

AGRICULTURE, HORTICULTURE AND
CONSERVATION AND LAND
MANAGEMENT INDUSTRY SECTOR

**IRC Skills Forecast and
Proposed Schedule of Work**

2019–2022

Prepared on behalf of the Agriculture and Production Horticulture Industry Reference Committee (IRC) and the Amenity Horticulture, Landscaping, Conservation & Land Management IRC for the Australian Industry Skills Committee (AISC).

IRC SKILLS FORECAST AND PROPOSED SCHEDULE OF WORK 2019-2022

Purpose

The Industry Reference Committee (IRC) Skills Forecast and Proposed Schedule of Work identifies proposed Vocational Education and Training (VET) training package development work necessary to meet the needs of industry and sets out the evidence of that need. The Australian Industry and Skills Committee (AISC) consider this information in prioritising and commissioning training package development work.

The IRC annual review of the Skills Forecast and Proposed Schedule of Work allows the identification of priority projects and provides the likely timing of training package development work over the next four years.

The Skills Forecast and Proposed Schedule of Work needs to provide the AISC with sufficient information on each project to consider:

- What work is to be commissioned;
- Clear evidence of employer and industry need;
- Alignment to Ministers' Priorities (see Appendix).

The Skills Forecast and Proposed Schedule of Work is to be developed in line with:

- Standards for Training Packages 2012;
- Training Package Products Policy;
- Training Package Development and Endorsement Process Policy.

This Skills Forecast presents the latest industry intelligence and resulting schedule of work for priority industry skills areas of the Agriculture and Production Horticulture Industry Reference Committee (IRC) and the Amenity Horticulture, Landscaping and Conservation & Land Management IRC.

This document is not intended to identify and address every challenge faced across all industry sectors; it identifies and addresses the issues, challenges and opportunities that industry has identified as 'priority' for this stage of the schedule and acts as a resource and reference for industry and associated skills, learning and accreditation bodies seeking to act upon them.

Detailed data and information concerning industry skills needs across all sectors covered by the Agriculture and Production Horticulture IRC and the Amenity Horticulture, Landscaping and Conservation & Land Management IRC, including information from previous Skills Forecasts, can be found on the Skills Impact website www.skillsimpact.com.au and is available to Industry, RTO and consumers in line with Ministerial priorities.

Method & Structure

This Skills Forecast and Proposed Schedule of Work was developed through research of national and industry data sources, and ongoing input from IRC members and key stakeholders.

IRC members undertake consultation with industry, and guide consultation processes undertaken on their behalf throughout each year. Consultation may include personal meetings, conference attendance, organised workshops, surveys, project feedback collection and unsolicited contributions sent to the SSO.

The Skills Forecast structure is guided by the Australian Industry Skills Commissions (AISC), which requires the following to be included:

- **Sector overview:** Brief description of the industry and industry sub-sectors, the Training Package, and current challenges and opportunities.
- **Employment & Skills Outlook:** Overview of the data, strategies and policies relevant to the industry.
- **Key Changes and Proposed Responses:** identifying the drivers for change from industry (e.g. occupations, technology, emerging markets), regulation, and nationally important policies, and proposed responses including the impact on stakeholders.
- **Consultation Undertaken:** Information on the consultation previously undertaken to support the proposed responses, including issues and sensitivities raised.
- **Proposed Schedule of Work:** The current proposed schedule of work over the next four-year period as modified from previous plans as a result of consultations and the need to meet changing priorities
- **Project Details:** details of proposed projects proposed for approval of the AISC to be undertaken in 2019 – 2020.

Administrative Information

Name of Industry Reference Committees (IRCs):

- 1) Agriculture and Production Horticulture
- 2) Amenity Horticulture, Landscaping, Conservation and Land Management

Name of Skills Service Organisation (SSO): Skills Impact

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EXECUTIVE SUMMARY

Agriculture, Horticulture, Conservation and Land Management have been at the forefront of Federal, State and Territory Government policies and Australian economic growth throughout the modern history of Australia. In particular, these sectors underpin the overwhelming majority of Australia's Indigenous, rural and regional communities. The sector employs almost 350,000 people, with more than 72,000 learners serviced by 643 Registered Training Organisations (2017 figures).

The AHC Agriculture, Horticulture and Conservation and Land Management Training Package is one of the most complex, diverse and largest in the Australian VET system. This has been recognised by the Australian Industry Skills Council, which has appointed two Industry Reference Committees (IRC) to oversee industry-driven review of the sectors. The Agriculture and Production Horticulture IRC and the Amenity Horticulture, Landscaping and Conservation & Land Management IRC are collaboratively overseeing updating and development of the training package.

Given the rapid technological advancements, changing product markets and climate ecosystems, new work methods, evolving global priorities and trade opportunities, demographic movements and numerous other social and economic changes, it is clear that ways must be found to ensure each training product in the *AHC Training Package* is reviewed on a regular basis. This needs to be achieved flexibly to allow industry to address urgent skills needs and create new job outcomes.

Both IRCs have examined and recommend a new approach to review of the AHC Training Package, based on identifying and reviewing units by their industry sector classification, rather than reviewing units based on listing in qualifications. It is estimated this will significantly increase the speed of review of qualifications, units of competency and skill sets within more complex training packages than is possible under a 'qualification' driven approach. It is estimated this will result in review of the Training Package in four-six years, while minimising the burden of voluntary support on industry.

There are several benefits to designing training package reviews around a specific sector or a group of interrelated sectors in complex training packages, including:

- 1) More efficient engagement of and use of the time volunteered by industry participants to consult on the review and redesign processes.
- 2) A greater return on investment of resources, especially when reviewing units that appear in multiple qualifications.
- 3) Clearer identification of duplication of unit/qualification outcomes and obsolete units/qualifications, ensuring these units are deleted or merged with other units/qualifications.
- 4) Easier correction of misalignment of units against the nominated Australian Qualifications Framework (AQF) levels.

In each year, the approach should result in review of between 150 and 185 units of competency, to be updated, modified or deleted. In addition, the recommended approach will also allow for flexibility to address urgent, emerging and changing skills needs, particularly in areas with current or potential job growth, regulatory changes, or where the ways of undertaking work are going through modification. In the next year, The IRCs are recommending projects in: Green Walls and Rooftop Gardens and Agronomy.

Proposed Schedule of Work 2019 – 2022

2019-2020	<p>Project 1: Unit Sector Approach Review of AHC Year 1</p> <p>Review of Unit Sectors</p> <ul style="list-style-type: none">• Cluster 1: Conservation & Land Management<ul style="list-style-type: none">○ Lands, Parks & Wildlife AHCLPW; Natural Area Restoration AHCNAR; Natural Resource Management AHCNRM; Soil & Water AHCSAW; Fire AHCFIR; Fauna AHCF AU; Explosives AHCEXP; Pest Management AHCPMG• Cluster 2: Nursery Production<ul style="list-style-type: none">○ Nursery Production AHCNSY; Plant Culture and Maintenance AHCP CM; Soils & Media AHCSOL• Cluster 3: Production Horticulture<ul style="list-style-type: none">○ Production Horticulture AHCPHT; Water AHCWAT; Medicinal Crops (Separate project previously approved to be incorporated into this project)• Cluster 4: Biosecurity and Emergency<ul style="list-style-type: none">○ Biosecurity AHCBIO; Biosecurity Emergency Response AHCBER• Cluster 5: Merchandising & Sales AHCMER <p>Project 2: Green Walls and Rooftop Gardens</p> <p>Address the skills needs of an emerging market and priority approach to addressing urbanisation issues through the development of new qualifications and units in Green Walls and Rooftop Gardens</p> <p>Project 3: Agronomy</p> <p>Development of National units of competency in Agronomy, utilising current units in the <i>AHC Training Package</i> and the current Victorian accredited course 22273VIC Diploma of Agronomy, with the development of 1 new qualification (to replace current Vic qualification) and new units for importation into current qualifications, and to delete duplicated units across multiple qualifications.</p>
2020-2021	<p>Project 1: Unit Sector Approach Review of AHC Year 2</p> <p>Review of Unit Sectors</p> <ul style="list-style-type: none">• Cluster 1: Landscaping<ul style="list-style-type: none">○ Landscaping AHCLSC; Parks and gardens AHCPGD; Design AHCD E S• Cluster 2: Indigenous<ul style="list-style-type: none">○ Aboriginal-Sites Work AHCASW; Indigenous Land Management AHCILM• Cluster 3: Broad Acre and Seed<ul style="list-style-type: none">○ Broad Acre Cropping AHCBA C; Seed Production AHCSDP; Seed Processing AHCSDT; Seed Testing AHCSPO• Cluster 4: Dairy and Milk Harvesting<ul style="list-style-type: none">○ Dairy AHCDRY; Milk Harvesting AHCMKH <p>Project 2</p> <ul style="list-style-type: none">• Therapeutic Horticulture

- Develop qualifications and units of competency to support the emerging industry of Therapeutic Horticulture

Project 3: Pregnancy Testing and Artificial Insemination

Review of AHCLSK408, AHCPRK301 and potential new units of competency to provide skills training to match new work methods of pregnancy testing including ultrasound and blood testing, and review of 5 units in artificial insemination (AHCAIS and AHCPRK303).

2021-2022

Project: Unit Sector Approach Review of AHC Year 3

Review of Unit Sectors

- Cluster 1: Community and Common
 - Community Coordination and Facilitation AHCCCF; Common AHCCMN; Work Health & Safety AHCWHS; Work AHCWRK
- Cluster 2: Composting & Organic
 - Composting AHCCOM; Organic Production AHCORG
- Cluster 3: Permaculture AHCPER

Other Projects to be identified to address industry priorities

2022-2023

Project: Unit Sector Approach Review of AHC Year 4

Review of Unit Sectors

- Cluster 1: Livestock
 - Livestock AHCLSK; Infrastructure AHCINF; Sustainability AHCSUS
- Cluster 2: Wool
 - Shearing AHCSHG; Wool Handling AHCWOL

Other Projects to be identified to address industry priorities

Agriculture and Production Horticulture IRC

The Agriculture and Production Horticulture (APH) IRC is responsible for national training package qualifications relevant to the production of food and fibre including livestock farming, mixed farming, broadacre cropping, production horticulture, and irrigation, pest management and agricultural support services relating to these industries.

Qualifications overseen by the IRC are in the AHC Agriculture, Horticulture and Conservation and Land Management Training Package.

The APH IRC is supported by the Skills Service Organisation, Skills Impact.

During 2018, Ms Sharyn Casey stepped down from the position of Chair of the IRC and resigned as the appointed organisation nominee from Hort Innovation. In addition, Mr Shane Hellwege resigned from the IRC. Replacements are currently being sought for both positions. Mr Geoff Harvey was appointed as Acting Chair, with a permanent appointment to be made in the first quarter of 2019.

Table 1: Agriculture and Production Horticulture IRC (as at January 2019)

Name	Organisation or area of expertise
Vacant	Hort Innovation
Geoff Harvey	Expertise in agricultural irrigation
Shane Roulstone	AWU - Australian Workers' Union
Gordon Verrall	Expertise in agricultural business practice.
Rebecca Fing	Expertise in broadacre – cotton and grain
Vacant	Expertise in livestock - dairy production
Dianne Fullelove	Expertise in production horticulture and agricultural chemicals
Judi Forsyth	Expertise in livestock and broadacre farming
Rob Fenton	Expertise in organic farming
Reginald Kidd	National Farmers' Federation
Greg Owens	NT Farmers Assoc.
Roderick Whistler	Expertise in livestock and agricultural support services
Meg Parkinson	Expertise in livestock -poultry production
Vacant	WA Farmers Federation
Jacqueline Heap	Expertise in livestock and production horticulture

Amenity Horticulture, Landscaping and Conservation & Land Management IRC

The Amenity Horticulture, Landscaping, Conservation and Land Management IRC is responsible for national training package qualifications relevant to production and retail nurseries, turf, landscaping, parks and gardens, botanical gardens, arboriculture, irrigation, pest and weed management relating to these industries, and conservation and land management.

Qualifications overseen by the IRC are in the AHC Agriculture, Horticulture and Conservation and Land Management Training Package.

The AHLCLM IRC is supported by the Skills Service Organisation, Skills Impact.

The Chair of the IRC is Ms Esther Ngang and the Deputy Chair is Mr Christopher O'Connor.

Table 2: Amenity Horticulture, Landscaping and Conservation & Land Management IRC (as at January 2019)

Name	Organisation or Area of expertise
Esther Ngang	Expertise in amenity horticulture landscaping parks and gardens
Christopher O'Connor	Nursery and Garden Industry Australia
Craig Hallam	Expertise in amenity horticulture landscaping parks and gardens
Jen Ford	Australian Association of Bush Regenerators Inc
Simone Staples	Australian Golf Course Superintendents' Association
Jyri Kaapro	Expertise in pest management and weeds
Geoff Harvey	Expertise in Irrigation for amenity horticulture
Paul Janssens	Expertise in amenity horticulture landscaping parks and gardens
Reginald Kidd	National Farmers' Federation
Des Boorman	Expertise in Production Nursery and Weed Management
Jim Johnson	Expertise in amenity horticulture landscaping parks and gardens
Julie Heran	Expertise in Indigenous Conservation and Land Management
Virginia Solomon	Expertise in Conservation and land management - permaculture
Susan Brunskill	Expertise in Permaculture and Landcare and Management
Mark Sorby	Expertise in amenity horticulture landscaping parks and gardens

SECTOR OVERVIEW

“People say to us how brave we are, fighting the wilderness, braving the isolation of the Outback. But these are easy opponents, compared with drought. To watch your land shrivel and die, year in and year out, to see beautiful fields turn to dust bowls, to watch your animals starve and die. To suffer all this, only to be then washed away in a flood, your home and your family treasures lost and destroyed. And then to pick up the pieces and start again.”

