that looked more broadly at education and training needs in agriculture. These were:

- The Australian Vegetable Industry Development Group's 2007 review of training needs specific to business skills and leadership development[27]
- The National Quality Council's 2010 study of regional skills development and the agrifood industries[28]
- Agrifood Skills Australia's 2012 environmental scan[29]

Our initial desktop review also included a comprehensive review of previous similar studies. These included studies undertaken by and the Australian Vegetable Industry Development Group (2007).

We correlated the relevant conclusions of all of these previous studies and categorised them into what we believed were the potential strategic or conceptual gaps in meeting the training needs of vegetable growers, and utilised this during the consultation phase of the project.

Macquarie Franklin, 2012

Macquarie Franklin was engaged by AUSVEG in 2012 to undertake a review of the skills and training needs in the vegetable industry. They undertook this review in two parts. Firstly, they completed a desktop review of the existing training programs and tools available to the vegetable industry and then they surveyed growers to better understand their training needs.

This comprehensive review has become a primary reference document for understanding growers' education and training needs and thus, guide industry investment in this area.

In summary, the "Review of skills and training in the vegetable industry" (Macquarie Franking, 2012) found that vegetable producers surveyed identified four key skill weaknesses:

- OH&S
- Marketing

[24] Macquarie Franklin 2012. Review of skills and training needs in the vegetable industry. Final Report to AUSVEG

[25] AUSVEG 2013. Investigating future training and education opportunities for both new and existing vegetable industry members. VG12077 Final Report to Horticulture Australia Limited.

[26] Stride Consulting 2014. Vegetable industry Academy of Excellence. VG13059 Final Report to Horticulture Australia Limited.

[27] Fullelove D and Australian Vegetable Industry Development Group. 2007. Australian vegetable industry training needs analysis in business skills & leadership development

[28] National Quality Council 2010. Regional skills development and the agrifood industries, prepared for the National Quality Council by Lista Consulting and TVET Australia

[29] Agrifood Skills Australia 2012. Environmental scan – http://www.agrifoodskills.net.au/?2012Scan accessed July 2015

- Information technology
- Compliance/quality systems

The key skills that producers wished to improve were:

- Information technology
- Business/financial management
- Marketing
- Soil/nutrient management

Some of the above mentioned weaknesses and needs are currently being addressed by HIA projects (OH&S, soil/nutrient management, market knowledge). HIA is also funding a leadership program for young producers "Growing Leaders".

Our review particularly focussed on the first component of the work by Macquarie Franklin, as our focus is on the appropriate strategic response by the industry, rather than the operational specifics of particular skill needs.

The key findings of Macquarie Franklin's desktop review can be summarised as:

- Growers tend to have apathy to training and, in the majority of cases only participate to address financial/market of legislative imperatives (compliance)
- Growers are more likely to undertake training in individual, relevant units rather than committing to a whole course or qualification
- Many VET (Vocational Education and Training, or TAFE style) courses on offer do not meet the needs of vegetable growers
- The lack of business and marketing skills in the farming community is a concern
- The computer literacy of vegetable growers is highly variable
- There is a heavy reliance on workers who speak a language other than English in the Australian vegetable industry, which raises issues around communication and training
- The quality of the delivery of training and extension programs to vegetable growers is highly variable
- There are limited opportunities for appropriate training in business skills
- The provision and ease of availability of tools and information to support skills improvement is highly variable across the country
- The reality that the majority of information is distributed via the internet is currently a concern, given the variable computer literacy skills of vegetable growers (this may change with generational changes).

This research also identified that to effectively address the training needs for the vegetable industry, the methods of delivery are critical. The following findings were reported:

- Targeted, topic specific (not generic) training is important, especially for employees
- There is high demand for informal learning such as field days, workshops and farm tours and that producers wish that these opportunities should remain supported
- External advisors and consultants are highly regarded by producers as training providers and key sources for learning about research outcomes and new technologies, resources and tools
- Tools, calculators and other extension materials have little value if supplied as standalone self training resources
- Subsidies and grants could be an incentive to producers for the training of their workers
- Encouraging and supporting young producers will enable the industry to evolve
- The VET sector is considered an important source of training but there are criticisms of the VET sector that will need to be addressed for producers to engage more closely with the VET sector.

Investigation of future training and education opportunities

Following the Macquarie Franklin 2012 research, AUSVEG was contracted to investigate future training and education opportunities for both new and existing vegetable industry members (AUSVEG, 2013).

The project objectives were to develop concepts on how the vegetable industry might increase the uptake of horticultural courses by tertiary students. It looked at how to boost the training and upskilling of producers and their employees while limiting the impact on the day-to-day operations of their business. The project's focus was on university courses. Several universities were identified as delivering relevant agricultural courses: Curtin University (WA), University of Western Australia (WA), University of Adelaide (SA), University of Tasmania / Tasmanian Institute of Agriculture (TAS) and University of Queensland.

The main findings from VG 12077 were:

- Many agricultural courses have either been discontinued or merged into other courses, which means that enrolment numbers are not a true indicator of industry graduates they produce
- None of the universities courses do exclusively focus on horticulture; a number of agricultural courses have a reduced or limited focus on horticulture
- The majority of enrolments in agricultural courses may not translate into horticultural careers
- A perception of an apparent shortage of career prospects in horticulture appears to exist
- At the moment, students are not gaining access to essential job-related knowledge, which consequently would guide them through their university degree to consider horticulture as a career

Universities representatives suggested strategies about how enrolments could be increased and courses more targeted towards horticulture.

The main recommendations from VG12077 and progress to date:

- Investigate the feasibility of a scholarship program or scheme to ensure graduates enter the vegetable industry. Progress: No follow up to date. NB: A similar recommendation came out of the International Horticultural Congress 2014 – encouraging and supporting internships.
- Provide vegetable levy payers with direct access to funds that would subsidise skills enhancement and education. So far access has been provided to training such as the negotiations skills program, new product development skills, export readiness programs, WH&S package and training program. However, these initiatives are not part of an overarching 'program'. Many people are expecting a structured approach (e.g. VAA or other 'Vegetable Industry Training Initiative') to deliver this. A number of growers have expressed that they would like an education and training program.
- Engage a marketing mechanism that promotes the virtues of the Australian vegetable industry and participation within it. The "mechanism that promotes the virtues of the Australian vegetable industry" has been addressed. This is the current project VG12090 "Conveying the positive social, economic, environmental and other benefits of the Australian vegetable industry". The CA advisory panel strongly supports this work. This platform could be expanded to include the final element of the recommendation "and participation within it".

Vegetable industry Academy of Excellence

Building on these two investigative projects, Stride Consulting was commissioned in 2014 to conduct a study into how the training needs of the Australian vegetable industry could be met under project VG13059.

This research recommended the establishment of a "Vegetable Academy (VAA)". VG13059 states:

> *"It is not the VAA's role to replace or substitute for the work of mainstream post secondary education and training institutions. ...such qualifications from good quality post secondary*

institutions like Universities and TAFEs provide irreplaceable career foundations in knowledge, understanding, analytical skills, and confidence. The Academy would effectively add to the services of existing training providers and or cooperate with them to develop and provide focused short course training programs for vegetable producers and or their staff dedicated to the following topis:

- *Strategy and profits*
- *Managing and communicating*
- *Producing and selling*
- *Science and sustainability*
- *Technology and advantage*
- *Innovation and progression*
- *The world of vegetable businesses*

This study also briefly touched on other education offerings available to vegetable producers including courses on leadership and negotiation being run specifically for producers using the vegetable levy with matched funds from Australian government and the Nuffield scholarship program.

It provides a model for a structured training initiative with firm governance (e.g. boards, CEO/director), a program based on a curriculum with seven pre-determined core modules, courses mainly of 2 day duration and contracted staff to deliver the training in convenient locations in major cities.

Potential strategic or conceptual gaps

We believe that potential strategic or conceptual gaps are:

1. Our understanding of growers' actual knowledge and skill needs (these may not fully match those mentioned in surveys, needs mentioned in surveys may be a 'wish list', not matching what they would commit to)
2. The relevance of existing training services to the vegetable businesses' success
3. Spatial and financial access to training
4. Growers' training preferences for themselves and or their staff (contents, delivery timing, format, flexibility etc.)
5. The delivery and quality of available training
6. The possible time commitment to training for business owners and staff, given multiple demands on time
7. Understanding training needs of employees (from workers to managers in the vegetable industry), and
8. The flexibility of training providers and courses / services on offer to cater for specific needs (e.g. topics, timing and delivery format and place).

Table 2 describes potential gaps based on a review of the previous reports. The table covers points 1-5 from the above list. Points 6 is potentially answered by the information provided by Macquarie Franklin (2012) and ABARES statistics, which both show that vegetable growers prefer workshops and field days, which require usually less than one day of time. Point 8 will be addressed through our research for the database of training and education services and our corresponding analysis.

The gaps summarised in Table 2 are discussed in more detail following the table.

Table 2: Potential gaps identified by the scoping study based on a review of the previous reports

Potential gap	Vegetable specific reports	Agrifood Skills Australia (2012)	National Quality Council (2010)	Agrifood Skills Australia (2009)	Australian Vegetable Industry Development Group (2007)
Skill needs	The lack of business and marketing skills in the farming community is a real concern. The computer literacy of vegetable growers is highly variable.			Research shows vegetable growers need skills in business management, financial management, people management and marketing.	Require more leadership (management?) and business skills tied to the profitability of the business.
Relevance	Growers tend to have apathy to training and, in the majority of cases only participate for financial/market of legislative imperatives. Many VET (Vocational Education and Training) courses offered do not meet the needs of vegetable growers.	Skills and training programs need to be linked to the latest industry innovations. Delivery of skills and knowledge that enable workers to optimise new technologies, equipment and practice.	There is disengagement from qualifications by agrifood industries.	There are low levels of participation in formal education and training. There is a belief amongst farmers that training does not meet their needs.	
Access	There are limited opportunities for training in business skills.	Need innovative responses to the skill needs of a non-traditional workforce, such as, seasonal labour, contractors and remote workers.	There are difficulties in accessing high quality training in regional, rural and remote areas.	There are more barriers to participation in rural and regional areas.	A key driver of engagement is the convenience of training.

Potential gap	Vegetable specific reports	Agrifood Skills Australia (2012)	National Quality Council (2010)	Agrifood Skills Australia (2009)	Australian Vegetable Industry Development Group (2007)
Preference	Growers are more likely to undertake training in individual units rather than commit to a whole course or qualification.	Building blocks and incremental skills development.	There would be more engagement by industry if there was a more "building blocks" approach to skills development.	There is a strong preference for informal training and skills development.	There is a preference for delivery in small group workshops, study tours and visits to other farms and businesses along the supply chain.
Delivery	Language barriers are a major issue in some areas. The quality of the delivery of training and extension programs to vegetable growers is highly variable. The reality that the majority of information is distributed via the internet is a concern, given the variable computer literacy skills of vegetable growers. The provision and ease of availability of tools and information to support skills improvement is highly variable across the country.		The policy landscape and implementation of it is confusing and inconsistent.	Vegetable growers do not access training because: • Its too generic • Too lengthy • Inconveniently located • Presented in unappealing ways They prefer experiential learning with a "hands on" approach rather than teacher/classroom centred delivery.	Training is ad hoc with little co-ordination.

Skill needs

It has been documented that growers in many industry sectors have specific skill needs in the areas of business, financial, human and marketing management i.e. topics that do not cover production technologies. Previous studies support this view for vegetable producers. These are the fundamental generic skills required by any business owner or operator, although the specific application of these skills differs significantly between industries and, some may say, between individual businesses.

We believe this gap arises because of the relationship of a number of unrelated factors. Firstly, there is a general belief that managing a vegetable growing farm (and any business) has become more complex over time and thus, the need for higher-level management skills have increased.

However, a potentially more important factor may be the culture of vegetable growing on small to medium sized farms and which is comparable to that of any small business. The owners or operators of a small business usually enter that business because they have a passion for what that business does, not because they want to be 'business people', 'marketers' or 'people managers'. Vegetable growing on a small to medium scale is no different. Most small to medium scale vegetable growers want to grow vegetables, however if they want to be profitable, they also need to run a business.

Large-scale operators who have developed from smaller vegetable growing businesses have done exactly that, i.e. focus on the business and create a scale and structure where operational tasks are handled by qualified staff. These developments were driven as much by personal attributes and acumen of the business owner, as by their formal or informal training. As a result, some staff employed by owners of larger scale vegetable businesses have higher attainment levels than the business owners. Therefore, just surveying owners may not provide a true picture of the actual skills profile (and training needs) in these businesses. The challenge for these businesses may not be the provision of training to themselves or staff but finding qualified people who are "industry ready"; education may be a greater need than training for these businesses.

Furthermore, the history of education and training for those already in the vegetable industry has largely focussed on the technical side of growing vegetables. It is no surprise to us that growers prefer technical training that is specifically relevant to their business and delivered informally and locally (refer to the following sections). This has been the basis of most technically focussed production extension and training for many years. However, business and or marketing/supply chain management training has been traditionally delivered in a generic and formal 'classroom style' way.

Not only have growers not previously seen the relevance of (generic) business or marketing/supply chain management training, but also it has been difficult to access it in a way that matches their preferred style of learning, and available time for it. Pressures on resources, inputs and prices have increased and profit margins eroded, which now has lead to an increased awareness of the importance of business related training. Still, the training would have to meet the main criteria of 'adult learning' and 'farmers learning' principles to be taken up by large numbers of growers. Potentially, growers who would benefit from training in 'the business of vegetables' may not like to participate in training in a setting where they are together with competitors.

In our analysis so far, there appears to be a gap in business and marketing/supply chain management training that is specific to horticulture and particularly vegetables and in an appropriate delivery format. Therefore, it is obvious that there is a strategic gap in the provision and uptake of these specific skills in the industry, however some previously designed and promoted training activities in this area have not been well utilised by vegetable growers. Thus, we may need to examine different ways of meeting this need.

Relevance

Macquarie Franklin's (2012a) first and, in our opinion, most telling conclusion was that:

> *"Growers tend to have apathy to training and, in the majority of cases only participate for financial/market of legislative imperatives."*

We agree with this conclusion, except for the use of the word "apathy". Apathy implies a lack of interest in something that others see as important, however we believe the issue is one of relevance, not apathy.

Naturally growers only want to participate in training that is relevant to their business, i.e. because they have to comply to keep operating (legislative imperatives), to access a specific market (market imperatives) or to add value to their business outcomes (financial imperatives). This appears perfectly rational to us.

We believe the Macquarie Franklin review (2102a) and survey report (2012b) are excellent, however we also believe that there is one flaw in the survey that every researcher faces, and is often near impossible to overcome, when undertaking such research, i.e. how to engage the disengaged.

The survey was available online, or was delivered in-person via a face-to-face interview or by telephone. When conducting the in-person interviews, the respondent was first asked, "*if they were interested in participating in the study and providing their perspective on skills and training in the vegetable industry*."

Thus, the survey is biased towards those who are "*interested*" in the topic of the survey, in this case training and providing a perspective. It is reasonable to assume that this would most likely be growers who have been more highly trained and see the benefit of such training, had a recent experience of training (good or bad) which they wish to share, or are simply participating for the broader good of the industry.

The educational attainment levels of those who participated in the survey are compared with those of the industry, as measured by ABARES, in 2012, which was the year of the survey.

Table 3: Educational attainment levels of the survey sample vs the ABARES data

Educational attainment	Survey sample	ABARES data
Primary school	n.a.	3%
Year 10 or less	22%	44%
Year 11 or 12	13%	28%
Trade apprenticeship/technical	32%	11%
University education	24%	13%
Other or not specified	8%	n.a.

Source: Macquarie Franklin (2012b) and ABARES (2014)

The data shows that:

- 35% of respondents had completed Year 12 or less, compared to 75% of the industry
- 56% of respondents had a post secondary education, compared to 24% of the industry.

Therefore, the educational attainment levels of the survey respondents can crudely be described as twice that of the rest of the industry. In other words, those growers who chose to participate in the survey had far higher levels of educational attainment than the rest of their colleagues in the industry.

This fact does not diminish the worth of the survey in identifying the training needs of growers, however it does mean that its results and conclusions are based on those growers who are more highly educated and therefore, more likely to see the value and relevance of education and training. Therefore the survey does not capture why the "average" grower does not see training as relevant. This is a strategic gap.

Access, preference and delivery

The Macquarie Franklin review (2012a) and many previous studies have all identified access (flexibility), preference and delivery method and/or quality as barriers to vegetable growers participating in education and training. These conclusions have formed the basis of much of the discussion about how to increase the uptake of education and training in the industry since this work was completed.

As Agrifood Skills Australia (2009) put it so succinctly and accurately:

Vegetable growers do not access training because:

- *Its too generic*
- *Too lengthy*
- *Inconveniently located*
- *Presented in unappealing ways*

They prefer experiential learning with a 'hands on' approach rather than teacher/classroom centred delivery. The quality of presenters is important. Regional delivery is part of relevance. Growers do not want to be trained together with their competitors in business sensitive areas.

Whilst there is an overlap between above gaps and relevance, i.e. the training is more likely to be perceived as irrelevant if it is not accessible, too generic, low quality or not delivered in the preferred way, or at a location that is convenient or the cost too high. Addressing gaps by topic alone will not deal with the issue of relevance. These are all aspects of delivery, which, if improved, will make training more attractive to those who seek it, however it is the content and perceived outcomes/direct applicability of training that will encourage growers to seek it in the first place for themselves and their staff.