Sara Henderson, From Strength to Strength

“It’s the sheer joy of seeing things grow and helping them to grow, even harvesting the stuff that you’ve grown yourself, no matter how old you are.”

Peter Cundall, Gardening Australia

Introduction

Agriculture, Horticulture, Conservation and Land Management play vital roles in Australia, contributing to the social, economic and environmental sustainability of the nation. The industry has been at the forefront of Federal, State and Territory Government policies and Australian economic growth throughout the modern history of Australia.

The Agriculture, Horticulture and Conservation and Land Management (AHC) Training Package covers the majority of training in the businesses and operations that underpin the overwhelming majority of Australia’s regional, rural and Indigenous communities. The sector employs almost 350,000 people, with more than 72,000 learners serviced by 643 Registered Training Organisations (2017 figures).

Table 3: Industry snapshot

Revenue	Industry Value Added ¹	Exports	Imports	Wages	Domestic Demand
\$144.4bn	\$39.1bn	\$18.4bn	\$1.5bn	\$11.2bn	\$127.4bn

Source: IBISWorld Industry Wizard

The AHC Training Package has 882 Units of Competency across 97 qualifications and 53 Unit Sectors. Each qualification within this Training Package typically includes units crossing several different industry sectors.

More than 80 per cent of Australian land hosts activities related to the AHC Training Package, with dominant uses including livestock grazing of native vegetation, grazing of modified pastures, conservation and parks, and dryland cropping. This excludes horticulture, micro-production, landscaping and gardening work within Australia’s urban areas.

Sector description

The agriculture, horticulture and conservation and land management industry sector is highly diverse, encompassing businesses that operate in the following sub-sectors:

¹ Industry value added (IVA) is the contribution by businesses in each industry to gross domestic product (GDP). Put another way, IVA records the market value of the goods and services produced by the industry, with the cost of goods and services used in production subtracted from the total.

Amenity horticulture

- Arboriculture
- Landscape services
- Gardening services
- Turf and sports turf management
- Permaculture

Production horticulture

- Turf production (commercial)
- Nursery production
- Retail nursery
- Floriculture production
- Vegetable growing
- Fruit tree growing
- Nut tree growing
- Seed Processing

Broadacre farming

- Grain growing
- Fodder growing
- Sugar cane growing
- Cotton growing
- Seed production

Livestock farming

- Sheep farming
- Beef cattle farming
- Sheep-beef cattle farming
- Dairy cattle farming
- Poultry farming
- Other livestock farming

Mixed crop and livestock farming

- Grain-sheep farming
- Grain-beef cattle farming
- Lifestyle block farming

Agriculture support services

- Shearing, cropping and agricultural support service
- Grain storage services
- Agronomy
- Agricultural Machinery Industry

Agricultural product wholesaling

- Fruit and vegetable wholesaling
- Cereal grain wholesaling
- Wool wholesaling
- Fish and seafood wholesaling

Conservation & Land Management

- National Parks
- Nature Reserves
- Council reserves
- Indigenous lands and Seas
- Corridors (national, state and local)
- Botanical gardens
- Landcare
- Coastcare
- Rivercare
- Seed Banks
- Private land

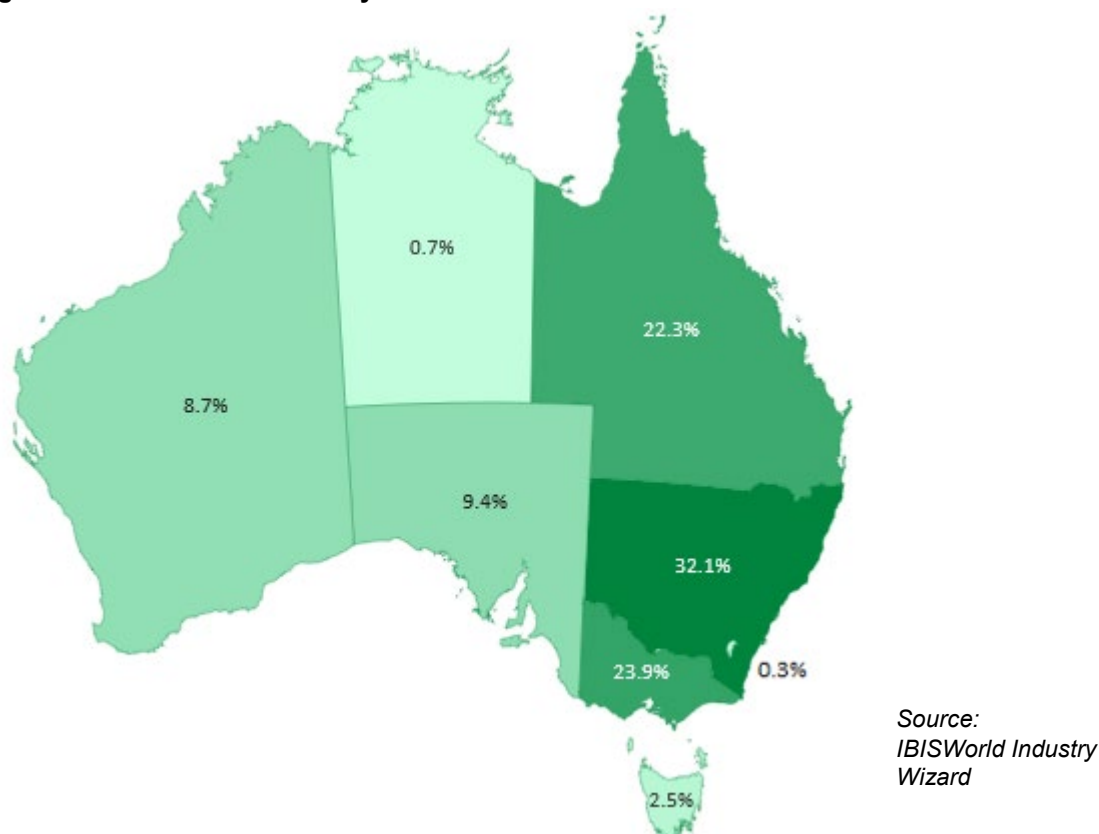
Landscaping

- Landscaping construction
- Public and private space design and scoping
- Feature installation and design
- Lawn and garden installation and design
- Residential, office & commercial building landscaping and maintenance services
- Watering systems and features

Businesses

As at June 2017, there were 176,419 businesses across agriculture, horticulture, agricultural product wholesaling and parks and gardens operations². Over 69 per cent (122,343) of businesses were non-employing, and 29 per cent (51,669) were small businesses, employing fewer than 20 people. There were 2,340 medium businesses (between 20 and 199 employees) and 78 large businesses (over 200 employees).

Figure 1: Business locations by state



However, Hort Innovation conducted research in 2017 into the reputed under-reporting of statistical data by ABS and other industry data collections including greenlife business sectors, specifically in nurseries and gardens. The report concluded that the value of and statistics in this sector have been consistently under-reported.

² Australian Bureau of Statistics, 2017, 8165.0 - Counts of Australian Businesses, including Entries and Exits, Jun 2013 to Jun 2017: Businesses by Main State by Industry Class by Employment Size Ranges, June 2016 and June 2017.

Figure 2: The industry in a ‘nutshell’

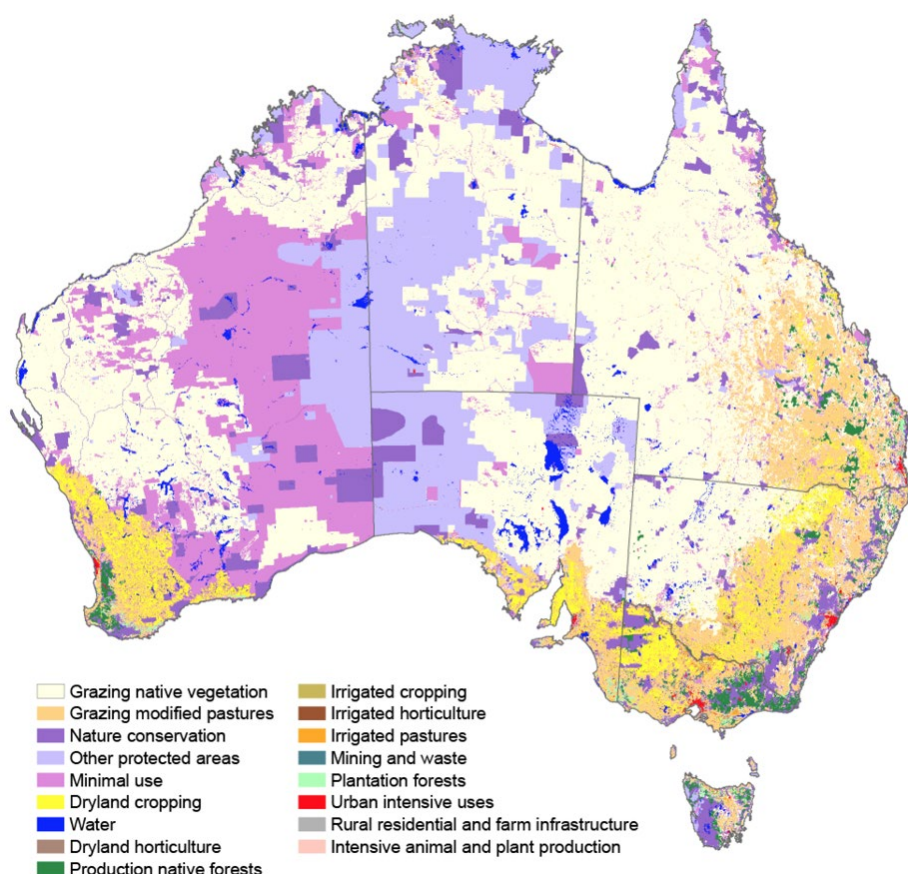


Source: Hort Innovation, 2018, *Nursery Industry Statistics and Research*, p.3

In addition to businesses, each level of government and a number of Non-Government Organisations are employers of graduates from the *AHC Training Package*.

The breadth of the scope of work undertaken by these businesses and operations can be illustrated by Australian Land Use mapping, which is regularly undertaken at various levels of government as information required for current and future policies and strategies. The complexity of activities covered is illustrated in the size and training coverage of the *AHC Training Package*.

Figure 3: Land use in Australia



Source: *Australian State of the Environment 2016*

<https://soe.environment.gov.au/theme/land/topic/2016/land-use-and-management>

It should be noted that many activities in Horticulture, Conservation & Land Management, Landscaping and micro-production also take place in urban intensive areas.

AgriFutures Australia has identified the decline in land used for farming in Australia as a current trend which is likely to be ongoing.

Stakeholders

APH Stakeholders

- National Farmers' Federation
- Australian Chicken Growers Council
- Australian Oilseeds Federation
- Australian Pork Limited
- Cane Growers
- Cattle Council of Australia
- Cotton Australia
- Dairy Australia
- Grain Growers
- Horticulture Innovation Australia
- Irrigation Australia
- Irrigation Council of Australia
- Maize Association of Australia
- Australian Lot Feed Association
- Ricegrowers' Association of Australia
- Sheep Meat Council of Australia
- Wool Producers Australia
- NSW Farmers
- NT Farmers
- Pastoralists and Graziers Association of Western Australia
- Primary Producers SA
- Queensland Farmers' Federation
- Tasmanian Farmers and Graziers Association
- Victorian Farmers Federation
- WA Farmers
- Australian Workers Union

AHLCLM Stakeholders

- Australian Institute of Horticulture
- Arboriculture Australia
- Landscaping Australia
- Parks and Leisure Australia
- Nursery and Garden Industry Australia
- Australian Conservation Foundation
- National Landcare Network
- Australian Institute of Landscape Architects
- Australian Institute of Landscape Designers and Managers
- LNA Master Landscapers Association
- Therapeutic Horticulture Australia
- Green Roofs Australasia
- Permaculture Australia
- Society of Ecological Restoration
- Sports Turf Australia
- Greening Australia
- Australian Landcare Council
- Ecological Society of Australia
- Landcare Australia Ltd
- National Parks Australia Council
- Soils for Life
- Australian Association for Environmental Education
- Community and Public Sector Union
- Australian Services Union
- Australian Association of Bush Regenerators
- Australian Golf Course Superintendents Association
- Conservation Volunteers Australia
- Greening Australia
- Turf Growers Australia
- Wetland Care Australia

Research & Development Organisations

- Council of Rural R&D
- Cotton RDC
- Grains RDC
- Agrifutures
- Australian Wool Innovation
- Sugar Research Australia

Other Bodies

- RTOs with project units of competency on scope
- Industry Training Advisory Bodies
- State/Territory Training Authorities

Challenges and Opportunities

Agriculture, Horticulture, Conservation and Land Management have been at the forefront of Federal, State and Territory Government policies and Australian economic growth throughout the modern history of Australia. There are many economic, social, cultural and political challenges and opportunities faced by Australia that will have direct or indirect connections with agriculture, horticulture, conservation and land management.