What is the problem?

Our scoping study brought us to believe that the problem has two main components:

1. Relevance – content and culture
2. Access, preference and delivery – availability, delivery method, quality, cost and location

Macquarie Franklin's (2012a) first conclusion is right. Growers will participate in education and training if it is relevant to their business and, most likely, **only** if it is relevant to their business. Thus, they will seek training that will improve their business lives, i.e. make things easier, better, faster or more profitable. Once they recognise that need and an opportunity, they will seek training that they can access and is delivered in their preferred style at a convenient location and time. Why would they do anything else when they have a business to run and a life to live?

A conceptual framework

Part of the objective of this study is to provide a rationale for HIA and the vegetable industry on how best to meet education and training needs, or 'fix the problem'. Thus, the industry needs to think strategically about what and how it should respond. We believe that a conceptual framework is needed to guide the industry's thinking on this matter during this project and prevent a jump to a 'quick fix' solution that does not have an appropriate rationale, or does not directly address the strategic gaps.

Given the conclusions we have drawn so far about the problem, we believe that framework has two sides, one for each component of the problem. This framework and its two sides are represented in Table 4.

Table 4: Draft conceptual framework

GOAL: Further improve the uptake and impact of relevant education, training and skills development in the vegetable industry		
Timeframe	**Short-term to medium term**	**Long-term**
Objective	Want to meet the actual need; want producers to take up the opportunities	Impact on productivity and sustainability of vegetable producers
Strategic gap	Access, preference, delivery – availability, delivery method, quality, cost and location	Relevance – content and culture
Primary audience	Training/extension providers (formal and informal)	Vegetable growing businesses (owner/growers and staff)

We believe that the industry needs to tackle the strategic gaps simultaneously, as they are inter-related, however the issue of relevance is a long-term job.

The primary audience for relevance is growers, whom we want to recognise the opportunities quality training for them and their staff can create. **The industry needs to implement multiple strategies over times that generate a culture of education and training**.

The issue of access, preference and delivery/flexibility/quality is a short-to medium term, but also ongoing job. The primary audience here is formal and informal training providers, whom we want to meet the actual needs of vegetable growing businesses. **The industry needs to develop and implement strategies that influence how training providers go about their business (supplying relevant, quality training).**

Thus, we need to create mechanisms that will influence both the demand for and the supply of training.

7 Output 3 – The education and training landscape

Education and training providers relevant to the vegetable industry

In general, the current Australian institutional and organisational structures supporting education and training include state and federal departments of agriculture and natural resource management; private extension providers; private agricultural businesses; vocational education and training providers; the national training authority; state training authorities; industry training advisory bodies; research and development corporations; Universities; farmer organisations; and other non-government organisations (RTOs and non-registered organisations). Increasingly, online training services are offered for agricultural audiences. These online providers may or may not be Australian based.

The majority of **formal education and training** providers are government funded on a 'throughput of students' basis; there are no rewards attached to outcomes on farms or impacts on profitability of the industries they service. Some VET providers work closely with industry e.g. with industry controlling content and, to a degree, delivery mechanisms. This provides a closer link between industry needs and training services.

The existing formal structures and institutions would have elements that foster effective learning (e.g. based on links with industry, using project or problem based approaches), and elements that do not foster effective learning (such as they way formal providers are rewarded as an organisation and or the way organisations reward their staff).

A wide and varied group of organisations and people are involved in providing **informal training** (extension) services to the agricultural sector. These include public sector and industry or project funded extension officers (including Landcare, industry projects, IDO's etc.) private sector consultants (on all aspects of farming, including farm management, personal relationships, finances, taxation, business development etc.), agribusiness employed field officers, product sales advisers/agronomists, researchers, rural banks and more. The professional development and reward structures for these practitioners may or may not be linked to their ability to foster learning on farms and advance the agricultural industry. Previous sections in this report showed evidence for the fact that many vegetable producers value informal training opportunities such as workshops and field days for a range of reasons.

While extension type training appears to rely on informal providers a great deal, and may influence outcomes on farms, information on its significance, quality and actual impact is sketchy. Our knowledge of education, (ongoing) training, competencies, the employment environment and career opportunities of these varied groups of informal training providers is limited. It was outside the scope of this project to investigate this sector in great detail.

Desirable knowledge and skills required and taught

Fundamental overarching themes and principal knowledge and skills areas (topics) that are relevant to the vegetable industry and should thus be covered across education and training services at different levels as appropriate have been recorded in an education and training database. Themes are: Science, Technology, Production environment, Field production, Protected Production / hydroponics, Postharvest, Business, Economy, Markets, People, Research, Information transfer. Several knowledge areas sit under each theme; they can be viewed in the database and are also summarised in table format under section 10 Outcome 1 – gap analysis.

Education and training courses offered through Universities, TAFE and on-line courses have been reviewed to find out whether and to what degree they cover these overarching themes and principal knowledge and skills areas. We also evaluated how well education and training providers communicate course contents and potential job opportunities.

The excel database containing details of the review of education and training courses has been provided to HIA as an electronic file. The following sections summarise our findings about formal education and training.

Education and training services for the vegetable industry

A search of the **Myfuture website** (myfuture.edu.au), for keyword "horticulture" returned 348 results; many are related to amenity horticulture, as well as environmental or landscape management and topics associated with animals.

Searching for "horticulture" and "vegetables" at the same time and for all qualification levels, 11 results could be found; 10 were Certificate in Production Horticulture courses II, III and IV by TAFE NSW, WA or offered 'nationally' (which on close inspection still only covered selected states).

The Certificate course summary on the website is: *"This qualification is part of the Agriculture, Horticulture and Conservation and Land Management Training Package. It reflects the role of personnel working on production horticulture farms. The qualification can be contextualised for a tree cropping, vegetable, and berry or flower production or mushroom production context as a job focus or, in the case of mixed enterprises, both. The job opportunities listed for Certificate holders are 'Horticultural tradesperson' and 'Rural heavy vehicle operator'"*.

National services thrown up be the search included one Diploma / Advanced Diploma in Production Horticulture course that is offering the following Subjects / Electives: "*Diagnose plant health problems; Manage a controlled growing environment; Develop a plan for a hydroponic system; Manage active operational emergency disease or plant pest sites; Market products and services; Monitor and review business performance; Design drainage systems; Design water treatment systems; and more."*

Higher qualification levels such as "Associate Degree" and undergraduate or postgraduate degrees were not found when searching for "horticulture" and "vegetables".

The findings highlight a potential gap in relation to available education and training services and pathways as well as the communication about them e.g. information for potential students on meaningful job and career opportunities in horticulture and the vegetable industry in particular.

The searchable **career harvest website** (http://www.careerharvest.com.au/), an initiative by the Australian Council of Deans of Agriculture provides information on a range of career options, opportunities including internships and scholarship and education pathways for agriculture, forestry and aquaculture.

A search for 'vegetables' came up with three options; 1 - Farm manager / owner /overseer, 2- farm hand / station hand and 3 - fruit/vegetable farm hand.

1- Farm manager / owner /overseer career path: "For this Position, the skills required could have been developed through on the job training, previous work experience in other related roles and through specialised and/or vocation training and/or through a Tertiary Qualification in Science, Humanities or Commerce."

Suggested education and training providers - Specialist vocational training and further education: Marcus Oldham Farm Management College, Australian Agricultural College Corporation, Longerenong College/Workco Ltd.

Tertiary Education: NSW Charles Sturt University University of New England, The University of Sydney, University of Western Sydney, Victoria: La Trobe, The University of Melbourne, Marcus Oldham Business School, South Australia: The University of Adelaide, Western Australia: Curtin University The University of Western Australia, Tasmania: University of Tasmania, Queensland: James Cook University, The University of Queensland.

2 7 3 - Fruit / vegetable / station farm hand: Perform farming operations to raise livestock and cultivate crops, fruit vegetables and other agricultural products.

7.1.1.1 Review of services by Universities for the vegetable industry

Course descriptions and website navigation - A web based review of the agriculture courses offered at Australian universities shows that the websites are generally easy to navigate, however the difference in 'language' between each university does cause some confusion. Whilst some universities refer to separate subjects as units or courses, others refer to the points allocated to each subject as units, making it hard to decipher what is meant, as this is not clearly explained. Another confusing difference between the universities is the points allocated to each subject and what is required for each course as they differ between each one. With the exception of the University of Western Australia they all offer an easy to use search option that yields clear results. 'Agriculture' and 'horticulture' were used as search words for each search and this resulted in finding the applicable courses.

With the exception of University of Queensland and Charles Sturt University, which provided detail on some courses about what was being taught under each subject or each week, the descriptions were quite broad. Some course descriptions were very overarching and did not provide much detail. With these courses it was hard to decipher what was being taught and choose what to study or understand what it might lead to as far as job opportunities are concerned. In compiling the University courses database, assumptions on courses were not made. If topics were not mentioned in the description on the web, then it was not noted in the database.

It was not made obvious on the websites whether or not it is possible or easy to complete courses from other universities as part of your degree. As some universities offer courses that others do not, it would be beneficial to be able to complete courses from more than one university to be able to tailor the degree to suit your needs or the needs of the industry you want to work in.

None of the courses offered specific content for vegetable production. Universities did not offer course units for separate enrolment e.g. as professional development course. Only undergraduate degrees were reviewed. Postharvest and supply chain management and especially protected cropping were not well covered in university courses. It would be hard to focus on new and emerging technologies as part of a university course.

Overall, course structures appeared to be quite rigid. Most appear to not have a focus on getting students ready to work in a production and marketing focussed farming business. A summary of findings is presented in the following table.

Details of course offers against themes and knowledge areas are captured in an Excel based database which has been supplied to HIA as a separate electronic file; a summary is included in Appendix 3 and some main points are listed below.

- With the exception of protected cropping all relevant knowledge areas and themes are covered to some extend throughout agriculture/horticulture degrees across Australia, although completing one specific degree does not mean that all topics will be covered in one degree. Cross-institutional study options would go some way to changing this. Science, production environment, field production, markets and R&D were better covered than the other themes and knowledge areas we investigated (e.g. financial / business management).
- University of Western Australia promoted short online courses well i.e. courses that people can do separately from their degree or even after they have completed a degree. These types of courses were not offered on any other university websites.
- Specialising within a degree was mostly offered through work experience and individual projects. Horticulture related subjects generally covered more than vegetables, i.e. orchards, grains etc., therefore time spent studying vegetable production could be quite limited in these courses.
- For any employer to begin to understand what a particular degree meant in terms of what has been learned (e.g. about vegetable production) is difficult. Detailed transcripts of course contents would be required from individuals as many degrees have broad titles, e.g. Bachelor in Agriculture.
- TAFE articulated places are seen in some universities, in particular Charles Sturt University has developed degrees which readily accepts students from the TAFE pathway rather than just the college pathway.

7.1.1.2 Review of services by registered training organisations for the vegetable industry

Registered training organisations would play an important role in training the workforce for the vegetable industry and preparing people for pathways into further tertiary education.

In agricultural education and training categorisation, vegetable production falls under the general category AHC10 – "Agriculture, Horticulture and Conservation and Land Management", "Production Horticulture". Vegetable production is mostly lumped together with fruit production ("fruit and vegetables"). However, many relevant subjects appear under "General Agriculture" and "Cropping" (broad acre crops like grains and legumes). Horticulture as a broad category encompasses amenity horticulture and landscape / garden design.

The RTOs registered to deliver relevant Training Packages are numerous and they can be found via following the National Training Information Service web site at: http://training.gov.au/.

The descriptions of a 'Production Horticulturist' or career paths that are open to somebody in production horticulture do not describe opportunities in the vegetable industry adequately (see for example http://agrifoodskills.site-ym.com/page/prod_horticulturist); words like technology, innovation, environment, economics, marketing, export, strategy, supply chain, export or policy do generally not appear for any level of attainment.

We have collated information on relevant courses under AHC10 - Agriculture, Horticulture and Conservation and Land Management and checked these against the 'desirable knowledge and skills list' (in the Excel database supplied to HIA).

Courses reviewed include Horticulture and Agriculture at a variety of levels, including:

- Certificate I, II, III or IV
- Diploma
- Advanced Diploma.

Navigation of websites - A review of TAFE course information online shows that the websites are generally easily navigated, with many providing easy browsing options and/or course finders. These are typically classified by course area (e.g. we searched by key words agriculture and horticulture), so it is a relatively easy and quick process to find out if a particular TAFE offers a course of interest. Course information online appears well coordinated in some States (e.g. webpages are consistent in their layout and operation), but not all. This affects how quickly and easily course information is obtained and whether services can be easily compared.

Description of courses, terminology - Courses are commonly described in a generic nature only, with varying levels of subject detail provided. Some institutions provide complete unit outlines or detailed subject lists, while others do not. This may be due to the flexible style of TAFE course delivery and/or the timing of courses on offer. Nonetheless, this may make it difficult to assess the content and thus suitability or availability of key areas of interest for a potential student.

Understanding terminology is important. While vegetables may be considered part of horticulture, TAFE courses in Horticulture are largely not for the vegetable industries. These courses are primarily intended for those in, or seeking careers in, the nursery, landscape or parks and reserves sectors. While there are units within Horticulture that may apply to the vegetable industry (e.g. managing soils or diagnosing plant health) it is not clear these would be relevant. N.B. We have therefore not included Horticulture courses in detail here (except where there are Production Horticulture courses offered; these are included). The term 'Horticulture' is more often used in the sense of production horticulture for university degrees. For statistics, horticulture and viticulture are combined.

TAFE courses in Agriculture are more appropriate for the vegetable industry. These courses typically offer some core subjects (e.g. environmentally sustainable work practices and OH&S processes) plus a wide range of electives. Electives include everything from farm finance, planning and machinery to animal breeding, crop management and water use. Many of these would be applicable for those in, or seeking careers in, the vegetable industry. It appears that flexibility of subject choice is available and courses can be somewhat tailored to meet student needs. Many TAFE websites encourage students to make enquiries to discuss subject and course options before enrolling (or as part of the enrolment process).

A table in Appendix 4 summarises the range of programs offered that are relevant for the vegetable industry, throughout Australian TAFE colleges (detail is provided for the highest qualification available). More information on the specific subjects included in these courses (where available) is provided in the TAFE database compiled for this project.

Our main points from the review are:

Subject areas - Most of the subjects on offer relate to production, with most courses typically including units in soils and/or soil management. Plant nutrition, integrated crop management, plant protection and using machinery are examples of other commonly offered subjects. Some (but not all) courses include units in water and/or irrigation.

Nearly all courses require students to complete units in OH&S as a core requirement. Business subjects also feature in many courses (as electives) – mainly these are business planning and some form of financial management unit. Managing staff features in some courses.

While most courses appear to be generic, there are some that offer specialist areas – some offer subjects in organic systems or climate change, for example. These are limited in number. There is one course that offers a Diploma of Irrigation Management (at Challenger, WA) and two specifically for hydroponics: a Diploma of Production Horticulture (at Chisholm's Cranbourne campus, Victoria) and Commercial Hydroponic Crop Production (at Melbourne Polytechnic). There is one course that even offers several units on carbon sequestration and emissions avoidance (Diploma of Agriculture at Durack Institute, WA).

There are no units offered in agricultural technology (e.g. genetics, precision farming, robotics etc.) or in economics. Courses that offer units in understanding markets and marketing are limited, as are those that offer units related to postharvest and supply chain management.

There are some TAFEs who offer short courses in, for example, pest management, chemical handling, or machinery use (e.g. tractors or quad bikes). Many of these would be relevant to existing employees in the vegetable sector.

Overall, the information available online varies considerably. The best webpages include detailed course outlines with subject lists, course costs, location and delivery details. Some also include short video clips that promote the course. Unfortunately, some webpages only provide a few sentences of generic text, making it difficult to quickly and easily assess course relevance.

NB: these comments relate to an online review only – other subject options may well be available by discussing and tailoring a learning plan directly with the training provider (out of scope in this project).

Spatial distribution of courses - We looked to the major vegetable growing regions for any links between course offerings and industry relevance or need. Cranbourne campus (with purpose built greenhouse facilities) is located in Victoria's largest vegetable growing region (and the 2nd largest in Australia). In Tasmania, agricultural courses are offered at the Burnie campus, in the major vegetable growing region of northwest Tasmania. In Queensland, where the major growing regions are spread from the Burdekin and Burnett-Mary regions of the north to the southeast areas around Toowoomba and the Lockyer Valley, the relevant courses appear to be offered largely online, which is suitable for those already within the industry.

7.1.1.3 On-line courses with relevant content for the vegetable industry

Course descriptions and website navigation - A review of online agriculture/horticulture courses was completed using the Food Innovation Australia Limited 'Ag and Hort Courses Map' (http://www.fial.com.au/ag-hort-courses-map). This website was useful as it clearly describes what courses are available and provides a direct link to the page required to get further information, however a general web search for online courses for horticulture or vegetables does not bring this website up; one would need to know the name of the website to find it and benefit from its information.

Three main institutions provide relevant online courses; Canberra Institute of Technology, ACS Distance Education and Madec (VIC & SA).

The majority of the online courses are provided through one main institution; ACS Distance Education. The courses offered generally have a focus towards horticulture in terms of landscaping, turf

management and nurseries, still some crop production courses are available as well. This lack of courses for production horticulture appears to align with the career of the ACS principal, with a focus on landscaping, not commercial vegetable production.

The careers mentioned on the website are not very inviting if looking for a career in commercial crop production such as vegetable production, agronomy, research or consulting. They generally focus on the job opportunities; mentioned is being a farm worker, working in retail or becoming a gardener. There are numerous courses listed and they all tend to prepare for similar careers, so it would be hard to decide why one would choose one course over another.

Generally, information transfer and post harvest management are two categories where courses tend to be mostly lacking. This may not be the case for the Madec courses but as unit descriptions were unavailable, detail could not be provided.

When reviewing for the database whether or not a course taught a specific topic, we did not make assumptions. In the database, content was only 'ticked' as included, if it was specifically mentioned. Appendix 5 provides an overview of online courses. Details are included in the Excel database supplied to HIA.

Our main points from the review of online courses are listed below:

- The topics of Information Transfer and Post Harvest were not covered as well as other topics
- ACS Distance Education made industry projects and research projects readily available in most courses, which allows a student to specialise in a particular topic of interest. The student or employer would need to enquire further about this to ascertain more details
- Pathways of what was needed to get into each course and what it could potentially lead to as far as jobs or careers are concerned was generally lacking or hard to find
- Work experience was not a large component of the courses, even though this would be beneficial
- Some certificates listed on the FIAL website were not included in the review as they focused on topics such as land scaping and turf management.

8 Output 4 – approaches taken by other industries

This section reports on findings from our conversations with organisations that developed education and training initiatives.

Reasons for taking a proactive approach in education and training

The driver for developing specific industry or organisational training initiatives was consistent across all organisations.

The people we interviewed talked about insufficient or even non-existing relevant education and training services. Services were often highly fragmented across the country apparently without a common platform. Inconsistent approaches, messages and outcomes from training were the result. Inadequate resourcing of providers and/or industry specific expertise was highlighted. The latest R&D or technical / cutting edge knowledge was usually not being used in the training effort.

Overall aims of specific initiatives were to change the culture of an industry towards training and increase the amount of training undertaken as well as to provide easy access to quality training that is relevant. An important aspect for some was to improve the professional development of trainers or select the best trainers available and not be stuck with trainers that do not work out well. An overarching goal was to too improve the profitability and sustainability of the respective industry or organisation.

What was achieved and is working well?

The specific training initiatives led to relevant training programs to meet industry needs; in many cases, flexibility to respond to market changes was built into the system. The specific initiatives usually meant that the trainees did not have to complete unnecessary units. Better quality, commitment trainers could be engaged who are aware of the latest technology and research.

Many mentioned alignment around a key set of guiding principles and performance goals / outcomes as an important aspect of their initiative.

Some training initiatives have a 'user pays' approach to maintain independence, which works best if there is no competition and or the course is excellent. In some cases the businesses themselves carried the training costs (e.g. in graduate training). Most initiatives were based on using levy funds with matching funding from the federal government.

Flexible delivery in face-to-face training was often highlighted as an important aspect; i.e. training delivery is fitting around production times and topical themes. Online services were offered to allow those who cannot make it to a face-to-face training event to still participate.

Most highlighted that it is very important that the industry or organisation owns and manages the IP or at the very least, has a major role in content design and delivery (part or joined ownership). It was seen as crucial to the industry to maintain control over the training provided to their members to ensure their needs were met, rather than the needs of the training providers. Retaining ownership also provides the opportunity for branding of the training service, which helps with marketing and promotion, as well as profiling the industry.

In some cases, a partnership with TAFE works well, in others TAFE was found to be ineffective or difficult to align with, especially if industry organisations wanted to '*get on with it'*. The issue of alignment and cooperation seems to be dependant on individual colleges. AgSafe e.g. used to be an

RTO but did not renew its certification because there was no perceived advantage for the organisation or those who took the course.

"NCDE is a brand used by an alliance of 10 RTOs nation wide to deliver dairy specific training under the control and influence of Dairy Australia (DA). DA owns and controls the NCDE and courses provide the opportunity to get a Diploma (ASQA certified)"

An industry does not need to align with a formal training provider to be able to deliver certified courses. "*Once Grain Traders Australia (GTA) had created all training materials over a number of years and fine-tuning was done, GTA developed an* ASQA[30] *certified Diploma course; GTA owns all IP."* Similarly, the Cotton industry Best Management Practice (BMP) program was developed into a certified diploma course at a later stage.

Training programs that address different levels of need within the industry (e.g. farm hand – manager, small – large enterprise) are considered most valuable.

The cotton or dairy industries for example are also active in promoting their industry and education, job and career opportunities in schools rather than solely focussing on people already working.

The specific training initiatives provide clearer pathways and tangible job / career opportunities compared to generic formal training services for agriculture. Providing people with 'transferable skills' was mentioned as a positive aspect of training initiatives. The recent cotton industry workplace training program is a good example of a targeted but flexible program rolled out on farms which equipped people with transferable skills e.g. forklift licence, OH&S training.

In some industries, the focus was on individual extension programs rather than broader training initiatives. Extension programs usually have a more particular focus e.g. on increasing productivity through specific technology and new research knowledge. Successful examples are APAL Future Orchards®, MLA PROGRAZE® and "Making more from sheep / beef) as well as the cotton industry (CRC) IPM / BMP (Note that two are now registered trademarks). As mentioned above for cotton, extension programs can progress into more formalised training.

Well designed extension type training programs can have the advantage of an effective system of flexible, focussed regional delivery which can have oversight by a peak industry or other coordinating body. They can be started as a short-term commitment, continued if successful and adapted as required.

Leadership and personal development programs as well as scholarships (e.g. Nuffield) were seen as important for achieving the overall goal of creating a more productive and resilient industry.

Dedicated education and training coordinators were important for the success of initiatives. Our interviews highlighted that the success of initiatives hinges on the enthusiasm and commitment of the people driving it. "*Coordinators and trainers should have the respect of the industry*."

What did not work so well or needs further attention?

A focus on a rigid system of specific courses and qualifications from the start or 'retrofitting' competency-based training can hamper flexibility and effectiveness. (It takes at least three years to generate a new program in the formal sector.)

An important principle should be to fill knowledge and skills gaps as they are recognised rather than

[30] Australian Skills Quality Authority (Australian Government)

expecting everybody to 'go through the motions' of predetermined courses.

Using trainer language and making a training initiative 'trainer driven', not industry driven and using industry language was recognised as a stumbling block. A clear focus on outcomes for industry / organisations and impacts on farms is needed. Accessing training should be made easy; flexible delivery in timing and content as much as possible should support this.

Training initiatives we reviewed have not been evaluated formally to assess whether they are reaching their goals and where their strong or weak points are. Anecdotal evidence has been cited, i.e. that most producers say the training had a positive effect on their business. Impact assessments may help in providing useful feedback for adjusting contents and delivery as required.

When producers are looking for employees, the attributes ('soft skills') of a person are as important as a certain training certification. In agriculture, the formal training certification is often not a top key selection criterion. Verbal or written references about knowledge, skills and attributes of a person are in many cases considered more important than formal qualifications.

Education and training needs to have a focus on 'industry readiness' i.e. that what is learned is relevant and can be applied. Formal education and training often lacks an 'on the job' component. Personal development is usually not included in training initiatives.

Reward mechanisms for formal education providers are vastly different from those that reward producers, i.e. providers are not rewarded for producing 'industry ready' people who can have a positive impact on productivity and sustainability on farms. Their reward is funding based on throughput of students, not outcomes. There is very little input from employers into formal training plans.

It is hard to judge the quality and impact of informal training (extension, training courses delivered by agribusiness etc.). Evaluations of funded informal training / extension events may address this. A 'training / skills passport' was mentioned as a concept for acknowledging participation in informal training.

Generally, there needs to be greater attention on training trainers.

What do findings mean for the vegetable industry

A specific education and training initiative for the vegetable industry can benefit from the experiences from other industries such as:

- Have clear goals and principles
- Maintain ownership of the initiative and IP, use branding if possible
- Do not formalise contents and delivery mechanism too early, if at all
- Seek feedback and react to it to maintain relevance and flexibility
- React to specific needs – consider regional needs, timing, business size or focus, prior knowledge and skills
- Fill gaps, do not repeat what is already out there, prioritise and focus
- Engage high quality, committed coordinators and trainers
- Train trainers or facilitate their professional development
- Explore on-line options
- Create pathways and promote interesting jobs and careers
- Look after personal and leadership development (potentially also in trainers)
- Assess outcomes and adapt as required to maintain relevance and impact

- Consider a ‘knowledge and training passport’
- Continue to communicate with formal education and training providers to assist them in being relevant and providing ‘industry ready’ people
- Continue with / commence a program with schools, potentially work together with other industries on this.

9 Output 5 – consulting, validating and testing with industry

Meeting the needs of a diverse industry

The Australian vegetable sector is characterised by a diverse range of businesses, owners and employees. It must be recognised that there is no 'average vegetable producer' or typical vegetable business or employee profile applying to the approximate 7,000 levy-paying vegetable producing businesses if we are to develop an education and training approach which meets the requirements of all of the vegetable industry.

There is significant variation in the age, cultural background, education and training level, strategic outlook, as well as operation size, production system, business models, supply chain integration, and business priorities. Location, vegetable types and business relationships contribute to the diversity. There is also a heavy reliance on workers who speak a language other than English with very variable backgrounds and culture, which poses a challenge for many employers and training providers. Furthermore, the challenges and needs in the industry vary greatly by crop, region, and farm (amongst the multitude of other factors). All of these factors will impact on how vegetable producers seek, understand and utilise information that relates to their business and their attitudes to education and training for themselves and their staff.

Therefore, a nationally relevant, effective education and training program must take a strategic approach to address the priority challenges and opportunities common to a majority of the industry and focus on outcomes that will have the greatest impact on its economic sustainability. This strategic approach also has to address priority regional or crop related needs, as neglecting them will impact on the entire industry (e.g. food safety) and render the program irrelevant.

Industry stratification and education, training and extension approaches

The findings of our industry consultation would suggest that vegetable producers should be clustered into three loose groupings for the purposes of designing and delivering an effective industry education and training program that meets their needs. These loose groupings are based on the size of their operation, their attitude towards training, innovation and change (progressiveness), and their capacity and willingness to adopt new concepts and technologies.

The groupings proposed below were identified through consultation with vegetable growers and the review of industry development needs, outlined in reports such as the Review of Skills and Training in the Vegetable Industry conducted by Macquarie Franklin in 2012.

These three loose groupings, which do not have clearly defined boundaries, are:

Progressive vegetable producers

These producers manage large businesses that contribute significantly to Australia's overall vegetable production (around 12% of vegetable farms contribute 58% to overall vegetable production[31]). They are very aware of production costs and constantly seek to reduce them. They are most likely to:

- Seek specialist advice to help manage various aspects of the business, including the use of

[31] Thompson & Zhang (2012) Australian vegetable growing farms. An economic survey 2010-11 and 2011-12. ABARES research report 12.11

paid advisers or employ specialists in the business to look after agronomy and other specialised fields of operation
- Be proficient at searching for information using on-line resources and travel (or getting somebody to do this for them), and using / adapting suitable information in the business
- Be open to new ideas and people, and see the benefit in direct conversation with researchers and others developing new technologies, as well as providing direction to these people about their needs
- Conduct, initiate or participate in on-farm trials and develop new production methods for their business to improve efficiencies, profitability and their position in the market
- Commit to and pay for training for themselves or employees that is focussed and relevant to their business success even if it may take longer than a day or involve travel
- Be able to take some risks and deal with complexity and uncertainties when implementing change.

Advancing vegetable producers

These producers manage medium sized businesses and are seeking to expand the size and value of their operation (move towards the top 20% of the industry). This includes an increase in staff levels. They are most likely to:

- Be especially motivated to improve the efficiency and profitability of their businesses by using new technologies, varieties, supply chain arrangements, etc.
- Want to hear about new technologies and research results relevant to their business and how these could be used without having to spend a lot of time searching for it, reading lengthy reports or spending a lot of time in training
- Appreciate assistance in filtering and interpreting relevant information due to the vast amount of material available and time constrains to get information relevant to them and their specific situation
- Not have or allocate the time and or funds to spend on intensive training, especially if it takes them or employees away from the farm for extended periods, i.e. they will participate in training that is local or regional, does not involve extensive travel, is not longer than one day, and is not overly costly[32] (also refer to Macquarie Franklin 2012[33])
- Not employ specialists to look after specific areas in the business (e.g. agronomy, marketing) or conduct trials
- Prefer to hear about new technologies and concepts from trusted people and have a mainly regionally or state focused outlook
- See the benefit in regional training events, organised study tours, case studies and active learning experiences, which show how relevant and tried new approaches and technologies that can be more or less instantly and successfully implemented
- Feel uneasy about taking (too many) risks and dealing with complexity and uncertainties, and will therefore implement change when new technologies are proven to be 'safe'.

Steady vegetable producers

These producers manage smaller sized businesses, which may struggle to provide a positive return in every year of production (36% of vegetable farms have an estimated value of operations less than $50,000 and they contribute around 2% of the value of vegetable operations[34]). These producers (which also include LOTE producers) are most likely to:

[32] Peter Hansford. Business Development Manager The Horticulture Centre of Excellence. pers comm.
[33] Macquarie Franklin 2012. Review of Skills and Training in the Vegetable Industry.
[34] Thompson & Zhang (2012) Australian vegetable growing farms. An economic survey 2010-11 and 2011-12. ABARES research report 12.11

- Have reasons, other than profitability, for remaining in the vegetable industry
- Not widely search for new technologies or information in written formats or training opportunities
- Require some support to ensure they meet environmental, food safety (QA) and other compliance requirements (e.g. WH&S, ChemCert) and make use of training already available in these areas
- Prefer one-on-one support by trusted individuals (potentially from advisors who speak their main language, if it is not English) rather than group training unless this is driven and delivered by their community
- Be risk adverse and try to avoid complexity and uncertainty.

Further and ongoing refinement

The three groupings identified for the purposes of education and training will require further and ongoing refinement based on the location of the vegetable producers, resources available and specific information and delivery requirements. However, as an initial step it provides an understanding of how education and training services may be valued and used by producers and how an effective approach may be designed to better meet their needs.

Producer attributes and training principles

Table 5 provides an overview of the producer attributes for the three loose groupings of vegetable producers. Attributes 1-8 in the left column of the table are characteristics of the farming business, not training topics to be covered. They are included to indicate potential training needs in these areas for steady and advancing growers.

Details the learning and training principles relevant to each of the groupings. We did not repeat the previous studies by asking producers again what they would like to learn about, but rather how they would like to learn. Our industry consultation and own experience supports those topics identified by Macquarie Franklin in 2012 as still relevant as priority training needs for the industry. However, our industry consultation did validate and reinforce our earlier contention that training in a certain knowledge area (content) will only be taken up if it is relevant at the time of delivery for the target audience, and if the delivery mechanism is appropriate for that audience.

Table 5: Producer/business attributes for three loose groupings of vegetable producers

Producer / business attributes	Steady producers (about 50%)	Advancing producers (about 30%)	Progressive producers (about 20%)
1. Farming business characteristic	Small size, low complexity, employee numbers and need for specialists skills within the business, simple structural organisation.	Medium size, complexity, structural organisation, employee numbers and need for specialists skills within the business.	From 'Steady to Progressive' – increasing size, complexity, structural organisation and planning, employee numbers and need for specialists skills within the business.
2. Financial management characteristics of business owners	Low average farm cash income, no or basic preparation of budgets. Mostly operational planning conducted, no business plans.	Moderate average farm cash income, preparation of straightforward budgets (gross margins). Risk and financial consequences considered when planning and making decisions.	Highest average farm cash income, preparation of budgets. Main decision drivers are risk and economic / financial considerations when preparing business / strategic plans.
3. Cost of production	Poor control over cost of production.	Aiming to better control cost of production.	Good control over cost of production.
4. Supply chain	No supply chain management.	Commencing or interested in supply chain management.	Good supply chain integration.
5. Environmental management (e.g. EnviroVeg or similar)	No or low interest in participation in environmental programs.	Interest in participation in environmental programs.	Participation in environmental programs.
6. Main markets supplied	Local wholesale and retail markets.	Local wholesale, retail markets, packers and processors.	Major retailers, wholesale, and export markets.
7. Quality assurance (driven by market requirements)	Low participation in food safety programs.	Increasing participation in at least one food safety program.	Participation in (several) food safety programs.
8. Top 3 selected impediments to future business viability (in order)	▪ Increased farm input costs ▪ Increased marketing costs ▪ Low prices due to imports	▪ Increased farm input costs ▪ Low prices due to imports ▪ Low prices for other reasons	▪ Increased farm input costs ▪ Increased marketing costs ▪ Low prices due to imports

Table 6: Learning and training principles for three loose groupings of vegetable producers

Learning and training principles	Steady producers (about 50%)	Advancing producers (about 30%)	Progressive producers (about 20%)
Main information sources used to learn and or progress the business	Trusted people in the industry, neighbours, workshops, informal training, practical, ready to use content, little time for reading.	Increased attendance at field days, workshops, study tours and other specific training events, some have formal training, prepared to spend some time reading.	Increased attendance at conferences, advice from outside the business, some formal training, want to know and read about R&D, new technologies, future opportunities.
Preferred main training service providers	Extension officers, agronomists (no charge), informal, free extension providers, IDOs.	As above row plus VET providers, grower associations, trainers coming on farm, informal course providers. Limited willingness to pay.	As above row plus: Paid advisers and trainers, Universities, State DPI researchers. Will pay.
Expectation of training programs	Relevance of 'ready to use' information. Locally or regionally oriented. Build on existing knowledge and experience, flexible, brief, hands on, known outcomes.	Relevance of information, happy to adapt learnings. Mainly regionally oriented. Use digital technologies. Build on existing knowledge and experience, flexible, not longer than 1 day, known outcomes.	Relevance of information, innovative, cutting edge. Happy to leave region. Use digital technologies. Want to be challenged, but build on existing knowledge and experience, flexible, high quality, known outcomes.
Learning pattern, networking[35]	Local focus of learning and networks sometimes people focussed.	Local and people focussed tending towards outward looking / networking.	Outward looking (nationally, internationally) and extensive networking.
Staff – highest attainment levels used	Employ staff that 'can do the job' and have training needed for compliance.	Employ multi-skilled staff with low and medium attainment levels.	Employ some staff with high attainment levels for specialised jobs.
Generalised expectation of staff training	Do not require formal training, support learning on the job, not overly keen on having staff going away for training.	Do not require formal training for most staff, support learning on the job and may get a trainer in or send staff to workshops or field days.	Value proof of formal training and higher attainment levels and also learning on the job, may get a trainer in or send staff to workshops, field days or short courses.