This section will focus on challenges and opportunities related to the IRCs' identification of priority skills and projects for 2019 to 2021.

Workforce growth

Agrifutures Australia has identified that the agricultural workforce is shrinking and aging³. According to the National Farmers' Federation (NFF)⁴, Australian agriculture faces an immediate and ongoing labour shortfall. They identify the need for greater clarity around skilled, on-farm job roles and continuing development opportunities for workers as a strategic route to doubling the number of current graduates by 2030. The job market for graduates is currently larger than the supply of graduates, with estimates suggesting that in some situations there could be a discrepancy of up to five times⁵, emphasising the complex and challenging contexts in which the agricultural industries operate.

The agricultural labour force is aging, with the average age of a farmer 17 years older than the average worker⁶. As at the 2016 Census of Population and Housing, 47 per cent of workers were over the age of 50 years. Furthermore, the proportion of people over 60 years increased by around three per cent when compared with 2006 data.

As can be seen from the information in the *Employment* section of this Skills Forecast, the labour force is projected to contract in most agricultural sectors. Reversing these trends will be a major challenge.

Aggregated statistical data collection and analysis for amenity horticulture, landscaping, conservation and land management is less prevalent than for agriculture and production horticulture (for example, through the work of Agrifutures and the CSIRO). That said, the rise in discretionary household income, increasing drive towards urban green spaces and focus on conservation practices across Australia has led industry analysts to describe and project a modest workforce growth.⁷

³ <https://www.agrifutures.com.au/national-rural-issues/emerging-trends/>

⁴ National Farmers' Federation, 2018, *2030 Roadmap*, p.39

⁵ National Farmers' Federation, 2018, *2030 Roadmap*, p.27

⁶ National Farmers' Federation, 2018, *2030 Roadmap*, p.7

⁷ IBISWorld, 2018, N7313 Gardening Services in Australia Industry Report

Climate and Environmental Sustainability

Drought is a central, recurring aspect of the Australian climate, and current science indicates that the potential for extreme weather events, including drought, floods, cyclones and lightning storms (leading to fires) is increasing.

All aspects of agriculture, horticulture, landscaping, conservation and land management are at the beck and call of the short, medium and long-term climatic condition in Australia. Reports, books, policies and opinions abound on environmental sustainability and climate in Australia. In a sphere critically and closely-examined from every aspect, it is clear that addressing issues requires adaptive, multifaceted approaches which will need to be supported through a skilled workforce.

The NFF's *2030 Roadmap* sets the target of Australia's farmers becoming world leaders in environmentally-friendly practices and that they become recognised by the broader community as proactive stewards of the land.

Urban environments are creating issues relating to the health and wellbeing of those living in cities, with the Urban Heat Island effect increasing temperatures in urban areas. Urgent action is being driven by government policies at multiple levels, much of which is being addressed by workers in amenity horticulture, landscaping and conservation. In particular, the development of rooftop and vertical gardens, including small food production operations, and urban green spaces are being encouraged.

New and emerging markets are being developed utilising plants and wildlife more suited to Australian conditions, including:

- Plants such as lemon myrtle, mountain pepper, bush tomato, anise myrtle, finger limes, Kakadu Plum, desert limes, quandong, muntries, wattleseed, riberry, Davidson Plum, and lemon aspen;
- Animals such as alpaca, buffalo, deer, fibre goat, crocodile, marron, mulloway and redclaw.

In turn, this is leading to increased interest in wild cultivation and traditional land management (see below).

The complexity of the issues being faced has led to farmers needing increased capacity to analyse potential solutions that can be applied on the farm. This is driving demand for agronomy skills to be the conduit between the increasing research and practical application.

Emerging Industries and Technologies

AgriFutures Australia has reported on the trend and impacts of an increasing gap between agricultural technologies and consumer capacity to understand and accept those technologies⁸. Support for digital technologies has been growing among industry, while consumers have been increasingly interested in how and where food is grown.

AgriFutures Australia⁹ identify seven emerging industries based on emerging technologies:

- Wild harvest
- Urban food production
- Cellular Agriculture
- Acellular Agriculture
- Insect farming
- Distributed manufacturing
- Manager services

Currently AgriFutures Australia emerging industry projects relate to:

- Manuka Honey
- Coffee industry
- Truffle Industry
- Quinoa Crops

⁸ AgriFutures Australia, 2018, Emerging agricultural technologies: Consumer perceptions around emerging agtech, <<https://www.agrifutures.com.au/wp-content/uploads/2019/01/18-048.pdf>>

⁹ AgriFutures Australia, 2018, Horizon Scan 6, <<https://www.agrifutures.com.au/product/horizon-scan-6/>>

The NFF Roadmap 2030 notes Australia's current poor performance in innovation based on a comparison with OECD countries. Australia currently ranks 76th among OECD countries for innovation efficiency, and there is a gap between research and the ability to translate research into practical impacts at production level. Agricultural Science, including agronomy, has been identified as an occupation on the Skills Shortage list.

Leveraging the Potential in Indigenous Land Management

The Northern Australia Environmental Resources Hub, supported by the North Australian Indigenous Land and Sea Management Alliance and the CSIRO, reports that "Indigenous peoples are responsible for land management across 58 per cent of Northern Australia".¹⁰

Caring for Country is a fundamental foundation for Indigenous cultures in Australia and the North of Australia has significant impacts on economic growth, national climate and Indigenous wellbeing.

The report acknowledges the need to undertake work in economic development and sustainable enterprises, as well as drawing out the benefits of the sharing of traditional knowledge and research/science knowledge. It also highlights the importance of understanding the real economic value of Indigenous Land Management and notes that the failure to properly value these benefits may lead to under-investment across Northern Australia.

"Indigenous land management activities are recognised as a good incubator for innovations, and for motivating Indigenous community action on the broader array of activities required to advance toward their aspirations. However, access to information about business innovation models, fostering supply chains, and other activities critical to ensuring revenue, is currently lacking."

Hill et al., 2016, p.V

The Australian Government Indigenous Rangers program was commenced in 2007 and has resulted in 839 full-time equivalent contracted positions held by more than 2,200 Indigenous Australians. Indigenous Ranger projects are also being supported at State and Territory levels.

Belt and Road Initiative

China's Belt and Road Initiative is likely to have major impacts in many fields, including those covered in the AHC training package. The basis for the Belt and Road program is to create transport corridors through both land and sea routes to deliver economic, scientific and technological development across Asia, Europe, Africa and the Pacific region.

According to a 2018 horizon scan of emerging issues for global conservation and biological diversity¹¹, an analysis of official documents identifies that conservation and ecological protection may diminish in the face of investment in huge infrastructure projects, thus increasing the risks of ecological changes and disease transmission, as well as opening up potential for illegal trade in endangered and non-native species. The Belt and Road program does include an ambition to create a big-data platform for environmental protection and is designed to support projects to combat climate change, however these are not emphasised in the current implementation.

The initiative will also drive increasing competition in all commercial sectors, while potentially creating major opportunities for reaching and servicing international markets.

¹⁰ Hill, R., Lyons, I., George, M., Biggs, K., 2016, Country: multiple values, multiple benefits into the future. Research priorities for Indigenous Protected Areas across northern Australia. Cairns, Australia: CSIRO Land and Water, p.v

¹¹ W.J. Sutherland et al., 2018, A 2018 Horizon Scan of Emerging Issues for Global Conservation and Biological Diversity, *Trends in Ecology & Evolution*, Volume 33, Issue 1, January 2018, pps. 47-58

Training Package Overview

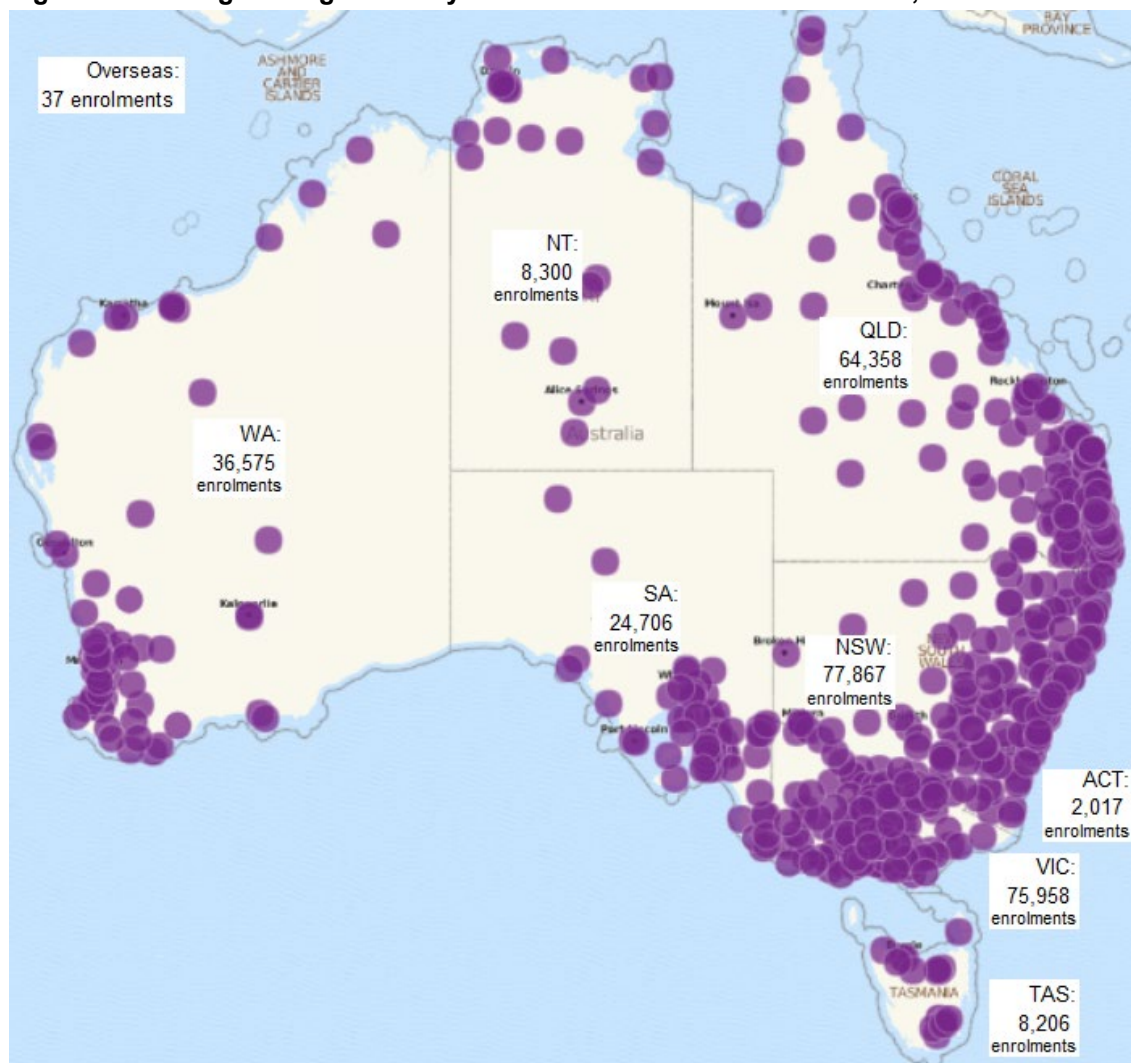
The *AHC Training Package* has 882 Units of Competency across 97 qualifications and 53 Unit Sectors. There are 49 Skill Sets currently in the Training Package. The former *AHC10 Training Package* was superseded by the current *AHC Training Package* in June 2016.

While the training package has been reviewed to meet National Training Package Standards, many components within the package have not been reviewed for content, new job roles and new skills requirements for more than seven years.

Detailed Information on the training package can be found in *APPENDIX 1*.

The significance of the *AHC Training Package* is demonstrated in the sheer concentration of RTOs who deliver its components, and their geographical spread throughout Australia (see Figure 4). Indeed, delivery is hugely important in regional and remote areas, just as it is in urban centres.

Figure 4: Training Package Delivery Locations and Enrolment Numbers, 2014-2017



Sources: a) NCVER, *Atlas of Total VET 2017*, SAS Visual Analytics Viewer; b) NCVER, *TVA program enrolments 2014-2017*

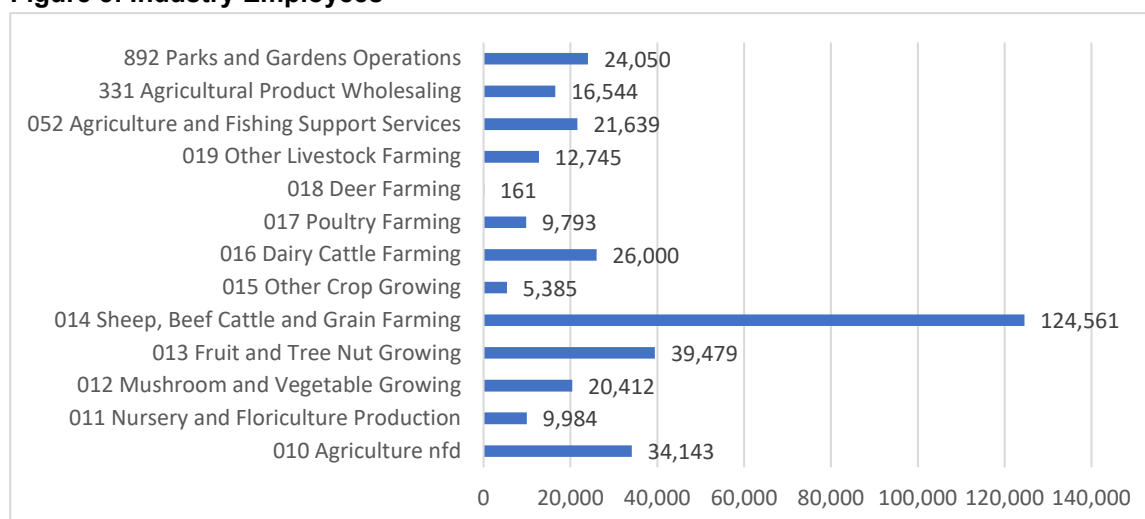
EMPLOYMENT AND SKILLS OUTLOOK

Employment

As at June 2017, AHC-related industries employed 344,894 people^{12,13,14}. Around 72 per cent (247,448) were employed full-time.

Employment figures in the sectors may not accurately reflect the real industry situation. Creating an employment picture is complicated by seasonal roles, temporary workers (including backpackers), complex and difficult classification of roles, and workers holding multiple, cross-industry responsibilities (e.g. Park rangers may cover tourism, eco-tourism, conservation, land management, animal care and management and other activities). An example of the level of inaccuracy is seen in the Hort Innovations work on greenlife production occupations, which estimated employment of 27,000 people compared to the ABS figures (ANZSIC 011) of approximately 10,000 industry employees.

Figure 5: Industry Employees



Source: Australian Bureau of Statistics - 6291.0.55.003 - EQ06 - Employed persons by Industry group of main job (ANZSIC), Sex, State and Territory, November 1984 onwards

ABS data projects an overall contraction of the AHC-related labour force, although relative growth rates are variable across sectors (see Table 4).

¹² Australian Bureau of Statistics - 6291.0.55.003 - EQ06 - Employed persons by Industry group of main job (ANZSIC), Sex, State and Territory, November 1984 onwards

¹³ Gardening Services, which is part of the broader ANZSIC industry classification '731 Building Cleaning, Pest Control and Gardening Services' and so cannot be utilised here, employed 36,888 people at the time of the 2016 Census of Population and Housing.

¹⁴ Industry feedback contends that ABS underestimates employment and industry data due to occupations, such as 'administrator', being aggregated separate to the industry for which the individual provides a service. For this reason, associations, such as Hort Innovation (2017), have commissioned surveys to facilitate industry knowledge and planning activities.

Table 4: Employment figures and projections to 2023

Industry of Employment (ANZSIC)	2008	2013	2018	2023 Projection	% growth: 2018 to 2023
010 Agriculture nfd	35,391	49,224	34,143	31,394	-8.1%
011 Nursery and Floriculture Production	12,405	12,051	9,984	9,948	-0.4%
012 Mushroom and Vegetable Growing	19,958	17,812	20,412	22,030	7.9%
013 Fruit and Tree Nut Growing	29,272	31,646	39,479	42,975	8.9%
014 Sheep, Beef Cattle and Grain Farming	143,363	97,131	124,561	120,724	-3.1%
015 Other Crop Growing	13,811	10,900	5,385	5,349	-0.7%
016 Dairy Cattle Farming	25,741	24,435	26,000	25,684	-1.2%
017 Poultry Farming	6,251	5,565	9,793	9,201	-6.0%
018 Deer Farming	0	0	161	161	0.0%
019 Other Livestock Farming	11,171	10,589	12,745	11,128	-12.7%
052 Agriculture and Fishing Support Services	21,910	18,926	21,639	23,325	7.8%
331 Agricultural Product Wholesaling	22,448	21,082	16,544	16,195	-2.1%
892 Parks and Gardens Operations	21,757	19,073	24,050	24,350	1.2%
Total	363,479	318,435	344,894	342,463	-0.7%

Sources: a) Australian Bureau of Statistics, 6291.0.55.003 - Labour Force, Australia, Detailed, Quarterly, August 2018: EQ06 - Employed persons by Industry group of main job (ANZSIC), Sex, State and Territory, November 1984 onwards (Pivot Table); b) Department of Jobs and Small Business, Labour Market Information Portal, Industry projections – five years to May 2023

Further to the figures in Table 4, '3291 Landscape Construction Services' employed 39,596 people at the time of the 2016 *Census of Population and Housing*.¹⁵

The ANZSCO and ANZSIC classifications are often challenged by stakeholders during consultations as inaccurately reflecting modern job roles, and they regularly report frustrations with trying to identify suitable classifications. This can be seen in the limited ANZSCO Title job roles listed with the *AHC Training Package* qualifications.

ANZSCO Title Job Roles as currently listed against AHC Qualifications

- Farmers and Farm Managers
- Farm, Forestry and Garden Workers
- Crop Farmers
- Pig Farmer
- Crop Farm Workers
- Dairy Cattle Farm Worker
- Livestock Farm Workers
- Poultry Farm Worker
- Mixed Crop and Livestock Farm Worker
- Grain, Oilseed or Pasture Farm Worker
- Grape Grower
- Apiarist
- Agricultural Technician
- Wool Handler

¹⁵ It is important to note that ANZSIC classifications, for which current ABS data releases provide statistics to the three-digit level, frequently conflate sectors that stakeholders consider distinct. For example, '3291 Landscape Construction Services' is an important industry sector; however, in ABS data releases, it is part of the group '329 Other Construction Services', which includes other groups such as '3292 Hire of Construction Machinery with Operator'. This entails that certain (sub-) sectors have not been included in these industry employment figures, thus any estimates of industry labour forces should be considered as indicative and, most likely, conservative.

- Wool Classer
- Shearer
- Agricultural Engineer
- Stock and Station Agent
- Pest Controller
- Park Ranger
- Nurseryperson
- Gardeners
- Landscape Gardener
- Arborist
- Garden Labourer
- Greenkeeper
- Horticultural Nursery Assistant
- Technicians and Trades Worker
- Mobile Plant Operators

Relevant ANZSCO Codes

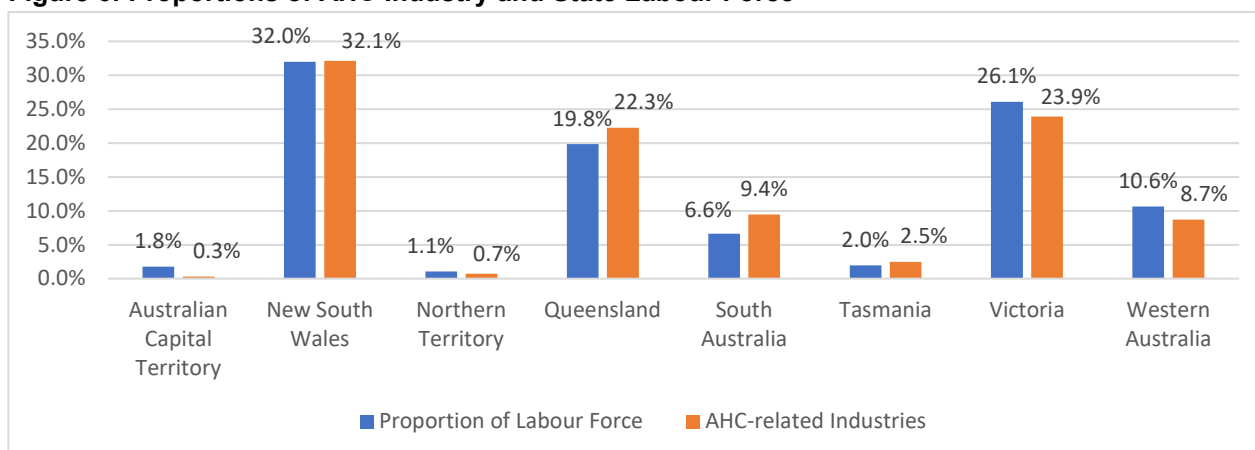
- 121211 Cotton Grower
- 121212 Flower Grower
- 121213 Fruit or Nut Grower
- 121214 Grain, Oilseed or Pasture Grower
- 121215 Grape Grower
- 121216 Mixed Crop Farmer
- 121217 Sugar Cane Grower
- 121218 Turf Grower
- 121221 Vegetable Grower
- 121299 Crop Farmers nec
- 121311 Apiarist
- 121312 Beef Cattle Farmer
- 121313 Dairy Cattle Farmer
- 121314 Deer Farmer
- 121315 Goat Farmer
- 121316 Horse Breeder
- 121317 Mixed Livestock Farmer
- 121318 Pig Farmer
- 121321 Poultry Farmer
- 121322 Sheep Farmer
- 121399 Livestock Farmers nec
- 121411 Mixed Crop and Livestock Farmer
- 311111 Agricultural Technician
- 362111 Florist
- 362211 Gardener (General)
- 362212 Arborist
- 362213 Landscape Gardener
- 362311 Greenkeeper
- 362411 Nurseryperson
- 361211 Shearer
- 399917 Wool Classer
- 721111 Agricultural and Horticultural Mobile Plant Operator
- 841211 Fruit or Nut Farm Worker
- 841212 Fruit or Nut Picker
- 841213 Grain, Oilseed or Pasture Farm Worker
- 841214 Vegetable Farm Worker
- 841215 Vegetable Picker
- 841216 Vineyard Worker
- 841217 Mushroom Picker
- 841299 Crop Farm Workers nec
- 841411 Garden Labourer
- 841412 Horticultural Nursery Assistant
- 841511 Beef Cattle Farm Worker
- 841512 Dairy Cattle Farm Worker
- 841513 Mixed Livestock Farm Worker
- 841514 Poultry Farm Worker
- 841515 Sheep Farm Worker
- 841516 Stablehand
- 841517 Wool Handler
- 841599 Livestock Farm Workers nec
- 841611 Mixed Crop and Livestock Farm Worker
- 841911 Hunter-Trapper
- 841912 Pest Controller
- 841999 Farm, Forestry and Garden Workers nec

The occupations in the above lists can be compared to the Unit Sectors used in the *AHC Training Package* and indicate gaps in coverage of industry job roles in ANZSCO and ANZSIC Codes.

AGB Agribusiness	MER Merchandising and Sales
AIS Artificial Insemination	MKH Milk Harvesting
ARB Arboriculture	MOM Machinery Operation and Maintenance
ASW Aboriginal-Sites Work	NAR Natural Area Restoration
BAC Broad Acre Cropping	NRM Natural Resource Management
BEK Beekeeping	NSY Nursery
BER Biosecurity Emergency Response	ORG Organic Production
BIO Biosecurity	PCM Plant Culture and Maintenance
BUS Business	PER Permaculture
CCF Community Coordination and Facilitation	PGD Parks and Gardens
CHM Chemicals	PHT Production Horticulture
CMN Common	PLY Poultry
COM Composting	PMG Pest Management
DER Deer	PRK Pork
DES Design	SAW Soil and Water Conservation
DRG Drainage	SDP Seed Production
DRY Dairy	SDT Seed Processing
EXP Explosives	SHG Shearing
FAU Fauna	SOL Soils and Media
FIR Fire	SPO Seed Testing
HYD Hydroponics	SUS Sustainability
ILM Indigenous Land Management	TRF Turf Management
INF Infrastructure	WAT Water
IRG Irrigation	WHS Work Health and Safety
LPW Lands, Parks and Wildlife	WOL Wool
LSC Landscaping	WRK Work
LSK Livestock	

States' proportions of AHC industry-related employees relatively closely mirror their overall labour force proportions:

Figure 6: Proportions of AHC Industry and State Labour Force



Source: Australian Bureau of Statistics 2017, 6291.0.55.003 - Labour Force, Australia, Detailed, Quarterly, August 2018: EQ06 - Employed persons by Industry group of main job (ANZSIC), Sex, State and Territory, November 1984 onwards

Demographics

Sex

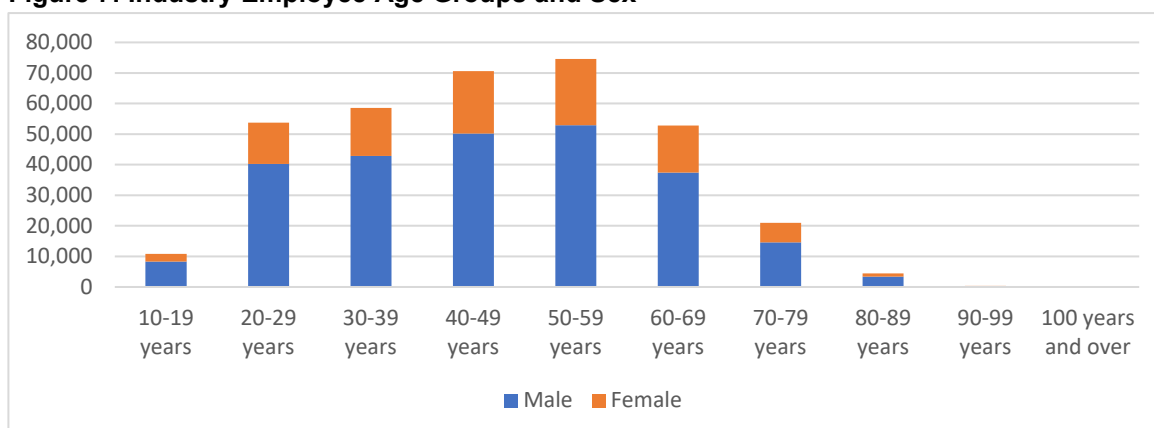
Women accounted for 32 per cent of the labour force, with an almost even number of full- and part-time employees (around 55,400 each). Women (57 per cent) outnumbered men in part-time positions; however, were only 22 per cent of the full-time labour force.