[35] Kilpatrick S. 2003. How farmers learn: Different approaches to change. The Journal of Agricultural Education and Extension. Volume 9, Issue 4.

Special considerations for LOTE producers

Background

Many LOTE producers provide an example of the 'stable vegetable producer', according to the industry stratification approach. They also provide an example of where industry support and training is not necessarily justified by economic reasons (i.e. they may contribute a very small component of total production), but by community and environmental concerns, thus they may require specific targeted training to meet their needs and those of the broader industry.

Producers who come from non-English speaking backgrounds are variously referred to as NESB (Non-English Speaking Backgrounds), CALD (Culturally and Linguistically Diverse) or LOTE (Language Other Than English) producers. We refer to them as LOTE producers, as this is the commonly used term in the vegetable industry.

LOTE producers come from a wide range of cultural backgrounds. Most of the Asian vegetables grown in Australia are grown by LOTE producers. Production of Asian vegetables occurs across Australia, with Queensland, NSW and Victoria the largest producing states by both value and volume (ABS 2010-11, refer to Appendix 6 for information on major vegetable growing regions)[36]. There are many LOTE producers from non-Asian backgrounds too, including Italian, Greek and Lebanese, who operate traditional or 'western type' vegetable crops. The Virginia region of South Australia has a large population of LOTE growers producing traditional crops, mainly in protected cropping systems but also 'market gardens' (AUSVEG SA).

Issues

A number of concerns have been identified, which have the potential to affect the reputation and sustainability of the Australian vegetable industry in general. These include:

- Sustainability production practices – the inflow or turn-over of first generation producers means that the issue of Best Management Practices in all aspects of production is an ever-present issue and it is likely that there will always be varying levels of knowledge and skill associated with the management of chemicals, pests and diseases, nutrients and quality assurance.
- Biosecurity – past biosecurity programs have not effectively engaged LOTE producers and they do not fully understand their role in managing biosecurity for the vegetable industry.
- Peri-Urban pressure – Asian vegetable production and 'market gardening' are 'intensive' horticultural enterprises in the peri-urban landscape; it is important that as an industry growers understand the urban planning process and the potential for land use conflict.

Agronomy advisers who liaise regularly with LOTE producers were consulted on specific issues facing this sector that may have wider implications for the vegetable industry and require training. The major challenges were identified as:

- Slow implementation of integrated crop protection methods including IPM due to the cost of 'soft' insecticides, lack of time to monitor and poor knowledge of pest and disease biology and spray technology
- Poor disease and weed management due to inadequate hygiene practices (both in-field and

[36] ABS 2010-11. Agricultural Commodities Statistics (by state and by NRM)

protected cropping), lack of crop rotation and inter-property contamination
- Increasing pesticide resistance due to over-use of some products
- Poor Occupation Health & Safety (OH&S).

The major problem in providing information and resources to assist LOTE producers is the language barrier and, to some extent, cultural barriers. Traditional methods in their home countries often include the unregulated use of chemicals and poor OH&S. Language difficulties include oral communication, as well as reading and writing. Despite LOTE producers being industrious and resourceful, communication difficulties may lead to isolation and reduced competitiveness. This limits the opportunities of many producers to learn and progress.

The language barrier is considerably increased when technical information is required by producers to implement basic farm practices, such as reading chemical labels or complying with OH&S guidelines in the preparation and application of chemicals. Language difficulties on such issues can cause hardship for producers and lead to practices that are harmful to themselves, others and to the environment. Moreover, lack of mutual understanding of cultural differences often leads to mistrust between LOTE producers and English speaking training staff, agents and service providers, along with fellow English speaking farmers and other sectors of the industry.

Training strategies to improve the capacity of LOTE producers to manage key issues need to apply an understanding of the particular characteristics of this sector, their production drivers and especially the cultural background. It needs to be targeted at overcoming communication barriers posed by both language and culture. Communication channels and training approaches utilised by other sectors of the vegetable industry are not likely to be as effective for LOTE producers.

Consultation with LOTE service providers has indicated that:

- LOTE producers rarely see the value in training, including workshops, field days, tours and conferences, and/or don't think they are 'doing anything wrong' so why train
- The sense of community is very strong and 'outsiders' need to earn trust over a period of time
- Engagement with and acceptance by community leaders is important
- Decision making is usually not based on economic analyses
- Many LOTE producers do not easily mix with growers of English speaking background at industry events
- Engagement of bilingual extension officers in the past has been on a short-term funding basis and therefore had little impact
- Agribusinesses are unlikely to dedicate a large amount of resources to meeting the needs of this sector due to the small market size
- In most cases, LOTE producers do not contemplate environmental or long term sustainability or OH&S in their decision making process, even if these issues are regulated.

Previous recommendations

There have been numerous reviews conducted over the last few years examining the characteristics, issues and opportunities relating to LOTE producers. Recommendations from these reports have been implemented to a degree and include:

- The use of bilingual extension officers, with a background in agriculture, to:
    - Conduct frequent farm visits to develop close working relationships with individual producers
    - Build networks within LOTE communities and the wider industry to facilitate sharing of best practice information/practices, e.g. communities of practice (NB: HIA is

investing in this area in some sectors through the industry development portfolio)

- Translation of relevant technical material into languages spoken by the larger LOTE groups
- Development of a training guide for service providers working with LOTE producers
- Education that focuses on developing producers practical problem solving and decision making skills
- Delivery of programs to address specific industry issues (e.g. on farm sanitisation and hygiene, water use and quality and spray application).

Based on our consultation, we believe that further effort is required to ensure continued, effective engagement of these producers. The expenditure of vegetable levy funds on developing the capacity of LOTE producers may not be justified for economic reasons alone, however some of the issues, especially those around pesticide use (OH&S, food safety, pesticide resistance) and lack of biosecurity awareness and vigilance, could impact negatively on the reputation and sustainability of the whole.

Australian vegetable industry and should be addressed as a priority.

10 Outcome 1 – gap analysis

Updated industry training and education needs

Industry education and training needs, i.e. the themes and knowledge areas that should be covered by education and training services at different levels, were compiled for the education and training database and this gap analysis. A successful vegetable business should be able to cover a majority of these themes within the business to some level. Actual needs will vary with the scope of the business.

The presented themes and knowledge areas were compared to training needs identified by Macquarie Franklin (red), Stride Consulting (blue) or both (**highlighted**). This appraisal showed that several knowledge areas, which may be important in the future, were not brought up through the consultation conducted as part of these two abovementioned projects.

Table 7: Principal themes and knowledge areas for vegetable businesses

	Themes	Knowledge areas
1	Science	Maths, Physics, Chemistry, Botany, Plant physiology, Biochemistry, Statistics
2	Technology	**Information Technology (IT)**, Genetics / breeding, **Machinery & equipment**, Precision farming, Spatial technology, Remote sensing, GPS/GIS, Vision technology (e.g. for grading), Robotics, Irrigation technology, Spray application technology, Waste Management, Energy efficiency, Food Science
3	Production environment	Climate/ Climate change, Landscape / Land capability / site selection, NRM/ sustainability, Water resources / quality, Resource use efficiency, Emission management, Carbon Farming
4	Field production	**Soil science, Soil management, Plant nutrition, Plant health and crop protection, Machinery & equipment, Irrigation management**, Integrated crop management, Agronomy, Sustainable production, **Variety selection**
5	Protected Production/ hydroponics?	Structures/ crop covers, Hydroponics, Greenhouse soil / substrate management Nutrition management / fertilisers, Plant health and crop protection, Climate and atmosphere control, Machinery & equipment, Irrigation management, Integrated crop management
6	Postharvest	Grading, Cool chain management, Post harvest physiology, Packaging, Storage, temperature and atmosphere control, Logistics, transport/ shipping, distribution, Food safety,
7	Business	**Strategy**, **Financial management**, **Business planning/management**, **Cost of production**, Record keeping, Investment decisions, Commercialisation, Managing growth, Compliance (legislative / regulatory), Quality systems, Managing risks
8	Economy	Economy 101
9	Markets	Understanding markets and consumers, **Marketing / promotion** / selling, Exporting, Product development, Supply chain management, Product development
10	People	**Leadership & management**, Conflict management/ **Negotiation**, **WH&S / OH&S**, Managing staff, Mentoring, people development, Managing apprentices, **Labour management**, **Communication**
11	*Research*	Trial protocols / design, Data capture and analysis, **Innovation**
12	*Information transfer*	Adult learning, Consulting, Extension methodologies, Facilitation, **Communication**

This is not a criticism of the projects, as their needs analyses were based on industry consultation and not an assessment of all themes and knowledge areas that should ideally underpin education and training in horticulture. The previous analyses by Macquarie Franklin and Stride Consulting reflect the understanding industry members who have been interviewed have of their needs and aspirations, while our assessment looked at industry needs at a principle level.

The main gaps, in addition to those mentioned by previous reports, were:

1. Management of the production environment / resource use efficiency / climate change
2. Technology (especially new and emerging technology areas)
3. Protected cropping (greenhouse production systems)
4. Postharvest management (including food safety)
5. Economy 101

Education and training gaps identified through the database

The following table identifies the gaps in the industry relevant attributes for effective education and training identified whilst compiling the database of courses currently available.

Figure 8 provides a summary of the number of attributes met by the currently available courses, or those proposed by the Vegetable Academy. It clearly demonstrates that informal training (extension) is better at meeting the relevant attributes for effective training and that most formal education and training provided by educational institutions (Universities and TAFE Colleges) or organisations (RTOs) fails to meet these attributes, which is the main reason for the low uptake of these courses by vegetable producers.

Figure 8: Summary of number of attributes met by currently available courses

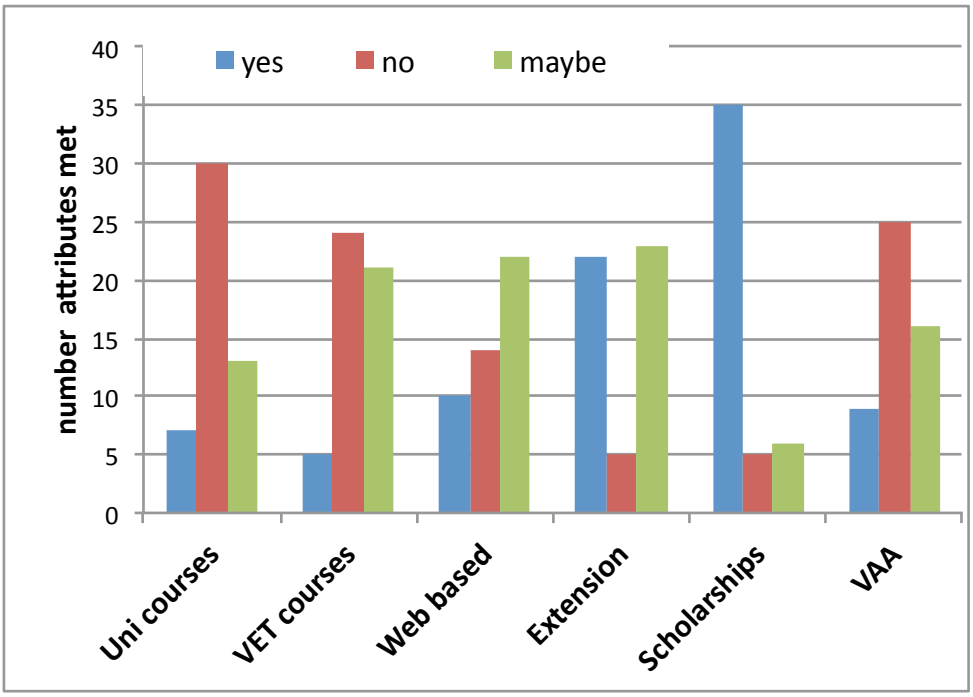


Table 8: Relevant attributes of effective education & training and alignment to delivery by different training providers

Attribute of effective education and training	University courses	VET courses	Web based courses	Workshops / field days / study tours	Scholarships (e.g. Nuffield, Churchill, Industry)	Proposed VAA
Training attributes identified by farmers (from literature)						
Short / suitable timing	No	No	Yes	Yes	No	No
Flexible delivery and assessment	No	No	Yes	Yes	No	No
Flexible content	No	No	No	Yes	Yes (focus topic)	No
Small groups	Potentially	Potentially	N/A	Potentially	N/A	Potentially
Close by / regional	No	Potentially	N/A	Yes	N/A	No
Proven value (good or poor)	Yes	Yes	Potentially	Variable	Yes	Potentially
Relevant (to farm business)	Potentially	Potentially	Potentially	Mostly	Yes	Potentially
Outcomes identified	Yes	Yes	Yes	Potentially	Yes	Yes
Practical, experiential	No	Potentially	No	Mostly	Yes	No
Peer led discussions	No	No	Potentially online	Yes	Yes	No
Quality presenters (in the view of farmers)	Potentially	Potentially	Potentially	Potentially	Yes	Yes
Social aspects	Potentially	Potentially	No	Yes	Yes	No

Attribute of effective education and training	University courses	VET courses	Web based courses	Workshops / field days / study tours	Scholarships (e.g. Nuffield, Churchill, Industry)	Proposed VAA
Attributes identified by vegetable producers (Macquarie Franklin 2012 and this study)						
Relevance to the business	Potentially	Potentially	Potentially	Mostly	Yes	Potentially
Specific skill focus	No	No	No	Yes	Yes	Yes
Easy access, local, regional	No	Potentially	N/A	Yes	N/A	No
Addressing impediments to farm business	No	No	Potentially	Potentially	Yes	Potentially
Proven (trusted) **/ quality 'teachers'**	Potentially	Potentially	Potentially	Potentially	Yes	Yes
Adoptable / practical	No	Potentially	No	Mostly	Yes	No
Flexible	No	No	Yes	Yes	No	No
Build on existing knowledge and experience (not generalised)	No	Potentially	Potentially	Potentially	Yes	No
New technology & R&D result focus	Potentially	No	Potentially	Yes	Yes	Potentially
Learning on the job	No	No	No	No	Partly	No
Some digital technologies	Yes	Yes	Yes	No	Yes	Yes
Mainly regional	No	Potentially	N/A	Yes	N/A	No

Attribute of effective education and training	University courses	VET courses	Web based courses	Workshops / field days / study tours	Scholarships (e.g. Nuffield, Churchill, Industry)	Proposed VAA
Additional attributes taken from other industries' or organisations' models (during consultation)						
Industry owned	No	Potentially	Potentially	Yes	Potentially	Yes
Simple structure, transparent	No	No	Yes	Yes	Yes	Yes
Relevant guiding principles for vegetable industry	No	No	Potentially	Yes	Yes	Yes
Responsive	No	No	Potentially	Yes	Yes	No
Addressing different levels of needs (basic - advanced)	No	Partly	Potentially	Potentially	No	Potentially
Multiple training methods	No	No	No	Yes	Yes	No
Have some level of push and pull with audience	No	No	No	Potentially	No	No
Driven by learners needs (not trainer, institutional needs	No	No	No	Yes	Yes	No
Producer driven approach	No	No	Potentially	Potentially	Yes	No
Flexibility, quick response to changing or new needs	No	No	Potentially	Yes	Yes	No
Use industry language, not trainers' language	No	No	Potentially	Yes	Yes	Potentially
KPIs, impact evaluation	No	No	Potentially	Potentially	Potentially	No

Attribute of effective education and training	University courses	VET courses	Web based courses	Workshops / field days / study tours	Scholarships (e.g. Nuffield, Churchill, Industry)	Proposed VAA
Fit with adult learning						
Self-directed and focused	Partly	Partly	Yes	Yes	Yes	No
Relevant and appropriate	Partly	Partly	Potentially	Yes	Yes	Potentially
Supportive and respectful	Partly	Partly	Yes	Usually	Yes	Potentially
Motivating	Partly	Partly	Potentially	Usually	Yes	Potentially
Providing feedback, refection and reinforcement	Potentially	Potentially	No	No	Yes	Potentially
Fostering aspiration	Yes	No	No	Potentially	Yes	Potentially
Help understand complexity	Yes	Potentially	Potentially	Potentially	Yes	Potentially
Fit with Gen Y learning						
Engaging, well designed	No	No	Potentially	Potentially	Yes	No
Mentoring	No	No	No	No	Potentially	No
Networking (social, electronic)	Yes	Yes	Yes	Yes	Yes	Yes
Exciting	No	No	No	Potentially	Yes	No
Experiential	No	No	Potentially	Potentially	Yes	No
Connected (digitally)	Yes	Yes	Yes	No	Potentially	Potentially
Rewarding	Potentially	Potentially	No	Potentially	Yes	Potentially

11 Outcome 2 – synthesis of findings

The meaning of 'education' and 'training'

Education and training is understood as capacity building, i.e. advancement of technical and personal knowledge and skills, as well as attitudes and aspirations.