Sector analyses reveal that nursery and floriculture production (ANZSIC: 011) and deer farming (ANZSIC: 018) had the highest overall female participation (both 52 per cent), followed by other livestock farming (48 per cent) and mushroom and vegetable growing (39 per cent).

Age Groups

The industry labour force is ageing. As at the 2016 Census of Population and Housing, 44 per cent of workers were over the age of 50 years (see Figure 7). Furthermore, the proportion of people over 60 years increased by around 3 per cent when compared with 2006 data.

Figure 7: Industry Employee Age Groups and Sex



Source: 2016 Census - Employment, Income and Education

Skills Outlook

Anticipating future skills needs in the agriculture, horticulture and conservation and land management sector remains crucial to preparing to meet the new demands of food markets, business requirements and biosecurity in Australia.

The skills needed across the industry are very broad, as is to be expected in this sector. Skills are needed to support work in areas including:

- Farm Management and Agribusiness
- Agricultural Science
- Agriculture, Environmental and Related Studies
- Animal Husbandry
- Horticulture
- Permaculture
- Organic Farming and Horticulture
- Viticulture
- Medicinal Crops
- Botany
- Land, Parks and Wildlife Management
- Conservation
- Landscaping
- Landscape Construction and Drainage
- Landscape Architecture and Design
- Urban Design and Regional Planning
- Pest and Weed Control
- Soil Science
- Wool Science
- Food Science and Biotechnology
- Food Hygiene
- Food Processing Technology
- Carbon Farming
- Irrigation
- Law and regulation enforcement
- Plant and Machine Operations
- Scaffolding and Rigging
- Work Health and Safety
- First Aid
- Work Practices Programmes
- Social and Interpersonal Skills Programmes
- Tourism Management (Agri-tourism)
- Business Management
- Project Management
- Quality Management
- Biosecurity Management
- Organisation Management
- Database Management
- Building Construction Management
- Boilermaking and Welding
- Plumbing
- Cleaning
- Communications Technologies
- Practical Computing Skills
- Purchasing, Warehousing and Distribution
- Sales and Marketing
- Secretarial and Clerical Studies
- Accounting
- Statistics
- Policy Studies
- Human Resource Management
- Indigenous Studies
- Anthropology
- Curatorial Studies
- Security Services
- Fire Technology
- Automotive Vehicle Operations
- Mechanical Engineering
- Environmental Engineering
- Ecology

- Water and Sanitary Engineering
- Hydrology
- Transport Engineering
- Mathematics
- Mapping Science
- Atmospheric Sciences
- Building Science and Technology
- Process and Resources Engineering
- Marine Science
- Laboratory Technology
- Geomatic Engineering

KEY DRIVERS FOR CHANGE AND PROPOSED RESPONSES

The major drive for change is the need to continually and flexibly adjust to new and emerging markets, trends, challenges and opportunities through the AHC training pack. The *AHC Training Package* is one of the largest in the Australian system. It is important that every component in the Training Package is reviewed and updated in the shortest time frame available to ensure the ability to respond to the changing landscape.

This has been a daunting prospect that has been faced by the IRCs. With almost 900 units of competency, reviewing the training package based on qualifications using projects that are approximately 100 units, a review of each component would take nine years to complete, an unacceptable timeframe given the importance and rapid evolution of the sub-sectors in the industry.

The IRCs are proposing a new strategic approach for reviewing and developing components in the *AHC Agriculture, Horticulture and Conservation and Land Management Training Package*.

The Current Approach

The *AHC Training Package* is complex covering many industry sectors, resulting in projects that are proving to be difficult to manage and to consume additional volunteer time.

The *AHC Training Package* has 882 Units of Competency across 97 qualifications. Each qualification within this Training Package typically includes units crossing several different industry sectors, some of which are very loosely related to the main functions of the qualification. For this reason, consultation is required with a broad mix of stakeholders, many of whom have only a peripheral interest in the qualification (being interested only in a specific unit or units) making the standard approach less efficient, usually requiring several years and multiple projects to review all of the units.

Agriculture, Horticulture, Conservation and Land Management are cornerstones of Australian business. Agriculture provides approximately \$260 billion to the economy and is a key contributor to Australia's GDP and economic prosperity. The *AHC Training Package* is designed to meet the training and skills needs of these workforces. This Training Package must respond to changes in workplace and job design that are driven by innovation, economic, technological, social and environmental factors and the introduction of legislation and policy changes.

The Proposed Approach

The IRCs are committed to maintaining the relevance of Training Packages from an industry perspective, including responding to rapid technological advancements, changing product markets and climate ecosystems, new work methods, evolving global priorities and trade opportunities, demographic movements and numerous other social and economic changes. After consultation and reviewing professional advice, the IRCs have approved a strategic and holistic approach to review and develop components with two specific aims:

- 1) Develop a framework and implement a strategic approach to the review and development of training packages, trialling this approach with the *AHC Training Package* over the next five years;
- 2) Create efficiencies by reviewing a Training Package sector or interrelated sectors.

Within a Training Package, units are assigned a sector classification, called a **Unit Sector**, reflecting the nature of the units. The IRCs are proposing an approach for complex Training Packages based on the Unit Sectors rather than reviewing units on the basis of their being listed in a qualification.

This approach will cluster units by sectors or groups of sectors, rather than by individual qualifications. This means all of the units within a sector will be reviewed simultaneously rather than use a piecemeal approach, as happens when undertaking projects with a qualifications approach.

In the AHC Training Package, there are 53 Unit Sectors identified, compared to 97 current qualifications. There are several benefits to designing training package reviews around a specific sector or a group of interrelated sectors, including:

- More efficient engagement of and use of the time volunteered by industry participants to consult on the review and redesign processes
 - Members of Training Advisory Committees, subject matter experts and public consultation participants will have a greater relationship to the whole of the units under review, with far less only interested in a small number of units (or even individual units)
- A greater return on investment of resources, especially when reviewing units that appear in multiple qualifications.
 - There is an increase in the likelihood of identifying job functions from a unit that can be applied across other relevant qualifications.
- Clearer identification of duplication of unit /qualification outcomes and obsolete units/qualifications, ensuring these units are deleted or merged with other units/qualifications.
 - The approach minimises the potential for delay relating to deleting units caused by the needs of qualifications not within scope of a current project by reviewing units across qualifications
- Easier correction of misalignment of units against the nominated AQF levels.
 - The approach focuses the review on the job function relating to the unit, and aligns that function with the relevant AQF level, rather than trying to relate a job function to a number of specific qualifications.

The implementation of this approach includes:

- Each project will be undertaken by dividing the work into a number of sub-developments, with one IRC nominated to provide the overview management for each sub-development
- Both IRC's will be consulted on the planning for sub-developments, including identification of relevant experts and stakeholders
- Usually both IRCs will sign-off on the Case for Endorsement prior to submission
- Additional projects to address new or high priority skills requirements or new ways of work can be undertaken as separately submitted projects
 - Example: In the Proposed Schedule of Work in this Skills Forecast, the IRCs have identified a number of small, additional projects to be submitted over the next two years, which are Green Walls and Rooftop Gardens; Agronomy; Therapeutic Horticulture; Medicinal Crops and Pregnancy Testing & Artificial Insemination in Cattle

PROPOSED SCHEDULE OF WORK

Project 1: Unit Sector approach Year 1

Cluster 1: Conservation & Land Management (including Pest Management)

As noted in the *2018 Skills Forecast*¹⁶, the AHLCLM IRC has identified that the current Conservation and Land Management qualifications and units of competency do not reflect modern industry practices, particularly in respect of land management, restoration projects and cultural inclusion. The current units of competency do not incorporate essential knowledge pertaining to plants, animals and ecology.

During the recent updating of Pest Management units within the agriculture and chemical handling contexts, feedback was received that there was insufficient inclusion of skills relating to pest management in a conservation and land management context. This will be addressed as part of the Unit sector approach through the review and updating of the eight units of competency not included in the previous project.

The AHLCLM IRC has also identified Ecotourism and a priority area for the development of training, and the APH IRC has noted Agritourism as a growth area. The IRCs have agreed that work in these areas can be incorporated into the Conservation and Land Management cluster of work under the new approach, and will require additional collaboration with the Tourism, Travel and Hospitality IRC. The major work will be the identification of existing units for importation, mainly from the *SIT Tourism, Travel and Hospitality Training Package*, and the potential development of new units or modification of current units relating to specific skills needs (e.g. snake awareness for tourists and visitors) and business approaches (e.g. developing an agritourism business).

During consultations with a wide variety of stakeholders, including EcoTourism Australia, it was noted that all states and territories are increasing funding supporting these areas. Recently in the NT, responsibility for Parks and Wildlife was incorporated into the Department of Tourism and Culture. Ecotourism and Agritourism are providing new and growing income streams, leading to greater need for skilled workers to support these opportunities. There are increasing demands on rangers and farm staff to undertake tourist and visitor management activities.

Cluster 2: Nursery Production

As noted in the *2018 Skills Forecast*¹⁷, both the retail and production nurseries industry struggle to find quality qualified staff. The industry struggles to gain recognition as a career pathway for entry and graduate-level workers. Recently Hort Innovation and Nursery & Garden Industry Australia commissioned research into the lack of interest in the industry and how this can be changed.

Recent updates to the *AHC Training Package* have addressed specific priority skills needs in this sector, particularly in pest management, soil management and irrigation. Given this work, it is now timely to review the rest of the units of competency within the Nursery Production, Plants Culture and Maintenance and Soils Management Unit Sectors to assist the industry's work in creating career pathways and improved recognition.

Cluster 3: Production Horticulture

The APH IRC has identified Production Horticulture as a priority area for review. The relevant units have not been reviewed for some years, with June 2016 updates mainly undertaken for the purposes of transition and not for industry relevance.

¹⁶ https://www.skillsimpact.com.au/site/skilliampactmedia/uploads/2018/05/ISF.AHC_IRCSkillsForecast.2018-2021-Signed.pdf

¹⁷ *ibid.*

Australia's horticulture industry has a reputation in both the domestic and international markets as a sustainable producer of premium safe food. This is primarily due to our high standards across all stages of the supply chain, from farm to consumer. The industry has moved from small-scale family farms to medium to larger scale operations including corporate farming. Australian farmers continue to adjust their operations and adopt new technologies to respond to the opportunities and challenges of agricultural production in Australia including, increased competition from imported fresh and processed produce, market price pressures, challenging or adverse seasonal conditions.

Cluster 4: Biosecurity and Emergency

Both IRCs have identified biosecurity as a major priority, and this is reflected in market preferences and government policy at federal, state and territory levels. Skills are required for developing and implementing preventive biosecurity strategies within agribusinesses. Skills required include; biosecurity surveillance, monitoring agricultural products and information analysis, implementing preventive biosecurity programs and environmental impacts of exotic pests and weeds to the Australian native flora and fauna. Biosecurity is a key contributor to the fifth priority area in the 2017 Agriculture Competitiveness White Paper (Accessing premium markets – improving international trade to grow farm businesses) and is central to land management.

Recent work in Pest Management did not cover biosecurity and emergency response units, which incorporate pest management and response elements, and the IRCs believe it is timely to undertake this work to ensure improved integration of available training and to minimise duplication through the deletion or merging of units.

Cluster 5: Sales & Merchandising

There are 12 AHCMER units covering sales and merchandising in rural industries and products, spread across Cert III, Cert IV and Diploma levels. These units were transitioned in June 2016, but there is no indication that they have been reviewed to ensure current relevance or updated industry requirements, and review is recommended, particularly given AISC priorities relating to minimising duplication of units of competency and importing units from external Training Packages.