Education is commonly seen as a learning process that takes place before a person enters the workforce. In this study, the term 'education' is used for teaching graduate or postgraduate students, not school students. This is not meant to detract from the importance of including agriculture / horticulture subjects in school curriculums. It only means that primary and secondary education in agricultural subjects is outside of our scope. It is currently addressed by several initiatives, including by industry bodies and RDCs.

Training is usually associated with 'the world of work' (Ollagnier, 2005)[37], i.e. training activities are aimed at professionals or practitioners. Following on from previous work (Macquarie Franklin, 2012)[38], and for the purpose of this study, extension is considered as 'informal training', while formal training is delivered by registered training organisations (RTOs).

Should HIA invest in education and training?

Based on this study, should HIA invest in specific education and training services for the vegetable industry?

Many of the current training services available to vegetable producers and their staff are not well aligned, in content or delivery, with the needs identified by the industry on many levels (e.g. content, relevance, format, timing, and potentially location and quality).

Production Horticulture courses are very generalist. Vegetable and fruit production are lumped together, even though there are many great differences between producing annual vegetables and perennial fruit crops. Training services that are available are often not well communicated to potential students or trainees. New technologies and science are usually not included in training. Information on university, VET or web based courses is often hard to find or follow, career paths are usually not clear, and the presented career options mostly look unattractive. They do not represent the reality of the breadth of the opportunities that exist in the vegetable industry.

Therefore, our conclusion is that HIA should invest in specific training services for the vegetable industry to help achieve its strategic objectives.

Vegetable producers' needs

Consultation has identified three loose groupings of producers in the vegetable industry, which we named 'steady', 'advancing' and 'progressive' producers.

The following points summarise the training and education needs of each group and provides recommendations relating to format and delivery of training, not content.

[37] Ollagnier, E. 2005. Training. In: L.M. English (ed.) International Encyclopedia of Adult Education. Palgrave-Macmillan, Basingstoke, 2005.
[38] Macquarie Franklin 2012. Review of skills and training in the vegetable industry. Final Report. Horticulture Australia Limited

1. A main target audience for training should be **advancing producers,** especially those with an increasing workforce. Due to the size of the business, both they and most of their staff have to be multi-skilled but may need to specialise as the business evolves or grows and structural needs change. They may already have recognition of education / training or may be interested in getting it. They have experience and knowledge they can build on. They want to fill specific knowledge gaps, relevant to their business now and over the next 2-3 years. They are time poor due to the demands of their evolving or expanding business. They want their staff to learn special skills to be better at specific jobs. They do not want staff to be absent from the workplace for extended time periods and consider on the job training as an attractive option for them. Formal recognition is not the major driver for training participation but they still like to get this for themselves and their staff, if possible. A major aim of training has to be to build resilience and focus into the business.
2. **Steady producers** and the **LOTE communities** will be strongly encouraged to participate in all training offered. They also require support in areas of need via targeted, local / regional events (e.g. field days, workshops) and assistance in accessing relevant compliance training. For LOTE communities, the culturally best fitting options have to be explored case by case with community leaders due to the diversity of the audience. A major aim of training for this group has to be to better manage the cost of production, resource use efficiency and compliance.
3. **Progressive producers managing large businesses** are also interested in training for their staff so that they get better at specific jobs. In many cases, on the job training is an attractive option. They are interested in creating career paths for some of their staff and they are also prepared to support these advancing employees financially and/or by allowing time off for training. They themselves have a wealth of knowledge and experience, which they want to add to and sometimes share. They are self-directed and are prepared to search for the relevant information, travel and or create other opportunities to get exactly the knowledge and experience they want. They can commit some time and money to this. Inspiration, innovation and new technologies are important drivers for them. They are industry leaders and this leadership role should be encouraged and supported.
4. The target audience for education is **newcomers to the industry** or those entering an **education pathway** to further their career. They want to receive recognition of their education in the form of a certificate, diploma or degree.

Many producers may need some encouragement to participate in training or have their staff participate if they have previously had negative experiences. HIA and AUSVEG should cooperate in communicating this new approach to the industry.

Guiding principles for vegetable industry education and training

The guiding principles for education and training in the vegetable industry are an outcome of our research, which was based on the findings of previous studies, consultation with growers and others in the vegetable supply chain, a review of the training and education models used by other industries or organisations, and numerous conversations with the Project Reference Group and those who deliver formal and informal training in agriculture.

We believe these fourteen guiding principles are the foundation of a levy funded vegetable industry education and training initiative.

1. The vegetable production context is increasing in complexity and risk and thus, demands growing sophistication and professionalism in the management of vegetable business operations; the same applies to trainers. In this context, training and learning must focus on

advancing the capacity to successfully manage challenges and adapt to constant change.

2. **The most important attributes of training delivery and content for the vegetable industry are relevance, ease of access, responsiveness and flexibility**.
3. **A further imperative is that delivery and content are driven by the needs of those who want or need to learn, i.e. growers and their staff, and not by the needs of education and training providers or top down approaches** that do not sit well with adults, in general, and producers, in particular, or the next generation.
4. **Industry ownership and oversight of an education and training initiative (e.g. by a peer group of producers) is a key to its success** and thus, is no different to the requirements of an effective RD&E program. A structured producer driven approach can deliver this requirement.
5. Given the aim to progress the vegetable industry as a whole, a strategic initiative that supports an organised and sustained approach to education and training is desirable. **This should preferably be based on an agreed industry vision, i.e. as stated in the current strategic plan[39].**
6. **In spite of some shortcomings in delivering adequate services to the vegetable industry, existing training and education opportunities should be better communicated to industry.** Most providers could offer clearer, more inspiring information about course content and especially learning outcomes and career paths relevant to vegetable growers and their staff.
7. The concept of training and learning principles and processes, as well as the delivery mechanisms, and the expected results should be based on our current knowledge of the needs and gaps (e.g. as compiled in this report). **Periodic impact assessments should be undertaken to review and renew the approach to meet changing needs.**
8. For employers, industry readiness of newcomers to the industry, an ability to learn on the job and the 'right' attributes and attitudes (i.e. fit with the business culture) are often more important than education certificates or even specific theoretical knowledge. This should be communicated to formal education providers.
9. Training content can be based on the outcomes of this gap analysis, outputs and findings of the Vegetables R&D program, especially where the content addresses identified gaps (which is why the projects were done), and feedback from future training events, and or well-founded industry/grower group requests.
10. Most states have recognised skills shortages in the agricultural sector and are designing and implementing strategies to address these. Opportunities to develop links with the relevant initiatives and existing education and training programs should be explored and used, if they fit the criteria for programs under the vegetable industry training and education initiative.
11. Conversations with formal providers about programs and pathways for effective education and training, with suitable delivery formats and content for the vegetable industry, should continue. This report highlights preferred formats and summarises gaps in content. Innovative teaching methods, which are based on the latest neuroscience research findings about how adults learn, should be supported.
12. While reviewing education and training needs and gaps for the industry, **we identified a need for 'trainer training'. Learning outcomes depend greatly on the quality of teachers and trainers in conventional teaching and training situations.** It is also critical to success in informal, extension type settings. There is a need for technically qualified, innovative educators and trainers who understand 'the science of learning', i.e. the latest neuroscience research findings about how young people and adults learn.

[39] "To be a cohesive, financially and environmentally sustainable, and highly efficient industry focused on growing demand profitably" from: Australian vegetable industry Strategic Investment Plan 2012 - 2017

13. **It is desirable to foster people in the industry who can mentor or coach new entrants to the vegetable industry or others who would benefit.** This could become an important part of up-skilling the industry, if it is not hampered by the competitive nature of the industry.
14. **Scholarships have been identified as especially appropriate and valuable.**

Industry image

The image of the industry will impact on how training providers and career advisers promote it and how the public perceives its value. Therefore, the industry must continue to develop and implement programs to improve its image in the eyes of potential employees, the public and those within it. It must avoid negative publicity.

The aim must be to avoid feedback on the vegetable industry, as cited below:

"I have to say that industry works very hard on **not** portraying a very attractive profile, to be frank, so it is somewhat understandable that careers advisers perhaps are not breaking their necks to recommend careers in agriculture and horticulture to young people when the industry itself says the things about itself that it does. That needs to be corrected, and some of us are working on that at the moment."[40]

"The Review found that some teachers and students expressed negative views about agriculture, and that some career advisors discouraged students from pursuing careers in agriculture due to perceptions that agriculture does not offer a secure career path. This emphasises the need for the agriculture sector to actively promote itself, and for there to be improvements in training and professional development for career advisors."[41]

[40] Mr Wayne Cornish, Transcript of Evidence, 10 August 2005, in Standing Committee on Agriculture, Fisheries and Forestry 2007. Rural Australia's Need.
[41] NSW Government 2013. Review into Agricultural Education and Training in New South Wales.

12 Evaluation and discussion

Evaluating ultimate success

This project reviewed previous work and undertook a gap analysis and developed a series of recommendations to guide HIA's future investment in education and training for the vegetable industry. The initial feedback received from HIA and the Project Reference Group is positive, however the success of the project cannot be measured until industry has considered the recommendations and decided to act on them. Ultimately, the project will be successful if the industry adopts the recommendations and implements them.

We offer the following brief responses to the specific evaluation questions:

Effectiveness

The project activities were highly effective in delivering the project outputs and the final outcome and recommendation. They key issues were:

- The review of education, training and learning in agriculture assisted the project team to more clearly define the problem and provide context for the activities that followed.
- The learning from that activity flowed through to our review of previous studies, which allowed us to clearly identify the strategic gaps and develop a conceptual model for testing with industry. This provided a clear focus and purpose for our consultation.
- The review of formal education courses was a key output of the project. It fulfilled its primary purpose of providing a database for industry to use, but more importantly, it assisted us identify the gaps in education and training in the industry, and start to formulate our response.
- Examining the approaches taken by other industries facilitated the development of our response to the gaps identified. It provided us with the opportunity to learn from others' experiences and ensure we recommended an approach that avoided the mistakes of the past and maximised the chance of success.
- Finally, the consultation with industry was essential for us to validate and test the lessons learnt, as we proceeded through the project, and incorporated the feedback received into our recommended response. As a result, we believe the recommendations accurately reflect what industry needs.

Feedback

Refer to Methodology (section 4) and Output 5 – consulting, validating and testing with industry (section 9).

Quantify and demonstrate change

Not applicable.

Learning and relevance

Refer to Outcome 2 – synthesis (section 11) and Recommendations (section 13).

13 Recommendations

A Vegetable Industry Education and Training Initiative

Design for the future

The education and training initiative (The Initiative) will have a strong focus on the future and its design will allow for training responses to ever-changing dimensions that may have an impact on the industry in different ways (e.g. via availability of new information, new technologies, changed operating conditions for businesses or market access, changed funding levels or mechanisms due to policy decisions):

- Technical / life science dimension – advances in science and technology, innovation
- Economic dimension – new markets, national and regional development, changes in national and global interdependence (e.g. trade agreements)
- Regulatory / institutional and legal dimension – compliance, regulation, 'red tape', attitudes to ligation
- Sustainability dimension – calls for resource use efficiency, protection of natural assets, a sustainable production base and sustainable production technologies (e.g. low emissions)
- Social dimension – food security, 'license to farm': public perception of farming and the safety and sustainability of food
- Communication dimension – change in how people and businesses can and do communicate
- Policy dimension – policies and their implementation on a state, national and global level affecting agriculture including education and training (e.g. the 2015 'Ag. White Paper').

The education and training initiative requires a focus on a targeted training program aimed at effectively upskilling people at all levels in the industry.

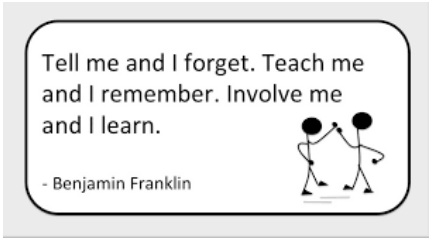
Communication with formal education institutions should continue to encourage changes to some content and delivery of horticultural training to produce qualified, industry ready entrants to the vegetable industry. Suitable career pathways should be developed. A first step could be to influence the way 'Production Horticulture' and associated career opportunities are portrayed and communicated by institutions.

The Initiative will be underpinned by a concerted effort by all to raise the image of the vegetable industry in the eyes of the public and especially formal and informal career advisers and potential employees. It aligns with the industry vision stated in the Australian vegetable industry Strategic Investment Plan 2012-2017 (AUSVEG 2012).

> *"To be a cohesive, financially and environmentally sustainable, and highly efficient industry focused on growing demand profitably".*

Targeted Training

'Targeted Training' will deliver on the main attributes of relevance, ease of access, responsiveness, flexibility and the need for quality trainers and effective delivery formats.



An important aspect of Targeted Training is a producer driven approach, similar to the approach of identifying and commissioning research services for HIA Pool 1 research programs, i.e. producers, producer groups, or entities representing a large enough group or groups of producers, request

training programs in one of the priority program areas. They may have already identified a training service provider who will prepare a proposal with them, or a service provider will be sought by HIA via a tendering process.

HIA will assess the 'request for training' proposals and suitability of service providers against a set of criteria for the specific program and services through a HIA advisory mechanism. Service providers may be RTOs or other suitable organisations.

HIA will coordinate partnerships, as appropriate, if requests for identical or similar types of training are received. HIA, through its advisory mechanisms, may identify training needs, confirm these with its members and then call for expressions of interest for the provision of training in certain program areas.

Figure 9 illustrates the current process used by HIA for R&D project identification and procurement process, as developed by AUSVEG. It has been adapted to show the similar process proposed for the identification and delivery of training services. 'Producers' in the diagram represent producers, producer groups, or entities representing a group or groups of producers.

Requests from 'Producers' will be invited under a general call for proposals, as per the RD&E program. Tenders for the delivery of services can be prepared at any time.

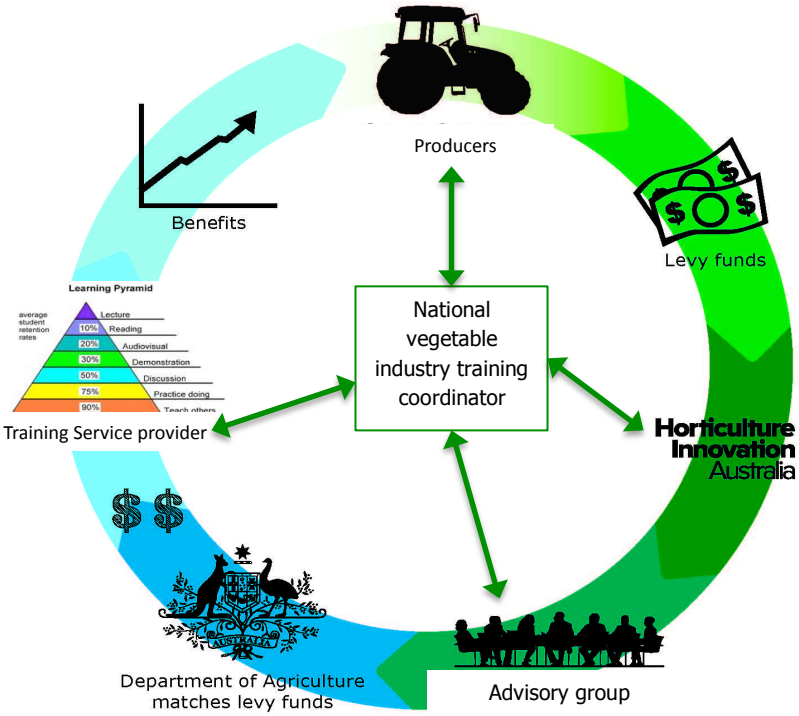


Figure 9: Training services identification and procurement process

Nearly 30 levy funded training and leadership programs have been delivered or are being delivered using the HIA R&D procurement process since 2008, showing that the principal approach is already in place but not formalised and 'branded' as a targeted training program under an education and training initiative.