A number of these units relate specifically to work previously undertaken (e.g. Provide advice and sell farm chemicals; Provide irrigation sales and service) but have not been reviewed because of the qualifications approach taken previously. If there is a need for specific sales and merchandising units within AHC, they need to relate to specific industry needs.

Both IRCs recommend that these units also be reviewed to ensure recent work can be fully utilised and to ensure there remains a need for Sales and Merchandising Units within the AHC Training Package.

Project 2: Green Walls and Rooftop Gardening

The AHLCLM IRC has identified the growth market of Green Walls and Rooftop Gardens as a priority need for the training of new and emerging skills. The increase of urbanisation and high-density living is seeing a higher reliance on public parks and gardens and a prevalence of green walls and rooftop gardens. Environmental, energy-saving, lifestyle and health benefits can be obtained in urban, regional and rural environments. Population growth in the cities is influencing government policies around sustainable living and urban greening within high-density living areas.

There is an increasing demand for skills in developing rooftop gardens and green walls. Job outcomes are still developing and currently include rooftop gardener, horticulturist and nursery worker/advisor, though it is expected that specialist occupations will become commercially viable in the near future. Working in Green Walls and Rooftop Gardening requires practical skills and knowledge relating to plant selection, installation of vertical water delivery systems, filtration systems, drainage facilities, waterproof barrier selection, wind sail knowledge, nutrient requirements, working at heights on elevated work platforms, microclimates and local government legislation.

Currently there are no relevant qualifications relating to these requirements, though some skills are covered in amenity horticulture, landscaping and conservation and land management qualifications.

Project 3: Agronomy

Agronomy is the science and technology for producing and using plants for food, fuel, fibre, and land reclamation. It encompasses work in the areas of plant genetics, plant physiology, meteorology, and soil science. Stakeholder consultation accepted by the APH IRC has demonstrated that the agricultural and production horticulture industry are looking for a more applied approach to training/education rather than the four-year ag science degree. Agronomy qualifications would give the farmers and horticulturalists the ability to make informed decisions regarding the production system when consulting with agronomists employed by retail-based companies and to make analytical and evidence-based product and business decisions.

Currently there are no nationally approved qualifications in Agronomy, with the only qualification in scope being the Victorian Accredited Course 22273VIC Diploma of Agronomy. The Diploma utilises AHC units, with only one unit not being from the *AHC Training Package*. Any units of competency and Qualifications are likely to be developed at post-trade/management levels.

PROPOSED PROJECTS 2019–2020

Joint Project 1: Unit Sector Approach Review of AHC Year 1 2019-2020

Description

The proposed project is for the review of the *AHC Training Package* based on industry sectors, including conservation and land management, nursery production, production horticulture, biosecurity and emergency response, and merchandising and sales. The project introduces a strategic and more efficient approach to reviewing the whole of the *AHC Training Package* over a four to six-year period, helping retain currency of training and response to industry skills needs.

Rationale

The *AHC Training Package* is one of the most complex, diverse and largest in the Australian system. The industry sectors covered by the training package employ almost 350,000 people, with more than 72,000 enrolments serviced by 804 Registered Training Organisations.¹⁸

Given the rapid technological advancements, changing product markets and climate ecosystems, new work methods, evolving global priorities and trade opportunities, demographic movements and numerous other social and economic changes, it is clear that industry is best served by the *AHC Training Package* being reviewed on a regular basis. This needs to be achieved flexibly to allow industry to address urgent skills needs and create new job outcomes.

The *Agriculture and Production Horticulture* and *Amenity Horticulture, Landscaping and Conservation & Land Management* IRCs recommend implementing a strategic approach to reviewing the *AHC Training Package*. This approach is based on identifying and reviewing units by their sector classification rather than on their listing in qualifications. This will result in all job roles related to a relevant unit sector being identified, allowing training to be updated with respect to the various performance contexts of those roles across industry. This approach should significantly increase the speed of review of the overall qualifications, units of competency and skill sets within the *AHC Training Package*. It should also result in the review of the whole training package within four to six years, while minimising the burden of voluntary support on industry.

Changes in job roles, workplace or industry

As noted above, within the *AHC Training Package* there will be multiple changes in job roles, functions and methods of work that occur over any four to six-year period.

Need for Graduates

As at June 2017, the industry sectors covered by the Training Package employ almost 350,000 people, with more than 72,000 enrolments serviced by 643 Registered Training Organisations. There were 176,419 businesses across agriculture, horticulture, agricultural product wholesaling and parks and gardens operations.¹⁹

¹⁸ <https://training.gov.au/Search/SearchOrganisation?nrtCodeTitle=AHC&scopeItem=TrainingPackage&tabIndex=1&implicitNrtScope=True&orgSearchByScopeSubmit=Search&IncludeUnregisteredRtosForScopeSearch=False>

¹⁹ Australian Bureau of Statistics, 2017, 8165.0 - Counts of Australian Businesses, including Entries and Exits, Jun 2013 to Jun 2017: Businesses by Main State by Industry Class by Employment Size Ranges, June 2016 and June 2017.

Timeline for Latest changes

All AHC units were transitioned in June 2016 to meet the new standards and templates. This did not include review and updating to meet the changes in the way that work is undertaken and new/emerging job functions and roles.

Low enrolments and New Components

Low enrolment units of competency will be reviewed for continuing relevance and potential deletion.

New components may include coverage of:

- Ecotourism and Agritourism will be included in Cluster 1: Conservation & Land Management to meet the increasing demands on rangers and farm staff to undertake tourist and visitor management activities. The major work will be the identification of existing units for importation, mainly from the *SIT Training Package*, and the potential development of new units or modification of current units relating to specific skills needs (e.g. snake awareness for tourists and visitors) and business approaches (e.g. developing an agritourism business).
- The review of the eight units of competency not updated in December 2018 relating to Pest Management will be included in the Conservation and Land Management context. This may result in new qualifications and units of competency, as well as the potential deletion of one existing qualification and some of the existing units.

For additional information, please see the *Attachment: Relevant Excerpts from the Skills Forecast*

Existing Components and cross-sector approaches

The Unit Sector approach is based on reviewing all existing components over a four to six-year period. The APH and AHLCLM IRCs are cooperating with cross-sector projects and work on those projects will be incorporated into the training package as required. As well as the size and complexity of the *AHC Training Package*, consideration must also be given to Industry and RTO training and assessment delivery, especially in rural and remote areas, and the need to maintain training providers' ability to retain units on scope.

Data

Detailed data is included in relevant sections of this Skills Forecast and in the Table A document separately submitted to the AISC.

Ministers Priorities Addressed

Obsolete and duplicate qualifications removed from the system

The Unit Sector approach ensures clearer identification of duplication of unit/qualification outcomes and obsolete units/qualifications, ensuring they are deleted or merged with other units/qualifications. The approach minimises the potential for delay relating to deleting units caused by the needs of qualifications not within scope of a current project by reviewing units across qualifications.

More information about industry's expectations of training delivery is available to training providers to improve their delivery and to consumers to enable more informed choices

It is likely that there will be an easier pathway to correction of misalignment of units against the nominated AQF levels. The approach focuses the review on the job function relating to the unit, and aligns that function with the relevant AQF level, rather than trying to relate them to a number of specific qualifications. There is also a likelihood of greater flexibility in the context in which training is delivered, which can be outlined in relevant Companion Volumes.

The training system better supports individuals to move more easily between related occupations

The Unit Sector approach identifies skills needs to perform job functions that occur across multiple industry sectors. There is an increase in the likelihood of identifying job functions from a unit that can be applied across other relevant qualifications.

Improved efficiency of the training system through units that can be owned and used by multiple industry sectors

The Unit Sector approach will result in more efficient engagement of and use of the time volunteered by industry participants to consult on the review and redesign processes. Members of Training Advisory Committees, subject matter experts and public consultation participants will have a greater relationship to the whole of the units under review, with fewer only interested in a small number of units (or even individual units) as happens under the qualifications approach. Experts will not need to be brought in repeatedly (often annually) to provide their expertise as happens under the qualifications approach.

Foster greater recognition of skill sets

The approach will incorporate examination of new and emerging skills in the context of existing unit sectors, allowing the potential for improved identification of streams within existing qualifications or the utilisation of skill sets.

Consultation Plan

Each year, there will be approximately 150-185 units of competency reviewed overall. These units have been clustered by Unit Sectors, with additional relationships identified between the clusters. The project will be undertaken by dividing the work into a number of sub-developments (usually from three to five), with one IRC nominated to provide the overview management for each sub-development. Both IRCs will be consulted on the planning for sub-developments, including identification of relevant experts and stakeholders. Usually both IRCs will sign-off on the Case for Endorsement prior to submission.

For each sub-development, initial development work will be undertaken in consultation with relevant subject matter experts. Drafts changes will be created and reviewed by the experts. The drafts will then be made available for public consultation and feedback, with consultation sessions to be held around Australia. Following this, the final drafts will be validated through further consultation and Quality Assurance processes. The Case for Endorsement will be finalised and submitted to the IRCs for review and final approval, prior to submission to the AISC.

Unit sectors to be covered (year 1)

- Lands, Parks and Wildlife
- Natural Area Restoration
- Natural Resource Management
- Soil and Water Conservation
- Nursery Production
- Plant culture & maintenance
- Soils & media
- Production horticulture
- Pest management
- Water
- Fauna
- Fire
- Explosives
- Biosecurity and emergency
- Merchandising operations and Sales

Stakeholders for Consultation

Broad consultation will be undertaken during the project. Stakeholders will include but will not be limited to the following:

IRCs

- Agriculture and Production Horticulture
- Amenity Horticulture, Landscaping and Conservation & Land Management
- Tourism, Travel and Hospitality (concerning Ecotourism and Agritourism)

APH Stakeholders

- National Farmers' Federation
- Australian Chicken Growers Council
- Australian Oilseeds Federation
- Australian Pork Limited
- Cane Growers
- Cattle Council of Australia
- Cotton Australia
- Dairy Australia
- Grain Growers
- Horticulture Innovation Australia
- Irrigation Australia
- Irrigation Council of Australia
- Maize Association of Australia
- Australian Lot Feed Association
- Ricegrowers' Association of Australia
- Sheep Meat Council of Australia
- Wool Producers Australia
- NSW Farmers
- NT Farmers
- Pastoralists and Graziers Association of Western Australia
- Primary Producers SA
- Queensland Farmers' Federation
- Tasmanian Farmers and Graziers Association
- Victorian Farmers Federation
- WA Farmers
- Australian Workers Union

AHLCLM Stakeholders

- Australian Institute of Horticulture
- Arboriculture Australia
- Conservation Volunteers Australia
- Landscaping Australia
- Parks and Leisure Australia
- Nursery and Garden Industry Australia
- Australian Conservation Foundation
- National Landcare Network
- Australian Institute of Landscape Architects
- Permaculture Australia
- Therapeutic Horticulture Australia
- Green Roofs Australasia
- Australian Golf Course Superintendents Association
- Sports Turf Australia
- Turf Growers Australia
- Wetland Care Australia
- Greening Australia
- Australian Landcare Council
- Ecological Society of Australia
- Landcare Australia Ltd
- National Parks Australia Council
- Soils for Life
- Australian Association of Bush Regenerators
- Community and Public Sector Union
- Society for Ecological Restoration
- Australian Services Union

Research & Development Organisations

- Council of Rural R&D
- Cotton RDC
- Grains RDC
- Agrifutures

- Australian Wool Innovation
- Sugar Research Australia

Other Bodies

- RTOs with project units of competency on scope
- Industry Training Advisory Bodies
- State/Territory Training Authorities

Scope of Project Overview

Overall timing: 14 months from delivery of signed Activity Order

Expected Date for Endorsement: September 2020

Table 5: Key Activity Timing

Months	Activity
1-2	Project planning and briefing, identification of experts and consultation with IRCs
3-5	Workshops with subject matter experts including research and functional analysis
6-7	Development of draft documents in preparation for public consultation
8-10	Public Consultation
11-12	Review of public consultation and Equity Review
12-13	Validation and Quality Assurance, final consultation for STA
14	Approval of Case for endorsement to IRCs and submission to AISC

Summary of Components

All work is within the AHC Training Package.