Outline of the Targeted Training Initiative Program

Program Coordination

A central, industry owned national coordination role (Target Training Initiative Coordinator) has to be established to manage the Targeted Training Initiative. The function of the coordination role is to:

- Establish an advisory group (with comparable function to the RD&E advisory group)
- Establish a procurement process
    - Establish the criteria proposals need to meet based on guidance from our report (principles and criteria)
    - Prepare briefs to call for proposals where clear needs and gaps have been identified
    - Manage an 'open call' proposal process to allow producers groups / training providers to submit training proposals to meet specific needs
    - If required, identify training needs, confirm these through an advisory mechanism and then call for expressions of interest for the provision of training in certain priority areas
- Maintain links with extension providers / projects so the industry can benefit from synergies
- Build relationships with formal and informal training providers
    - Communicate existing training opportunities to vegetable businesses e.g. provide a training 'brokering service'
    - Communicate industry needs to training providers
- Establish and oversee trainer training
- Establish and oversee a mentoring program
- Oversee a scholarship program
- Investigate and, if feasible, implement a Vegetable Industry Training Passport to allow training participants to keep records / evidence of the training they attended, especially if not delivered by an RTO
- Establish and oversee evaluation training programs and impact assessment of the targeted training initiative (continuous improvement).
- Coordinate partnerships, as appropriate, if requests for identical or similar types of training are received.

These functions may be refined based on suggestions from vegetable industry representatives.

Proposals (Training Plans)

We suggest the following approach:

- Vegetable producers, groups of producers or providers of formal or informal training on their own or jointly may prepare proposals, which are Training Plans (Plans) that meet specifically identified producer needs.
- Strong linkages and some overlaps may exist between some programs and some of the focus

areas. Training Plans can go across programs and focus areas to meet a need.

- Training Plans can be designed for steady, advancing or progressive producer groups or staff with the depth and complexity, as well as the delivery methods selected accordingly. Plans must show content, delivery format(s) and costs.
- Clear goals, KPIs, expected outcomes and impact evaluation must be part of the Plans.
- Preferably, trainees / participants should work through a project that entails applying the learned content to their vegetable business whether employee or owner / manager (e.g. problem based learning).
- Existing knowledge, skills and preferences of targeted participants must be considered.
- Duplication of available training or extension services in the same region is generally not acceptable, but linkages or leverage with existing formal or informal programs is desirable.
- Use of available information developed in Vegetable R&D programs is desirable and may be specifically requested, rather than the use of general or generic information.
- Specific content should be determined with targeted trainees and meet an identified need.
- If a proposal is not directly driven by producers, then the trainees or trainee groups must be identified in the proposal and letters of support, or commitment may be included as part of the proposal.

Design and delivery of training

As mentioned, relevant training content for vegetable producers already exists in many cases so that a focus of training should be on design and delivery to meet the criteria of relevance, ease of access, responsiveness, flexibility, focus on outcomes and quality of training providers. Design and delivery must consider the principles of adult / farmer learning and those identified by the vegetable industry, as relevant to them.

Potential delivery formats and styles will depend on topics and may include, but not be limited to, one or more of the following: workshops, field days, study tours, web based training, short courses, master classes, as well as scholarships, internships, graduate training programs and coaching/mentoring.

Different delivery methods will fit with different producer and staff needs and topics. Problem or project-based, active learning should be used as a preference for the different formats suggested above.

Table 9 describes recommended principles and approaches for design and delivery of training programs.

Table 9: Recommended principles and approaches for design and delivery of training programs

Principle	Description of core principle for training programs within a training initiative
1. Understand and respect the target audience	Training programs must be targeted to the audience and address their specific motivations and existing knowledge and experience to be relevant and effective. Understanding the audience involves including them in decision making processes of the delivery format and content – producer driven. Previous needs and gap analyses have to be considered. Training programs should focus on groupings of growers ('market segmentation') where a specific need has been identified rather than using a 'blanket' approach for all growers or groupings (one size does not fit all).
2. Group the target audience and identify expected outcomes	Needs of distinctive groupings differ and may even vary by region and over time. The delivery style and or content required to address priority needs may be different for various groups. Harnessing local knowledge and expertise to design or adapt programs will address this. The rationale for priority needs and expected training outcomes must be identified in training plans.
3. Understand motivations for participation in training and applying new knowledge	Training programs must be driven by 'Producers' or primarily consider the targeted participants and respect their individual situation, views and motivations. An in-depth understanding of the many technical and social factors which lead to a decision, and the background, needs and aspirations will ensure that the participants' perspective is appreciated. Producers have good reasons for not adopting a specific innovation, practice and/or technology and this is not necessarily limited by lack of knowledge. Adoption of an innovation may occur for a range of reasons relating to the individuals motivations – including social benefits such as labour saving, prestige, comfort and opportunities for recreation (not just finance).
4. Ensure clarity of objectives and alignment with growers' needs	Success of a training program must be facilitated by clearly identifying the end goal or objective. Training activities should be planned that build the capacity of participants and enable them to work towards their overarching goal. Training programs designed for an audience need to ensure that messages are consistent with the motivations of this target audience. Benefits for producers in participating need to be promoted with targeted messages for specific groups (messages that are relevant to their motivations and farming context), if, for a good reason, training plans are not driven by the producers themselves.
5. Utilise a range of training methods/models	Training programs need to incorporate a mix of training methods suitable for adults. Utilisation of the range of training methods/models will cater to the needs of different groups. The focus has to be on the producers and building on their knowledge and experiences (problem or project based), rather than providing generic information. This is especially important and preferred where content and issues are complex.

Principle	Description of core principle for training programs within a training initiative
6. Consider range of different learning styles	Training programs need to be developed incorporating a suite of activities suited to different adult learning styles.
7. Appreciate complexity of decision making	An appreciation of the complexity of on farm decision-making will facilitate the development of successful training programs. The focus of programs should be on striving for better decisions rather than best practice – given many decisions are complex and best practice implies there is only one way to achieve a desired outcome. Training is important in facilitating the process for complex decision-making.
8. Focus on capacity building, enable and inspire (problem and project based training)	As issues and decisions become more complex, there is a need for increased people skills and human capacity of the trainer. Training programs can support better decision-making by helping to improve producers' awareness and skills in the decision making process and developing intuition to improve decision making, i.e. facilitating the ability by increasing the experience, reflection and discussion of, or thinking about a particular area. There is a core need to build capacity of individuals to seek the relevant information themselves and make the best decisions for their individual situations.
9. Utilise trusted service providers with appropriate skills	Training practitioners need to incorporate the adult learning principles into all activities of the programs to maintain participation rates and establish a supportive learning environment. Participants must trust service providers to support, respect and really listen to them and adapt to their needs (not the other way round).
10. Adopt a flexible and responsive approach	Training programs need to be flexible to respond to changing needs and circumstances. This should include evaluation for the on-going adaptation and continuous improvement including changing training delivery models or using a combination of delivery models in parallel.

Content

Error! Reference source not found. provides an outline of the suggested programs and focus areas for Targeted Training and their alignment with the objectives of the current Strategic Investment Plan (SIP 2012-2017). The programs / focus areas with greatest overall need, based on previous reports and our analysis, are highlighted in bold font in 10.

The training needs identified in previous reports are colour-coded within the table:

- red in the table - Macquarie Franklin
- blue in the table - Stride Consulting
- **highlighted** – both
- not red, blue or highlighted – this report.

Our appraisal showed that several knowledge areas, which may be important in the future, were not brought up through the two previous projects. This does not necessarily mean that they are not important. It may mean that interviewees focussed on current needs only rather than the future, they did not include staff training needs, some choices were not provided in the surveys or some important issues are disliked as training topics.

Formal training and/or extension programs already cover some of the needs identified and listed in Table 1. Therefore, improving access to these programs or brokering services will have a fit under 'Targeted Training'. Training may be already available, but not in a location that is accessible to those who would like to take part, or in a format or quality that makes producers want to take it up for themselves or their staff. This means a need still exists.

Since 2012, much relevant training material has been developed through levy funded projects in numerous focus areas under SIP objectives 1, 2 and 4. Information relevant to SIP objective 3 is also available from levy funded projects and other research programs (e.g. other Hort Industries, GRDC, RIRDC) and from many published sources.

The important aspect of the producer driven approach is that even though program areas have been determined for Table 1 and the Database to provide structure to the Initiative, the actual program and knowledge areas that will be delivered, will be self-selecting based on demand and commitment by producers who actually want to do specific training. This means that the program areas in **Error! Reference source not found.** do NOT constitute 'training packages'. The use of program areas to create structure is similar to the use of Objectives in the SIP to give structure to the RD&E program. Training Plans should only be funded if levy payers' commitment to participate exists.

This is important given the experience that many 'top down' training programs offered, with predetermined 'one-fits-all' content, have not been taken up by producers. This has happened even when the topic was identified on the 'wish list' of topics producers wanted to know more about (e.g. WH&S, communication, business management).

Targeted Training delivery will receive levy support under approved structural programs and program criteria relating to audience, attendance / subscription, delivery format and content. Proposals by 'Producers' (or training providers on behalf of producers) as explained above are the main process driving this. Proposals will in effect be budgeted Training Plans.

Table 10: Structural components (programs) of Targeted Training

Programs	Focus /knowledge areas / scope	SIP * objective
Technology	**Information Technology, Machinery & equipment, Precision horticulture, Spatial technology, Remote sensing, GPS/GIS, Vision technology (e.g. for grading), Robotics, Irrigation technology, Spray application technology, Waste management, Energy efficiency**	3 (&4)
Production environment	Climate/ Climate change, Landscape / Land capability / site selection, NRM/ sustainability, Water resources / quality, Resource use efficiency, Emission management, Carbon Farming, Environmental sustainability, Site selection	3
Field production, Advanced crop management	Soil management, Crop nutrition / fertilisers, Plant health and crop protection, Machinery & equipment, Irrigation management, Integrated crop management, Agronomy, Sustainable production, Variety selection, How to conduct on farm trials	3
Protected Production/ hydroponics	Structures/ crop covers, Hydroponics, Greenhouse soil / substrate management, Nutrition management / fertilisers, Plant health and crop protection, Climate and atmosphere control, Machinery & equipment, Irrigation management, Integrated crop management	3
Postharvest	Grading, Cool chain management, Post harvest physiology, Packaging, Storage, temperature and atmosphere control, Logistics, transport/ shipping, distribution, Food safety, Waste Management	3 (&2)
Vegetables for profit	**Strategy, Financial management, Business planning/management, Cost of production, Record keeping, Investment decisions, Commercialisation, Managing growth, Compliance (legislative / regulatory), Quality systems, Managing risks**	3
Products to Markets	Understanding markets and consumers, Marketing / promotion / selling, Exporting, Product development, Supply chain management, Product development	1&2
People	**Leadership & management, Conflict management/ Negotiation, WH&S / OH&S, Managing staff, Mentoring, People development, Managing apprentices, Labour management, Communication**	4
Information transfer	Adult learning, Consulting, Extension methodologies, Facilitation, Communication	4

***Strategic Investment Plan (SIP) Objectives:** 1 Consumer Alignment, 2 Market and Value Chain Development, 3 Farm Productivity, Resource Use and Management, 4 Drive Train

NB.: The focus / knowledge areas / scope are the same as those used for the Education and Training Database to rate current services provided by RTOs and Universities or web based courses.

Training the trainers

Table 9 highlights the need for quality trainers. A producer driven approach will self-select the best trainers. Therefore, once a pool of trainers has been established through a round of training projects, an educator/ trainer training seminar should be run to further up-skill trainers in innovative methods and to share the latest neuroscience research about learning, as well as exchange experiences and ideas.

14 Intellectual property/commercialisation

No commercial IP generated.

15 References

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- Sharyn Casey, Portfolio Manager, Education, Training and Leadership, HIA.
- Jeff McSpedden, Principal and Vegetable Producer, Springfield Farm.
- Kurt Hermann, Assistant Manager Industry Development, AUSVEG.
- Ian MacLeod, Managing Director, Peracto Pty Ltd.
- Gordon Griffin, Manager Rural Skills Online, Rural Skills Australia.
- Leigh Taig, Training Co-ordinator Protected Cropping Australia, GOTAFE.
- Byron de Kock, Vegetable Program Implementation Manager, HIA.

Appendix 1: Communications and Consultation Plan

Objectives

This communication plan describes the purpose of project communications including:

- **What** information will be communicated
- **How** the information will be communicated
- **When** the information will be distributed
- **Who** is responsible for the communication activity

The key objective of the communication plan (why we have a plan) is to ensure that key activities and findings are communicated consistently and clearly. This is especially important because different organisations and or people may have diverging views about the desired outcome of the work.

Content

All information communicated must be based on unbiased evidence of a quantitative or qualitative nature (e.g. expert elucidation) and or scientific publications.

Compliance and acknowledgments

All communication must comply with HIA requirements.

Levels and types of engagement

Stakeholders include individuals or organisations that are affected by the project and its outputs. Communication goals and methods will vary according to the level of engagement required. The following table outlines the ways we will engage with stakeholders and the client throughout the project.

Different levels of engagement for project stakeholders (adapted from the IAP2 framework[42])

	Inform	Consult	Involve	Collaborate	Empower
Engagement goals	Provide objective, consistent information to assist understanding of progress, issues, alternatives, opportunities and/or solutions	Obtain feedback on issues, analyses, alternatives and/or outcomes	Ensure that each project step is consistently understood and acknowledged as objective and appropriate for the project's aim	Agree on the approaches for the delivery of the project and identification of preferred solutions	Placing final decisions about progressing the issue in the hands of the stakeholder
Undertaking	We will keep you informed	We will keep you informed, listen and acknowledge inputs and ideas	We will involve you and ensure that your input is considered in the recommendations we develop	We will take guidance from you and use your advice for our study	We will accept your decisions and actions
Methods	Publications (Vegetables Australia, AUSVEG Weekly Update)	Seek input via surveys or one to one discussions by phone / in person	Teleconferences, email (cc. HIA project manager)	Phone, emails, meetings	Project reports as per contract
Stakeholder	Levy payers in the vegetable industry	Vegetable levy payers, Education & training providers Other industry programs (dairy, citrus, MLA) Macquarie Franklin, Stride Consulting, AUSVEG	Project reference group	HIA project manager	HIA as an organisation

[42] Refer to http://www.dse.vic.gov.au/effective-engagement/developing-an-engagement-plan/a-model-for-engagement for information on IAP2

Appendix 2: Project Reference Group terms of reference

VG14061 Vegetable Industry Education & Training Gap Analysis

Project Reference Group - Terms of Reference

Tuesday, 12 May 2015

This Terms of Reference (ToR) sets out the arrangements for the Project Reference Group for VG14061 and provides information about its purpose, chair and membership, and meeting schedule.

Background

RM Consulting Group (RMCG) is delivering a vegetable levy funded study for the vegetable industry. The main objective of this study is to clearly articulate the needs, services, gaps and synergies across the agricultural training landscape, and provide a rationale for HIA and the vegetable industry to make a decision on how the education and training needs of Australian vegetable growers/businesses should be met effectively. This includes addressing whether, why and how a separately funded unique vegetable academy or other suitable model would best meet the particular needs of levy payers.

Project outcomes, outputs and the methodology are explained in the HIA brief and RMCG proposal for the project. These two documents form the basis for the guiding framework for the study prepared by RMCG. These documents will be supplied to the PRG ahead of the first meeting.

Terms of Reference

Project Reference Group

The Project Reference Group (PRG) is the principal group for providing opinion and information on project plans, outputs and activities. Members are selected by HIA based on their ability to provide balanced views and valuable responses when discussing plans and findings. The PRG brings together key persons with expertise and experience in the vegetable industry from growing vegetables to providing advice and or education and training services. The PRG is not an industry representative group.

Scope

HIA determined the scope of the PRG. The group's input into the study will include, but not necessarily be limited to:

- Ensuring that the study applies an understanding of the diversity of the vegetable industry; this includes different scales, operational foci, staffing and locations of vegetable producing businesses, and also their advisers, and agribusinesses providing inputs and technologies.
- Making sure that sound methodologies are used to produce objective evidence; and
- Ensuring the project stays focussed on the required outcomes as stated in the HIA project brief and subsequent RMCG proposal, and does not repeat previous work in this area.

Term

This Terms of Reference is effective from 01 June 15 and continues until a Draft Report is submitted to HIA at the end of July 2015. It will be ongoing during that term unless changed or terminated by HIA. HIA will chair the group. A minimum of three and a maximum of six meetings of one-hour duration are envisaged during this period.

Membership

	Name	Organisation	Position Title
1	Sharyn Casey	HIA	Portfolio Manager, Education, Training and Leadership
2	Jeff McSpedden	Springfield Farm	Principal, Vegetable producer
3	Kurt Herman	AUSVEG	Staff member
4	Ian MacLeod	Peracto Pty Ltd	Managing Director
5	Gordon Griffin	Rural Skills Australia	Rural Skills Online
6	Leigh Taig	GoTAFE	Training coordinator for Protected Cropping Australia
7	Adrian Kennelly	RMCG	Principal
8	Doris Blaesing	RMCG	Associate, Project Leader
9	Byron de Kock	HIA	Vegetable Program Implementation Manager

Roles and Responsibilities

The role of the PRG is to:

- Attend meetings by phone to contribute experience and expertise to the project, and or provide written feedback
- Act as a 'sounding board' to the project manager and team
- Support the development of project outputs that are 'fit for purpose'.

Meetings

- Sharyn Casey will chair all meetings and Anthony Kachenko will act as a proxy if required.
- Meetings will be held by phone or Internet video conferencing, e.g. Skype.
- A meeting quorum will be three (3) non-RMCG members of the reference group plus one (1) RMCG member and the HIA chair or proxy.
- Meeting agendas and minutes will be provided by RMCG, this includes preparing and distributing:
    - Agendas and supporting papers at least three (3) days before meetings
    - Brief meeting notes after meetings.
- Meetings will be held in alignment with project milestones and associated project communications, which will form the supporting papers.
- If group members cannot participate in a meeting but would like to comment, they can do this

via email prior to the meeting after receiving the meeting agenda and papers. Their comments will be made available to all meeting participants.

Contact

The contact for all matters related to the project (VG14061) delivery and inputs from the Project Reference Group is the Project Leader, Doris Blaesing of RMCG, who can be contacted on 0438 546 487 or dorisb@rmcg.com.au.

Appendix 3: Summary appraisal of university courses for the vegetable industry

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
University of Western Australia	Medium: course search results on homepage search are not clear but pathway to course details from the homepage is relatively easy	Bachelor of Science (Agricultural Science Degree-Specific Major) http://handbooks.uwa.edu.au/majors/majordetails?vdir=mjdagsci Three years (full-time) Flexible Have to choose a second major from those available in the Bachelor of Arts, Bachelor of Commerce, Bachelor of Design or Bachelor of Science Must study at least four units which satisfy broadening requirements Bachelor of Science (Agricultural Science Second Major) http://handbooks.uwa.edu.au/majors/majordetails?vdir=mjdagsci#sm-tab "As above" except agricultural science is the second major	Paragraph explaining the content of each unit	Agricultural consultant Agricultural scientist Biotechnologist Environmental consultant Environmental manager Finance manager Geneticist Journalist Land economist University lecturer	Average annual fee is $8,688. Typical fee range is $7,787 - $9,517

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
Curtin University	Easy: effective course search on home page	Bachelor of Agribusiness http://handbook.curtin.edu.au/courses/31/319313.html Three years (full time) Applications for credit for recognised learning may be awarded for approved TAFE units	Paragraph explaining the content of each unit	Farmer/farm manager Agricultural and resource economist Agricultural technical officer Agricultural scientist Agronomist Horticulturalist Resource economist Soil conservationist/scientist	Indicative first year only is $8,800
University of Adelaide	Easy: effective course search on home page	Bachelor of Agricultural Sciences http://www.adelaide.edu.au/degree-finder/2015/bags_bagricsci.html Three years (full time) Alternative entry pathways include higher education applicants, VET applicants, special entry applicants or without formal qualifications	Paragraph explaining the content of each unit	Advisory and services Agricultural and business consulting Agricultural production Agronomy Banking and rural finance Managing commercial enterprises Journalism, communication and marketing Research and technical work Secondary, tertiary and vocational education	Indicative annual fee is $8,775

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
University of Tasmania	Easy: effective course search on home page	Bachelor of Agriculture http://www.utas.edu.au/courses/set/courses/73n-bachelor-of-agriculture Three years (full time) Flexible study – two breadth units and two electives from other schools can be chosen Industry project of own topic Bachelor of Agricultural Science http://www.utas.edu.au/courses/set/courses/73m-bachelor-of-agricultural-science Four years (full time) Industry project of own topic	Paragraph explaining the content of each unit	Agribusiness Private sector Service consultancy Agricultural development Enterprise management Forestry Research Production agriculture or horticulture Resource management Business management Government agencies Education Aquaculture Food processing Food technology Waste management Marine and Antarctic research	Band 2 HECS fee (agriculture) is $8,768 annually

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
University of Queensland	Medium: effective course search on home page. Information on each course is harder to navigate	Diploma in Science (Food Science and Nutrition Single Major) https://www.uq.edu.au/study/plan.html?acad_plan=FOODSX2321 One year (full time) Ideal as a pathway for entry into another program Bachelor of Agribusiness https://www.uq.edu.au/study/program.html?acad_prog=2007 Three years (full time) Bachelor of Applied Science https://www.uq.edu.au/study/program.html?acad_prog=2240 Three years (full time) Bachelor of Science https://www.uq.edu.au/study/program.html?acad_prog=2030 Three years (full time)	Paragraph explaining the content of each unit and in some courses a breakdown of what was being taught within each subject or week.	None listed Includes the following Exporting Commodity trading Sales and marketing Banking, finance and insurance Supply chain management/value chain management Government agencies Policy development and analysis Agribusiness management Includes the following Agricultural advisers and inspectors Agricultural and resource economics Agricultural technical officers Agronomists Animal nutritionists Animal scientists or technicians Animal welfare officers Biosecurity or customs officers Bushland regenerators and conservation officers Crop physiologists Dairy produce inspectors Ecotour guides Educators Environmental officers Environmentalists	Indicative annual fee is $8,492 Indicative annual fee is $9,550 Indicative annual fee is $8,806 Indicative annual fee is $8,461

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
Central Queensland University	Easy: effective course search on home page	Bachelor of Science (Agricultural and Food Science Major) https://www.cqu.edu.au/courses-and-programs/study-areas/science-and-environment/undergraduate/bachelor-of-science Three years (full time) Professional placement or project of own topic Bachelor of Agribusiness and Food Security https://www.cqu.edu.au/courses-and-programs/study-areas/science-and-environment/undergraduate/bachelor-of-agribusiness-and-food-security Three years (full time) Professional placement or project of own topic	Paragraph explaining the content of each unit	Includes the following Chemical and material production Medicine Mining and metals Power industry Environmental science and ecology Food technology and forensic analysis Research and development Includes the following Manager of agricultural production enterprise Scientist or technician Consultant Farm or livestock manager Commodities trader Rural lending and investment banker	Average fee per course is $2,677.50

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
University of New England	Easy: effective course search on home page	Bachelor of Agriculture https://my.une.edu.au/courses/2015/courses/BAGR Three years (full time) Diploma in Agriculture Up to four years (part time) Bachelor of Agriculture/Bachelor of Business https://my.une.edu.au/courses/2015/courses/BAGBUS Four years (full time) Bachelor of Agriculture/Bachelor of Laws Five years (full time)	Paragraph explaining the content of each unit	Includes the following Agricultural advisory Management and consulting Agribusiness Primary production Landcare Soil conservation Natural resource management None listed Includes the following Rural borrowing and lending Merchandising of farm inputs Merchandising of farm outputs Management and consulting positions Rural politics and advocacy Property management Includes the following Solicitor Barrister	Deferred fee is $8,768 per year and Upfront fee is $7,891.20 per year

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
Charles Sturt University	Easy: effective course search on home page	Bachelor of Agriculture http://www.csu.edu.au/courses/bachelor-of-agriculture TAFE articulated program Distance education Six years (part time) or five and a half years (part time for TAFE articulated program) Bachelor of Agricultural Science http://www.csu.edu.au/courses/bachelor-of-agricultural-science Four years (full time) Can include a honours year or exit after the Bachelor of Agriculture is completed Bachelor of Agricultural Business Management http://www.csu.edu.au/courses/bachelor-of-agricultural-business-management Three years (full time) TAFE articulated program (four years part time) Bachelor of Horticulture http://www.csu.edu.au/courses/bachelor-of-horticulture Six years (part time) Distance education Bachelor of Ecological Agricultural Systems http://www.csu.edu.au/courses/bachelor-of-ecological-agricultural-systems Six years (part time) Distance education	Paragraph explaining the content of each unit and course syllabus describing details of each course/topics	a) and b) Includes the following Agronomists Livestock/animal production specialists Farm managers Agricultural merchandise representatives Agricultural researchers Landcare coordinators/managers Advisory and technical consultants Teachers Journalists Irrigation specialists Marketing professionals Rural financing supply officers Parks and recreation officers Includes the following Professional farm management Commodity trading International marketing Exporting Financial management Agronomic and livestock sales Management Business consulting Agribusiness management Agribusiness banking Includes the following Production, post harvest and	$8,952 for first year of study

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
University of Western Sydney	Easy: effective course search on home page	Bachelor of Natural Science (Sustainable Agriculture and Food Security) http://future.uws.edu.au/future_students_home/ug/sciences/sustainable_agriculture_food_security Three years (full time) "Real world" project for a professional client	Paragraph explaining the content of each unit	Agriculture and food related organisations Natural resource management Agricultural production Food security Public health and nutrition Community development Policy Communication Planning Advisory Local government Non-government organisations	Annual fees are approximately $8,768
University of Sydney	Easy: effective course search on home page	Bachelor of Food and Agribusiness http://sydney.edu.au/handbooks/agriculture/undergraduate/b_food_agribusiness.shtml Four year (full time) Option of honours Bachelor of Science in Agriculture http://sydney.edu.au/courses/programs/bachelor-of-science-in-agriculture/Bachelor-of-Science-in-Agriculture Four years (full time) Option of honours	Paragraph explaining the content of each unit	Includes the following (agribusiness) Trade Logistics Market research Product development Sales Promotion Marketing Retail management Strategic management	$8.768 annual indicative fees

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
University of Melbourne	Easy: effective course search on home page	Bachelor of Agriculture http://coursesearch.unimelb.edu.au/undergrad/714-bachelor-of-agriculture Three years (full time) Internship during the second year of the degree Bachelor of Science (Agricultural Science Major) http://coursesearch.unimelb.edu.au/majors/3-agricultural-science Three years (full time)	Paragraph explaining the content of each unit	Includes the following Farm management Harvesting Food processing Crop science Agronomy Soil management Research Environmental work Salinity project work Catchment work International trade Government roles Conference and event management Sales representation Journalism Freelance writing Agribusiness Resource economics Includes the following Agribusiness Research and development Public and private extension agencies Government and policy agencies Private consulting companies	Annual fees are approximately $8,768

University	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost or phone number
LaTrobe University	Medium: effective course search on home page, however information within the course is harder to find	Bachelor of Agriculture and Technology http://www.latrobe.edu.au/handbook/2015/undergraduate/she/science-psych/single-degrees/sbat.htm Three years (full time) Bachelor of Science (Agricultural Science Major) http://www.latrobe.edu.au/handbook/2015/undergraduate/she/science-psych/single-degrees/sbat.htm Three years (full time) Bachelor of Science and Society http://www.latrobe.edu.au/handbook/2015/undergraduate/she/science-psych/single-degrees/sbssob.htm Three years (full time) Access to the 'Work-Ready' program Bachelor of Agricultural Sciences http://www.latrobe.edu.au/handbook/current/undergraduate/she/science-psych/single-degrees/sbag.htm Three years (full time) Optional honours year 12 weeks compulsory work experience	Paragraph explaining the content of each unit plus recommended readings	Includes the following Government Defence Research Business Journalism Management Includes the following Business Government Education Science	Done by unit basis (annual average not available)

Appendix 4: Summary appraisal of TAFE courses for the vegetable industry

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
New South Wales					
Hunter Institute	Easy: central course finder	Diploma of Agriculture (Scone campus) http://www.hunter.tafensw.edu.au/browse-courses/pages/ahc50110-01v03-diploma-of-agriculture.aspx Flexible for 36 weeks Cert II and III also available by enquiry	Subject list	Station manager, property manager, farm production manager, production unit manager, agronomist	Full fee $9510 NSW Govt funded $4780
Illawarra Institute	Easy: course finder	Agriculture – Diploma (Goulburn campus) http://search.tafeillawarra.edu.au/coursedetails.htm?cid=AHC50110-01V03&q=agriculture Flexible over 2 years Cert III and IV also offered	Generic text	Station manager, property manager, farm production manager, production unit manager, agronomist	Varies & is based on eligibility for NSW Govt subsidy
New England	Easy: central browse option	Advanced Diploma – Agriculture (Armidale campus) http://www.tne.edu.au/Courses/CourseDetails?mode=brochure&cid=AHC60110-01V01&sem=S12015&query=agriculture&campus=Armidale%20Campus Delivery mode not listed Diploma and Cert II, III and IV also offered	Generic text	Agriculture manager	Varies & is based on eligibility for NSW Govt subsidy

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
North Coast	Easy: central course finder	Diploma of Agriculture http://www.northcoasttafe.edu.au/courses/ahc50110-diploma-of-agriculture.aspx Delivery mode not listed Cert II, III and IV also offered	Generic text	Farmer or farm manager	Varies & is based on eligibility for NSW Govt subsidy
Northern Sydney Institute	Difficult: unclear which courses are available (takes you to a generic website)	Advanced Diploma of Agribusiness Management https://www.tafensw.edu.au/ No details available – by enquiry only	Generic text	Station manager, property manager, farm production manager, production unit manager, agronomist	Varies & is based on eligibility for NSW Govt subsidy
Riverina	Easy: central course finder	Advanced Diploma – Agriculture http://www.rit.tafensw.edu.au/courses/detail/agriculture-adv-dip-2015-688481 By distance (Primary Industries Centre) Diploma and Cert II and III also offered	Generic text	Agriculture manager	Aust Govt subsidised $4550
		Advanced Diploma – Agribusiness Management http://www.rit.tafensw.edu.au/courses/detail/agribusiness-management-adv-dip-2015-688483 By distance (Primary Industries Centre) Diploma and Cert IV also offered	Specific text	Rural and regional agribusiness managers, agriculture / production horticulture enterprise business managers	Full fee $13180

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
Western Institute	Fairly easy: small course finder bottom of page	Certificate III in Agriculture (Bathurst, Dubbo and Orange) http://www.tafewestern.edu.au/find-a-course/course/no/AHC30110-01V04/agriculture Full time, part time and workplace delivery modes Cert II also offered	Generic text	Farm or station hand, farm or station worker	Varies & is based on eligibility for NSW Govt subsidy
Western Sydney Institute	Easy: central course finder	Diploma of Agriculture http://www.wsi.tafensw.edu.au/course/agriculture-diploma/ By distance (Open Training and Education Network) Cert III also offered	Subject list (course outline PDF)	Station manager, property manager, farm production manager, production unit manager, agronomist	NSW Govt funded $4780
		Certificate III in Production Horticulture http://oten.tafensw.edu.au/course/production-horticulture-certificate-3/ By distance and 3 workshops (Open Training and Education Network)	Subject list (course outline PDF)	Farm worker, plantation worker	Full fee $9870 Subsidised $2170-$2600 Concession $240
VICTORIA					
Bendigo TAFE	Easy: central course finder	Diploma of Agriculture (Echuca) http://www.bendigotafe.edu.au/Courses/Pages/Diploma-of-Agriculture.aspx Up to 2 years (flexible and part time options) Cert III also offered	Specific text	Farm production manager, agronomist, station/property manager	Full fee $11160 NSW Govt funded $4960 Concession $992

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
Chisholm	Easy: course finder	Diploma of Production Horticulture (Cranbourne) http://www.chisholm.edu.au/Courses/Diploma/Production_Horticulture Tailored towards hydroponic crop production Delivery includes experience in a working environment (glasshouse) 2 years full time (4 years part time) Cert III and IV also offered	Subject list	Production unit manager, climate control system technician, IPM technician, crop production manager, crop harvesting manager	Full fee $11602.50 Govt subsidised $6842.50
Go TAFE	Easy: course finder	Certificate IV in Production Horticulture http://www.gotafe.vic.edu.au/courses/course_info.cfm?CID=AHC40310#.VW_1YmSqpBc 24 months part time Cert III also offered	Subject list	Farm team leader, farm supervisor	Govt subsidised $3094
South West TAFE	Easy: course finder	Diploma of Agriculture http://www.swtafe.vic.edu.au/courses/info/201 Flexible delivery and course length	Subject list (course outline PDF)	Farm owner/manager, consultant, agricultural sales/marketing	Varies
Melbourne Poly-technic	Easy: course finder	Commercial Hydroponic Crop Production (Training Program) http://www.melbournepolytechnic.edu.au/courses/commercial-hydroponic-crop-production-training-program Part time and evening classes available (Fairfield campus)	Generic text	Hydroponic pest management, sustainable crops consulting, nutrients consulting, sales representative, crop research and development	Varies

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
Sunraysia	Easy: icons	Diploma of Production Horticulture http://www.sunitafe.edu.au/AHC50310/diploma-of-production-horticulture/ No course details provided (by enquiry only) Cert III and IV also offered	None	Job outcomes available by enquiry	Varies
Queensland					
TAFE East Coast & TAFE South West	Easy: course finder	Diploma of Agriculture http://tafeeastcoast.edu.au/course/9926/diploma-agriculture Awarded by Recognition of Prior Learning Designed for those already in industry	Subject list (course outline PDF)	Farmers and farm managers, production managers, farm or station hand / worker	Varies
Australian Capital Territory (Canberra)					
Canberra Institute of Technology	Easy: course finder	Certificate I – Horticulture (Agrifood Operations) http://cit.edu.au/study/courses/horticulture_agrifood_operations_certificate_i Entry level course – basic skills for those without previous connection to industry Delivery tailored to group requirements	Subject list	None listed Can qualify for Australian Apprenticeship	Varies
South Australia					
TAFE SA	Easy: course list drop-down	Diploma of Agriculture http://www.tafesa.edu.au/xml/course/aw/aw_TP00204.aspx?S=AWD&Y=2015 Up to 48 months part time Has some entry requirements	Subject list	Farm production manager, production unit manager, agronomist, station/property manager	Varies with Govt funding
Western Australia					
Challenger	Moderate:	Diploma of Irrigation Management	Subject list	Irrigation business manager	Varies