Qualifications

Summary:

- Review – 20 Qualifications
 - Updating – up to 18 qualifications
 - Deletion – up to eight Qualifications
- New – up to five Qualifications

Qualifications by Cluster:

- **Cluster 1 Qualifications: Conservation & Land Management**
 - AHC10116 - Certificate I in Conservation and Land Management
 - AHC21016 - Certificate II in Conservation and Land Management
 - AHC31416 - Certificate III in Conservation and Land Management
 - AHC40916 - Certificate IV in Conservation and Land Management
 - AHC51116 - Diploma of Conservation and Land Management
 - AHC60415 - Advanced Diploma of Conservation and Land Management
 - AHC31616 - Certificate III in Lands, Parks and Wildlife
 - AHC31716 - Certificate III in Natural Area Restoration
 - AHC32316 - Certificate III in Conservation Earthworks
 - AHC41716 - Certificate IV in Pest Management
 - AHC51316 - Diploma of Pest Management
- **Cluster 2 Qualifications: Nursery Production**
 - AHC20716 Certificate II in Production Nursery
 - AHC31116 Certificate III in Production Nursery

- AHC40616 Certificate IV in Production Nursery
- AHC50816 Diploma of Production Nursery Management
- **Cluster 3 Qualifications: Production Horticulture**
 - AHC20316 Certificate II in Production Horticulture
 - AHC30616 Certificate III in Production Horticulture
 - AHC40316 Certificate IV in Production Horticulture
 - AHC50316 Diploma of Production Horticulture
- **Cluster 4 Qualifications: Biosecurity and Emergency**
 - No qualification reviewed
- **Cluster 5 Qualifications: Merchandising & Sales**
 - AHC32716 Certificate III in Rural Merchandising

Units of Competency

Summary of Project 1: Unit Sector approach

- Review – 174 Units
 - Updating – up to 150 Units
 - Deletion – up to 50 units
- New – up to 35 units

Unit of Competency Clusters:

Cluster 1 Units of Competency: Conservation & Land Management

AHCPMG301- Control weeds
 AHCEXP301- Handle and store explosives
 AHCEXP302- Identify and select explosive products
 AHCFAU201- Recognise fauna
 AHCFAU301- Respond to wildlife emergencies
 AHCFAU501- Manage fauna populations
 AHCFIR201- Assist with prescribed burning
 AHCFIR501- Manage wildfire hazard reduction programs
 AHCFIR502- Plan prescribed burning for fuel, ecological and cultural resource management
 AHCLPW301- Supervise park visitor activities
 AHCLPW303- Construct access tracks
 AHCLPW304- Carry out inspection of designated area
 AHCLPW305- Perform diving for scientific purposes
 AHCLPW306- Undertake sampling and testing of water
 AHCLPW401- Process applications for changes in land use
 AHCLPW402- Implement land and sea management practices
 AHCLPW403- Inspect and monitor cultural places
 AHCLPW404- Produce maps for land management purposes

AHCLPW405- Monitor biodiversity

AHCLPW501- Develop a management plan for a designated area

AHCLPW503- Assess applications for legislative compliance

AHCLPW505- Implement natural and cultural resource management plans

AHCLPW601- Coordinate the preparation of a regional resource management plan

AHCNAR101- Support natural area conservation

AHCNAR102- Support native seed collection

AHCNAR201- Carry out natural area restoration works

AHCNAR202- Maintain wildlife habitat refuges

AHCNAR301- Maintain natural areas

AHCNAR302- Collect and preserve biological samples

AHCNAR303- Implement revegetation works

AHCNAR304- Undertake direct seeding

AHCNAR305- Collect native seed

AHCNAR306- Conduct photography for fieldwork

AHCNAR307- Read and interpret maps

AHCNAR401- Supervise natural area restoration works

AHCNAR402- Plan the implementation of revegetation works

AHCNAR501- Manage natural areas on a rural property

AHCNAR502- Conduct biological surveys

AHCNAR503- Design a natural area restoration project

AHCNAR504- Manage natural area restoration programs

AHCNAR505- Plan river restoration works

AHCNAR506- Develop and implement sustainable land use strategies

AHCNRM401- Plan and implement a biosecurity program

AHCNRM501- Develop a coastal rehabilitation strategy

AHCNRM502- Develop a water quality monitoring program

AHCNRM503- Support the implementation of waterways strategies

AHCNRM504- Interpret and report on catchment hydrology

AHCNRM505- Provide technical advice on sustainable catchment management

AHCNRM506- Plan and monitor works projects in catchments and waterways

AHCNRM507- Manipulate and analyse data within geographic information systems

AHCNRM508- Investigate suspected breaches of natural resource management legislation

AHCNRM601- Review land management plans and strategies

AHCNRM602- Develop a monitoring, evaluation and reporting program

AHCNRM603- Implement a monitoring, evaluation and reporting program

AHCPMG410- Implement the pest monitoring and evaluation plan

AHCPMG411- Ensure compliance with pest legislation

AHCPMG414- Apply predator trapping techniques

AHCPMG506- Manage the implementation of legislation

AHCPMG507- Develop a regional pest management plan

AHCPMG508- Develop a system to monitor and evaluate the pest management plan

AHCPMG509- Investigate a pest control failure

AHCPMG510- Develop a pest survey strategy

AHCSAW201- Conduct erosion and sediment control activities

AHCSAW301- Construct conservation earthworks

AHCSAW302- Implement erosion and sediment control measures
AHCSAW401- Set out conservation earthworks
AHCSAW403- Supervise implementation of conservation earthworks plans
AHCSAW501- Design control measures and structures
AHCSAW502- Plan erosion and sediment control measures
AHCSAW503- Plan conservation earthworks

Cluster 2 Units of Competency: Nursery Production

AHCNSY101- Support nursery work
AHCNSY201- Pot up plants
AHCNSY202- Care for nursery plants
AHCNSY203- Undertake propagation activities
AHCNSY204- Maintain indoor plants
AHCNSY301- Maintain nursery plants
AHCNSY302- Receive and dispatch nursery products
AHCNSY303- Install and maintain plant displays
AHCNSY304- Deliver and promote sales of plants
AHCNSY305- Prepare specialised plants
AHCNSY306- Implement a propagation plan
AHCNSY307- Operate fertigation equipment
AHCNSY401- Plan a growing-on program
AHCNSY402- Plan a propagation program
AHCPCM201- Recognise plants
AHCPCM202- Collect, prepare and preserve plant specimens
AHCPCM203- Fell small trees
AHCPCM301- Implement a plant nutrition program
AHCPCM302- Provide information on plants and their culture
AHCPCM303- Identify plant specimens
AHCPCM304- Report on health and condition of trees
AHCPCM401- Recommend plants and cultural practices
AHCPCM402- Develop a soil health and plant nutrition program
AHCPCM403- Implement an integrated pest management program
AHCPCM501- Diagnose plant health problems
AHCPCM502- Collect and classify plants
AHCPCM503- Specify plants for landscapes
AHCPCM504- Design specialised landscape
AHCPCM505- Conduct environment and food safety risk assessment of plant nutrition and soil fertility programs
AHCPCM506- Develop an integrated pest management program
AHCPCM601- Develop and implement a plant health management strategy

AHCSOL202- Assist with soil or growing media sampling and testing
AHCSOL301- Prepare growing media
AHCSOL303- Implement soil improvements for garden and turf areas
AHCSOL401- Sample soils and interpret results
AHCSOL402- Develop a soil use map for a property
AHCSOL403- Prepare acid sulphate soil management plans
AHCSOL404- Supervise acid sulphate soil remediation and management projects
AHCSOL501- Monitor and manage soils for production projects
AHCSOL502- Manage soils to enhance sustainability
AHCSOL503- Manage erosion and sediment control
AHCSOL504- Develop and manage a plan to reclaim land affected by salinity

Cluster 3 Units of Competency: Production Horticulture

AHCPHT101- Support horticultural production
AHCPHT201- Plant horticultural crops
AHCPHT202- Carry out canopy maintenance
AHCPHT203- Support horticultural crop harvesting
AHCPHT204- Undertake field budding and grafting
AHCPHT205- Carry out post-harvest operations
AHCPHT206- Handle and move mushroom boxes
AHCPHT207- Perform mushroom substrate process tasks
AHCPHT208- Water mushroom crops
AHCPHT209- Produce trellis dried grapes
AHCPHT301- Carry out a crop regulation program
AHCPHT303- Implement a post-harvest program
AHCPHT304- Harvest horticultural crops mechanically
AHCPHT305- Regulate crops
AHCPHT306- Establish horticultural crops
AHCPHT307- Prepare raw materials and compost feedstock
AHCPHT308- Prepare value added compost-based products
AHCPHT309- Supervise mushroom substrate preparation
AHCPHT310- Coordinate horticultural crop harvesting
AHCPHT401- Assess olive oil for style and quality
AHCPHT402- Develop a crop regulation program
AHCPHT403- Develop harvesting and processing specifications to produce an olive oil
AHCPHT404- Implement and monitor a horticultural crop harvesting program
AHCPHT405- Manage mushroom substrate preparation
AHCPHT406- Control Phase II mushroom substrate process
AHCPHT407- Manage mushroom crop development

AHCPHT408- Oversee vineyard practices
AHCPHT502- Develop a horticultural production plan
AHCPHT503- Manage a controlled growing environment
AHCPHT504- Develop a grape production plan
AHCPHT505- Evaluate wine
AHCPHT506- Manage a wine making process
AHCWAT201- Set up, operate and maintain water delivery systems for compost
AHCWAT301- Monitor and operate water treatment processes
AHCWAT501- Design water treatment systems
AHCWAT502- Manage water systems

Cluster 4 Units of Competency: Biosecurity and Emergency

AHCBER301- Work effectively in an emergency disease or plant pest response
AHCBER303- Carry out emergency disease or plant pest control procedures at infected premises
AHCBER304- Carry out movement and security procedures
AHCBER401- Plan and supervise control activities on infected premises
AHCBER402- Carry out field surveillance for a specific emergency disease or plant pest
AHCBER501- Manage active operational emergency disease or plant pest sites
AHCBER502- Manage the implementation of an emergency disease or plant pest control program
AHCBER601- Plan and oversee an emergency disease or plant pest control program
AHCBIO201- Inspect and clean machinery for plant, animal and soil material
AHCBIO202- Follow site quarantine procedures
AHCBIO302- Identify and report unusual disease or plant pest signs
AHCBIO305- Apply biosecurity measures
AHCBIO403- Plan and implement a farm or enterprise biosecurity plan

Cluster 5 Units of Competency: Merchandising & Sales

AHCMER301- Process customer complaints
AHCMER302- Provide advice on hardware products
AHCMER303- Sell products and services
AHCMER304- Recommend irrigation products and services
AHCMER401- Coordinate customer service and networking activities
AHCMER402- Provide advice and sell machinery
AHCMER403- Provide advice and sell farm chemicals
AHCMER404- Provide advice on agronomic products
AHCMER405- Provide advice on livestock products
AHCMER406- Provide information on fertilisers and soil ameliorants

AHCMER407- Provide irrigation sales and service

AHCMER501- Develop a sales strategy for rural products

Skill Sets

- Review – six Skill Sets
 - Updating – up to six Skill Sets
 - Deletion – up to three Skill Sets
- New – up to ten Skill Sets

Cluster 3 – Production Horticulture

AHCSS00065 Production Horticulture Machinery

AHCSS00066 Production Horticulture Manager

AHCSS00067 Production Horticulture Supervisor

AHCSS00068 Production Horticulture Technology

AHCSS00069 Production Horticulture Administration Officer

AHCSS00064 Production Horticulture Administration Supervisor

Project 2 (AHLCLM IRC): Rooftop and Vertical Gardens

Description

The proposed project will develop one new qualification, new units of competency and skill sets in Rooftop and Vertical Gardens to meet the needs of emerging markets in Australia. The new qualification and skill sets will be developed at an advanced trade level within the Landscaping unit sector (AHCLSC) and will comprise of a mixture of new units, current units within the *AHC Training Package* and, potentially, units imported from other training package(s). This project was identified as a priority in the *2018 Skills Forecast*²⁰.

Rationale

In Australia, there is an emergence of urban green infrastructure, which is of increasing significance to stakeholders at all levels, including government policy-makers, landscapers, horticulturalists, architects, property developers and the public²¹. This emerging sector is representative of a worldwide trend and, as international examples (discussed below) show, city councils around the world are increasingly turning to rooftop and vertical gardens in the face of increasing urbanisation, for economic, environmental and socio-cultural benefits. The design and implementation of rooftop and vertical gardening has thus far been limited in Australia because of a lack of detailed knowledge and skills, and we propose creating units of competency to address the skills gap and so enable Australia to develop in line with this global trend.

During industry engagement, Michael Casey, Founder and director of MJC Horticulture and President of Australian Institute of Horticulture Australia, stated:

Our company supports the proposal put forward [by the IRCs] to create relevant training in the Greenwalls and Rooftop gardening space. Our industry requires formally educated and trained designers, installers and maintenance professionals in the fields of plant selection and knowledge, growing media, irrigation, just to name a few. The creation of a relevant training offering in this field will ensure that the future of this industry is competent in delivering safe, well designed and aesthetically pleasing green infrastructure projects.

Major employers in the industry, including construction corporation Lend Lease, and industry operators The Greenwall Company, MJC Horticulture and Green Roofs Australasia, have expressed support for qualifications and vocational training in the field to meet future demand and to aid employers in ensuring access to a competent workforce in the long-term.

Support for this project, based on market growth and skills needs, was also expressed during consultations with the Master Landscapers Association, Landscaping Industries Association WA, Landscape Queensland, Australian Institute of Horticulture, Westwood Environmental, Nursery and Garden Industry Australia, Landscaping Victoria TAFE Brisbane and the University of Melbourne.