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
	search option	Full time (Murdoch Campus) Part of Science & Environment program (not Agriculture) Suitable for specialising in irrigation design, planning, auditing, drainage, water treatment etc.			
Durack	Easy: course finder	Diploma of Agriculture http://www.durack.edu.au/courses/course-detail/diploma-of-agriculture 2 semesters (Geraldton Campus) Recognition of Prior Learning study mode Cert II and III also offered	Subject list provided by external link to training.gov.au	Farm production manager, production unit manager, agronomist, station/property manager	No info
		Certificate IV in Agribusiness http://www.durack.edu.au/courses/course-detail/certificate-iv-in-agribusiness 2 semesters (Geraldton) Workplace assessment study mode Suitable for specialising in agribusiness administration	Subject list provided by external link to training.gov.au	Agribusiness administrator	No info
		Certificate III in Rural Operations http://www.durack.edu.au/courses/course-detail/certificate-iii-in-rural-operations 1 semester (Geraldton) full time Can be tailored from Agriculture electives to suit cropping / horticulture employment opportunities	Subject list provided by external link to training.gov.au	None listed. Can be tailored to provide opportunities in cropping or horticulture	No info
Great Southern	Easy: course finder	Certificate II Production Horticulture http://www.gsit.wa.edu.au/courses/course-detail/certificate-ii-in-production-horticulture-katanning	Subject list hard to find - link provided	None listed. Designed to provide foundation skills and knowledge required by the	Varies

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
		1 semester full time (Gnowangerup & Kogonup campuses) Practical, foundation skills provided Cert II (Organics Focus) is also offered (Denmark campus)	at bottom of Products & Services Catalogue	production horticulture sector	
Pilbara Institute	Easy: course finder	Certificate I in AgriFood Operations http://www.pilbara.wa.edu.au/courses-at-pi/certificate-i-in-agrifood-operations 6 weeks (21 hrs per week) Entry level course – basic skills for those without previous connection to industry Can be tailored to suit interests	Core subjects listed. Electives to be discussed during enrolment	None listed. Aims to provide basic skills and knowledge to prepare for work in agriculture or horticulture.	$1107.51
South West Institute	Easy: course finder	Certificate III in Production Horticulture http://www.swit.wa.edu.au/courses/Pages/Certificate-III-in-Production-Horticulture.aspx Flexible, self-paced delivery mode (Margaret River Campus) Cert II also offered	Subject list	Production horticulture assistant, farm worker	No info
Tasmania					
TasTAFE	Easy: course finder	Diploma of Agriculture http://www.tastafe.tas.edu.au/courses/course/diploma-of-agriculture/ 2 years full time / flexible workplace training Cert II, III and IV also offered	Subject list	Students are encouraged to pursue further qualifications e.g. Advanced Diploma or Rural Business Management or to consider tertiary study	Full fee $13379 Subsidised $6215
		Diploma of Agribusiness Management http://www.tastafe.tas.edu.au/courses/course/diploma-of-agribusiness-management/	Subject list	None listed	Full fee $12432 Subsidised $5775

College	Ease of navigation	Course details	Level of subject detail provided	Mentioned careers	Cost
		Flexible delivery – on the job training Requires Cert III in Agriculture or extensive experience Intended for those currently employed in industry			

Appendix 5: Summary appraisal of on-line courses for the vegetable industry

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
Canberra Institute of Technology	Diploma - Horticulture http://cit.edu.au/study/courses/horticulture_diploma Duration: 2 semesters full-time (approx. 30 hours per week) OR part-time equivalent Access to a horticultural workplace is desirable but not essential VET FEE-HELP is available 8 core subjects Certificate III – Horticulture http://cit.edu.au/study/courses/horticulture_certificate_iii Duration: Recognition pathway or delivery tailored to targeted groups This qualification meets the requirements of the 'Agriculture, horticulture and Conservation and Land Management Training Package' General vocational outcome in amenity horticulture – not suitable for horticultural trades 2 core subjects and 14 electives (minimum 8 group A electives & minimum 3 group A or B electives) Certificate II – Horticulture http://cit.edu.au/study/courses/horticulture_certificate_ii Duration: Recognition pathway or delivery tailored to targeted groups This qualification meets the requirements of the 'Agriculture, horticulture and Conservation and Land Management Training Package' 2 core subjects and 13 electives (minimum 3 group A and minimum 7 group A or B electives) Certificate I – Horticulture (Agrifood operations) *"See 'TAFE info & notes' and 'TAFE database' for information"*	Paragraph explaining the course content. The information supplied is broad. Subject list Subject list	Include: Senior horticulturist Parks and gardens manager Horticultural enterprise manager Includes: Horticulturist Gardener Includes Horticulture worker Horticulture assistant	$4,332 Dependant on units chosen Dependant on units chosen
ACS Distance		Lesson structure		Depends on

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
Education		and topics generally provided for each unit. In some cases only a brief description is available.		payment plan chosen.
	Diploma in Agriculture http://www.acs.edu.au/courses/diploma-in-agriculture-514.aspx Duration (approx.): 2,100 hours 10 core modules and a selection of 11 electives from 32 choices Research projects can be on any area of interest		Includes: Farm management Farm contracting Services to farmers Agricultural equipment and supplies Education, media, research	Full payment up front: $9,363.20 3 part payments: $10,094.70 6 part payments: $10,972.50
	Advanced Certificate – Farming http://www.acs.edu.au/courses/advanced-certificate-farming-self-designed-614.aspx Duration: 900 hours 1 core module and a choice of 8 electives from 32 choices Industry project to be completed – can have any focus		Includes: Ordering equipment and supplies Planning work programs Directing staff (and contractors) Managing the maintenance of facilities and equipment Managing stock levels and quality Managing animal or crop health/condition Budget control Record keeping Staff training	Full payment up front: $4,044.15 2 part payments: $4,368.10 3 part payments: $4,733.85

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
			Workplace health and safety Farm contracting	
	Proficiency Award in Agriculture http://www.acs.edu.au/courses/proficiency-award-in-agriculture-586.aspx Duration: 500 hours Self-paced course 2 industry projects on choice of subject to be completed as core subjects and a choice of 3 electives from 24 choices		None listed	Full payment up front: $1,860.10 2 part payments: $2,048.20 3 part payments: $2,225.85
	Advanced Diploma in Agriculture – Alternative Agriculture http://www.acs.edu.au/courses/advanced-diploma-in-agriculture-alternative-agriculture-193.aspx Duration: 2,500 hours 8 core modules, 8 stream modules and a choice of 8 electives from a choice of 28 modules 2 research projects on topics of own choosing to be completed		None listed	Full payment up front: $12,571.35 3 part payments: $13,543.20 6 part payments: $14,609.10
	Advanced Certificate in Horticulture http://www.acs.edu.au/courses/advanced-certificate-in-horticulture-374.aspx Duration (approx.): 900 hours 5 core modules and 1 elective stream consisting of 3 modules. *Note: for this work the "Crops Stream" was chosen* Subjects can go towards the Associate Diploma in Horticulture		None listed	Full payment up front: $4,044.15 2 part payments: $4,368.10 3 part payments: $4,733.85
	Associate Diploma in Horticulture http://www.acs.edu.au/courses/associate-diploma-in-horticulture-383.aspx Duration: 1,500 hours		Includes: Landscaping gardens and other areas Cut flower production	Full payment plan: $6,970.15 2 part payments: $7,544.90

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
	Self-paced Prerequisite certificate required (Advanced Certificate in Horticulture)		Floristry Indoor 'plant scaping' Home gardens Turf Forestry Plant nursery operation Garden centre retailing Allied trades – manufacturing and supplying hardware, equipment and machinery Providing education, media, consulting or other services Fruit and nut production Mushroom production Growing vegetables or herbs Oil production (cooking oils, perfumes etc.) Medicinal plants Fuel crops (bio-fuels) Horticultural therapy Soil improvement crops – for production of composts, fertility supplements, etc.	3 part payments: $8,056.95
	Associate Diploma in Agriculture http://www.acs.edu.au/courses/associate-diploma-in-agriculture-587.aspx Duration: 1,500 hours		Includes: Own your own farm Work as a farm manager (if you already have some	Full payment: $6,970.15 2 part payments: $7,544.90

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
	6 core modules and 9 electives from a choice of 31 modules 2 of the core modules are an industry project and a research project which can be on a topic chosen by the student		farming experience) Work as a farm contractor – offering specialist services Start as a farm hand with management potential Work for farm suppliers – services, material and equipment Work in new enterprises such as organic and sustainable farming	3 part payments: $8,056.95
	Diploma in Horticultural Science http://www.acs.edu.au/courses/diploma-in-horticultural-science-486.aspx Duration: 2,100 hours 6 core modules and 15 electives that are chosen from a choice of 25		Includes: Work in a professional horticultural role in nurseries Work as a horticultural consultant across many sectors Work as a teacher Work in research Work as a technician	Full payment up front: $9,363.20 3 part payments: $10,094.70 6 part payments: $10,972.50
	Certificate in Agriculture http://www.acs.edu.au/courses/certificate-in-agriculture-10.aspx Duration: 600 hours 3 core modules and 3 electives from a choice of 14		Includes: Farm worker or manager Farm owner (small or large) Agricultural services or supplies Agricultural or produce marketing consulting Teaching	Full payment up front: $3,114.10 2 part payments: $3,281.30 4 part payments: $3,511.20

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
			Media	
	Diploma in Horticulture http://www.acs.edu.au/courses/diploma-in-horticulture-536.aspx Duration: 2,100 hours 10 core modules and 10 elective modules from a choice of 27 An industry project and a research project on a topic of own choosing are part of the core modules		None listed	Full payment up front: $9,363.20 3 part payments: $3,364.90 6 part payments: $10,972.50
	Advanced Diploma in Horticultural Management http://www.acs.edu.au/courses/professional-advanced-diploma-in-horticultural-management-487.aspx Duration: 2,400 hours Flexible study 15 core modules and 10 elective modules from a choice of 33 modules		None listed	Full payment up front: $12,571.35 3 part payments: $13,543.20 6 part payments: $14,609.10
	Proficiency Award in Horticulture http://www.acs.edu.au/courses/proficiency-award-in-horticulture-61.aspx Duration: 500 hours Primarily industry project or work experience If you work in the industry you have been studying, a reference from you employer OR If you don't work in the relevant industry, an industry project needs to be completed (with help from supervisor) Assumed broad understanding of horticulture – the course is designed to strengthen particular areas of interest		None listed	Full payment plan: $1,860.10 2 part payments: $2,048.20 3 part payments: $2,225.85
	Advanced Certificate in Applied Management (Crops) http://www.acs.edu.au/courses/advanced-certificate-in-applied-management-crops-98.aspx		Includes: Farm manager Marketing	Full payment up front: $4,044.15 2 part payments:

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
	Duration: 900 hours Self-paced Can upgrade to a diploma 6 core modules, 2 stream modules and 1 elective from a choice of 15 modules Industry project on topic of own choosing		Start your own business	$4,368.10 3 part payments: $4,733.85
	Advanced Diploma in Horticulture (Crops) http://www.acs.edu.au/courses/advanced-diploma-in-horticulture-crops-99.aspx Duration: 2,500 hours 11 core modules, 13 electives from a choice of 23 and 100 hours work experience or if unable to complete work experience, take workshop 1 course		None listed	Full payment up front: $12,571.35 3 part payments: $13,543.20 6 part payments: $14,609.10
	Certificate in Horticulture (crops) http://www.acs.edu.au/courses/certificate-in-horticulture-crops-94.aspx Duration: 700 hours 2 core modules and a choice of 4 electives from 11 modules		Includes: In a production nursery As a crop grower On a farm In an orchard At a farm supplier Crop processing Marketing, education and media Urban farming	Full payment plan: $3,114.10 2 part payments: $3,281.30 4 part payments: $3,511.20
	Diploma in Horticultural Science http://www.acs.edu.au/courses/diploma-in-horticultural-science-486.aspx		Includes: Work in a professional horticultural roles in nurseries	Full payment up front: $9,363.20 3 part payments:

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
	Duration: 2,100 hours 6 core modules and a choice of 15 electives from 25 modules		Work as a horticultural consultant across many sectors Work as a teacher Work in research Work as a technician	$10,094.70 6 part payments: $10,972.50
	Diploma in Horticulture http://www.acs.edu.au/courses/diploma-in-horticulture-536.aspx Duration: 2,100 hours 10 core modules and a choice of 10 electives from 27 modules		None listed	Full payment up front: $9,363.20 3 part payments: $10,094.70 6 part payments: $10,972.50
	Advanced Diploma in Horticultural Management http://www.acs.edu.au/courses/professional-advanced-diploma-in-horticultural-management-487.aspx Duration: 2,400 hours 15 core modules and a choice of 10 electives from 33 choices Flexible study		None listed	Full payment up front: $12,571.35 3 part payments: $13,543.20 6 part payments: $14,609.10
	Advanced Certificate – Farming http://www.acs.edu.au/courses/advanced-certificate-farming-self-designed-614.aspx Duration: 900 hours 1 core module (industry project) and a choice of 8 electives from 32 choices		Includes: Ordering equipment and supplies Planning work programs Directing staff (and contractors) Managing the maintenance of facilities and equipment Managing stock levels and	Full payment up front: $4,044.15 2 part payments: $4,368.10 3 part payments: $4,733.85

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
			quality Managing animal or crop health/condition Budget control Record keeping Staff training Workplace health and safety Farm contracting	
	Certificate in Alternative Farming http://www.acs.edu.au/courses/certificate-in-alternative-farming-484.aspx Duration: 600 hours 2 core modules and a 4 electives from a choice of 18 modules		None listed	Full payment plan: $3,114.10 2 part payments: $3,281.30 4 part payments: $3,511.20
Madec	Certificate II in Horticulture VIC - http://www.madec.edu.au/wp-content/uploads/2011/12/AHC20410Certificate-II-in-Horticulture2.pdf SA - http://www.madec.edu.au/wp-content/uploads/2011/12/AHC20410-Certificate-II-in-Horticulture.pdf Duration: 8-12 months Combination of classroom-based and workplace activities 2 core units and 15 electives Certificate III in Horticulture VIC - http://www.madec.edu.au/wp-content/uploads/2011/12/AHC30710-Certificate-III-in-Horticulture2.pdf SA - http://www.madec.edu.au/courses/certificate-iii-in-horticulture/ahc30710-certificate-iii-in-horticulture-5/	Only heading of 2 core subjects provided	Includes: Horticulture worker Horticulture assistant Includes: Horticulturist Gardener	Not listed Not listed

Organisation	Course details	Level of subject detail provided	Mentioned careers	Cost / phone number
	Duration: 12 months 2 core units and 14 electives			

Appendix 6: Main vegetable production regions

NRM regions are included because ABS data is produced by NRM, state or statistical boundaries

State	Main vegetable producing region		NRM region	# Vegetable businesses	Vegetable area (ha)	Main crops (& Asian vegetables)
NSW	1	Sydney Basin	Hawkesbury-Nepean	672	<4,440	Lettuce, Asian and bunching vegetables, brassicas, leafy vegetables LOTE
	2	Bathurst region	Central West	< 194	<4,440	Sweet corn, beetroot, brassicas, lettuce
	3	Cowra region	Lachlan	< 194	<4,440	Onions, beetroot, leafy vegetables
NT	4	Darwin / Katherine areas	Darwin Katherine	< 194	<4,440	Vegetables general, Asian vegetables LOTE
QLD	4	Bowen/Burdekin	Burdekin	< 194	7995	Beans, corn, capsicums, cucurbits LOTE
	5	Bundaberg	Burnett-Mary	318	7,355	Capsicums, zucchini, beans, corn, cucurbits, snow peas, sweet potato, baby leaf, Asian vegetables
	6	Lockyer Valley (Gatton) /Fassifern	South East (Qld)	614	13,258	Carrots, lettuce, celery, beetroot, brassicas, sweet corn, beans
	7	Stanthorpe	Border Rivers (QLD)	< 194	<4,440	Lettuce, celery, baby leaf, brassicas
SA	8	Virginia / Adelaide Plains	Adelaide and Mount Lofty Ranges	403	<4,440	Lettuce, brassicas, carrots, (cucumbers, capsicums) LOTE
	9	Adelaide Hills			<4,440	Leek, lettuce, celery, brassicas
	10		SA Murray Darling Basin	< 194	7,398	Carrots
TAS	11	North West (Devonport, Burnie, Smithton)	Cradle Coast NRM	298	6,489	Carrots, brassicas, beans, peas, celery, leek, beetroot

State	Main vegetable producing region		NRM region	# Vegetable businesses	Vegetable area (ha)	Main crops (& Asian vegetables)
	12	North (Scottsdale, Cressy)	NRM North	205	6,220	Peas, beans, carrots, broccoli
	13	South (Hobart / Cambridge)	NRM South	< 194	<4,440	Baby leaf, lettuce, brassica, spinach
VIC	14	Werribee	Port Phillip and Westernport	374	12,343	Lettuce, brassicas, cauliflower, Asian vegetables
	15	Cranbourne/Koo Wee Rup (Sand belt)				Lettuce, celery, parsnips, baby leaf, Asian vegetables
	16	Sale/Maffra	West Gippsland	< 194	6,458	Lettuce, baby leaf, brassicas, sweet corn, beans, carrots
	17	Lindenow (East Gippsland)	East Gippsland	< 194	<4,440	
		Increasing vegetable production in Northern Victoria (Shepparton, Swan Hill, Mildura), emerging LOTE growers				
WA	18	Perth metro - Swan coastal plain	Swan	216	<4,440	Sweet corn, lettuce, brassicas, baby leaf, Asian vegetables, carrots
	19	Manjimup/ Pemberton, Busselton/Myalup	South West (WA)	194	4,480	Lettuce, baby leaf,