There are myriad examples of rooftop and vertical gardens throughout Europe, Asia and North America, where city councils are actively encouraging their installation through grants, subsidies, incentives and regulations²². Examples include:

- The City of Toronto, Canada: there is an estimated 150,000m² of green roof²³. The city council passed bylaws requiring green roofs on developments with floor areas greater than 2,000 square metres²⁴. It also established an Eco-Roof Incentive Program in 2009 as part of its goal to reduce greenhouse gas emissions by 80 per cent by 2050, and offers up to \$100,000 for

²⁰ https://www.skillsimpact.com.au/site/skillimpactmedia/uploads/2018/05/ISF_AHC_IRCSkillsForecast.2018-2021-Signed.pdf

²¹ Perkins, M. and Joyce, D., 2012, *Living Wall and Green Roof Plants for Australia*, Australia Government, Rural Industries Research and Development Corporation

²² City of Sydney, 2014, Green Roofs and Walls Policy Implementation Plan, accessed April 2019, <<https://www.cityofsydney.nsw.gov.au/vision/sustainable-sydney-2030/sustainability/greening-the-city/green-roofs-and-walls>>

²³ <https://www.sgaonline.org.au/green-roofs/>

²⁴ <https://www.abc.net.au/news/2018-05-20/why-australia-needs-more-rooftop-gardens/9775464>

eligible green roofs projects²⁵. These projects have seen a huge increase in rooftop and vertical garden businesses offering their skills and knowledge, while research has proven that developments have reduced storm water runoff, urban heat island effects and energy consumption, while increasing city beautification, green spaces and opportunities for local food production.²⁶

- Portland, USA: has instituted an extensive incentives program to promote green and eco-roofs for more effective storm water management. This and various other initiatives have been coupled with a strong focus on education – people can access information about events, guides and other resources offered by the city council.²⁷
- Singapore: there are over 600,000m² of green roofs and walls²⁸. Singapore is the foremost global proponent of green walls, with a policy-enshrined vision of creating a ‘city in a garden’.²⁹
- Germany: green roofs cover an area of over one billion m² – 15 per cent of all German rooftops³⁰. In Munich, green roof provisions have been included in building ordinance since 1984. Berlin enacted a green roof subsidy program in 1983, which reimbursed up to half of any construction costs³¹. By 2002, 103 German cities had instituted policy incentives for green roofs.
- London, UK: the UK’s Environment Agency promotes the widespread adoption of green roofing, and the London Mayor’s Climate Change Adaptation Strategy called for 100,000m² of new green roofs by 2012, with a requirement that green roofs be installed on all major new developments within London’s Central Activities Zone. The UK’s Green Building Council promotes green roofs’ role in creating urban amenity space, addressing global warming, improving urban habitats, and offering biodiversity and sanctuaries for endangered species.³²

Rooftop and vertical gardens are on the rise globally because they are a unique measure for simultaneously combatting a range of social, health and environmental issues while providing economic benefits. Australia is now playing ‘catch-up’. Reflecting on the many international examples presented at the International Green Roof Congress (London, 2010), ArchitectureAU stated that, “While [Australia is] still lacking long-term experience and technical knowledge, there is the potential to create a thriving and competitive green roof market as is occurring in Europe and the USA by developing standards that increase the longevity and performance of green roofs.”³³

Taking their lead from international examples discussed above, the Sydney³⁴ and Melbourne³⁵ City Councils have been promoting green roofs and vertical gardens for around a decade, with the Sustainable Sydney 2030 policy setting out ambitious targets through the *Green Roofs and Walls Policy Implementation Plan*³⁶. Adelaide City Council developed the Green Infrastructure Guidelines 2014³⁷, and, in 2016, launched the Green City Grant Program with a pledge to cover up to half the cost of rooftop and vertical gardens projects (to a maximum \$10,000). In these contexts, the Rural Industries Research and Development Corporation identified the sector as ‘emerging’ in their *Living Wall and Green Roof Plants for Australia* report (2012). However, it is only since recent national and international

²⁵ <https://www.toronto.ca/services-payments/water-environment/live-green-toronto/>

²⁶ State of Victoria, 2013, *Growing Green Guide: green roofs, walls and facades policy options background paper*, Department of Environment and Primary Industries, p.19.

²⁷ State of Victoria, 2013, *Growing Green Guide: green roofs, walls and facades policy options background paper*, Department of Environment and Primary Industries, p.20.

²⁸ <https://www.sgaonline.org.au/green-roofs/>

²⁹ Perkins, M. and Joyce, D., 2012, *Living Wall and Green Roof Plants for Australia*, Australia Government, Rural Industries Research and Development Corporation, p.5

³⁰ <https://www.sgaonline.org.au/green-roofs/>

³¹ Kohler, M. & Keeley, M. 2005, Green Roof Technology and Policy Development, in Arpels, M. (ed), *Green Roofs: Ecological Design and Construction*, Schiffer Books.

³² Hodges, M., 2011, *Green Roofs in the Garden City: Exploring the Opportunities for Green Roof Policies in Missoula*, Montana, University of Montana, p.32

³³ <https://architectureau.com/articles/international-green-roof-congress/>

³⁴ City of Sydney, 2010, Green Roof Resource Manual, accessed April 2019,

<https://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0006/109383/Green-roof-resource-manual-full-version.pdf>

³⁵ State of Victoria, 2014, *Growing Green Guide: A guide to green roofs, walls and facades in Melbourne and Victoria*, Department of Environment and Primary Industries

³⁶ City of Sydney, 2014, Green Roofs and Walls Policy Implementation Plan, accessed April 2019,

<<https://www.cityofsydney.nsw.gov.au/vision/sustainable-sydney-2030/sustainability/greening-the-city/green-roofs-and-walls>>

³⁷ https://www.cityofadelaide.com.au/assets/documents/Green_Grant_Program.pdf

research has established the many environmental and social benefits of these spaces, and resource manuals and university-level training³⁸ have been developed, that more property developers and owners have begun to invest in green infrastructure³⁹.

Recent examples demonstrating expansion in the establishment, nature and diversity of rooftop and vertical gardens over the last few years include:

- Mirvac, one of Australia's largest construction enterprises, launched the country's first Indigenous Rooftop Farm at the Australian Technology Park in Redfern, NSW, in November 2018, planning for this to be the prototype for future projects across the country⁴⁰. The new rooftop farm showcases Indigenous permaculture methods and cultural knowledge.
- Macquarie Bank's Sydney headquarters features a rooftop garden, covering approximately 180m², which is used as a social space, micro-farm and habitat for wildlife. It is tended by around 100 bank staff, who water the plants and feed the chickens. Harvests of seasonal vegetables and herbs, including chillies, eggplants, lettuce, kale, beetroot, cucumber and strawberries, are distributed amongst staff and are even used by the in-house cafes. Flowers such as lavender have been added for the bees, the hives for which produce more than 100kg of honey per year.⁴¹

According to Sustainable Gardening Australia, constructions like these are on the rise. Local Governments in Sydney, Melbourne and Adelaide have created guides and policies to support green infrastructure, and it is estimated that there are over 50 green roofs in Melbourne and 80,000 square metres of green roofs and walls across Sydney⁴².

The City of Sydney instituted a specific Green Roofs and Walls Implementation Plan in 2014, which identified skills training and education programs among the barriers to successful implementation. The City of Melbourne operates the Urban Forest Fund to accelerate greening activity across the city, including vertical greening and green roofs. The fund is helping to develop projects across the Melbourne City Council region, including in apartment blocks and co-funded by residents.

The Australian Institute of Landscape Architects (AILA) state that rooftop and vertical gardens contribute to healthy living and environmental sustainability through:

- Reducing the urban heat island effect
- Improving building efficiency and energy savings by reducing heat absorption and reflection, and insulating structures
- Enhancing biodiversity by increasing the available area and quality of habitat
- Enhancing food production capacity at a local level
- Enhancing green space in urban areas using limited space to achieve multiple outcomes
- Reducing greenhouse gas emissions and improving air quality
- Reducing urban runoff and enhancing water quality

The AILA also identifies a key barrier as a lack of experience in the Australian industry due to relatively limited number of installations, which can be partially addressed through new training.

³⁸ See, for example, University of Melbourne's subject 'Designing Green Roofs and Walls (HORT90046)' <<https://handbook.unimelb.edu.au/2018/subjects/hort90046>>

³⁹ <https://www.abc.net.au/news/2018-05-20/why-australia-needs-more-rooftop-gardens/9775464>

⁴⁰ <https://www.commercialrealestate.com.au/news/mirvac-to-host-australias-first-indigenous-rooftop-garden-in-redfern/>

⁴¹ <https://www.theaustralian.com.au/weekend-australian-magazine/green-thumbs-of-the-city/news-story/2c7c6a3c8689b5f015b5e89811d643c6>

⁴² See <https://www.sgaonline.org.au/green-roofs/>.

Changes in job roles, workplace or industry

While rooftop and vertical gardens trades are well-established internationally⁴³, they are only now emerging in Australia, encouraged by government policies on green spaces, sustainability, population growth and local/building climate management. The range of developments are also evolving from standard green spaces and building gardens to cultural installations⁴⁴ and micro-farms. What unifies such developments as part of the broader rooftop and vertical gardens field is the requirement for workers to possess the knowledge and skills specific to green infrastructure design, installation and maintenance, including contextual methods and safety procedures (associated with working from heights, using appropriate machinery and preventing organic or building materials from endangering the public).

As vocational training is not yet available, various associations and councils have created their own resources and professional development activities. The Australian Institute of Horticulture has introduced formal professional development events focused on rooftop and vertical gardens for qualified members⁴⁵. The City of Sydney ran workshops and a large forum on green roofs and green walls as part of the Sydney Design Festival⁴⁶. Such educational activities are to ensure that appropriate information is being offered for improving knowledge and skills at a range of technical levels where there is an absence of vocational training. As the City of Sydney Council puts it, "One of the issues with green roofs and walls is the difficulty in finding appropriate and reliable information"; hence why they advocate for "information sharing, skills training, education programs and technical support."⁴⁷

Relevant occupations that will benefit from the development of this new qualification may include:

- Rooftop and vertical gardeners
- Landscapers and landscape designers
- Micro and permaculture farmers
- Horticulturists
- Environmental Consultants
- Nursery workers and advisors
- Hydraulic engineer
- Builder
- Building Surveyor
- Irrigation consultant
- Waterproofing supplier
- Leak detection specialist
- Green roof provider
- Green wall provider
- Green façade provider
- Greenwall maintenance
- Project Manager
- Construction Manager

Need for Graduates

There are no qualifications servicing this industry in the VET sector. Policy directions being implemented at local government level and private preferences from land owners and developers demonstrate the potential for market growth and the need for graduates to support the industry. As Hort Innovation contend, "Specialised knowledge and skills are needed for maintenance and care when green roofs, walls and facades [are] installed in high-rise buildings, such as One Central Park in Sydney."⁴⁸

The training is likely to require previous experience (potentially including qualifications) in a relevant industry and is likely to be established as an advanced trade qualification at AQF Level 4 or 5 (subject to further analysis by subject matter experts).

⁴³ State of Victoria, 2013, *Growing Green Guide: green roofs, walls and facades policy options background paper*, Department of Environment and Primary Industries, pp.19-21.

⁴⁴ <https://www.commercialrealestate.com.au/news/mirvac-to-host-australias-first-indigenous-rooftop-garden-in-redfern/>

⁴⁵ For example, see: <https://www.aih.org.au/news/greenwalls-and-rooftops-including-community-and-food-usage-visit/>

⁴⁶ <https://sydneydesign.com.au/2019/event/designing-innovative-green-spaces/>

⁴⁷ City of Sydney, 2014, Green Roofs and Walls Policy Implementation Plan, accessed April 2019, pp.10-13,

<<https://www.cityofsydney.nsw.gov.au/vision/sustainable-sydney-2030/sustainability/greening-the-city/green-roofs-and-walls>>

⁴⁸ Hort Innovation, 2018, Expanding the Living Architecture in Australia, p.5, accessed April 2019,

<<https://opus.lib.uts.edu.au/handle/10453/119804>>

Currently, University of Melbourne offers a course in Designing Green Roofs and Walls at AQF Level 8⁴⁹. This subject largely emphasises the design of Greenwalls and Rooftop gardens whereas this project proposes vocational training in all aspects of the design and build of greenwalls and rooftop garden including species selection, irrigation, ongoing maintenance and wind factors. The University of Melbourne is very supportive of training being created for greenwalls and rooftop gardens in the VET sector. John Raynor, Associate Professor and Director of Urban Horticulture at The University of Melbourne Burnley campus, writes:

At present, there is no available or adequate training for employment in this sector. Existing vocational training options do not satisfy the needs of what is a very multi-disciplinary and technologically-complex industry. There is a need for new training to reflect these needs; training that encompasses aspects of planning and design, horticulture, landscape construction and maintenance, engineering and safe work practices. This will ensure that graduating students are highly valued and readily employed by industry.

The current lack of a suitable vocational qualification in green roofs and green walls is stymying development of the industry, particularly in installation and maintenance, and will continue to do so until high quality and relevant training is provided.

As is acknowledged in the *Growing Green Guide*⁵⁰, there are very few, if any, resources that impart technical advice or training for designing, constructing and maintaining green roofs, walls and facades. It is further asserted that it “is likely that over time the industry will mature and have a body of research and experience that can be used to move from advice to technical standards that are directly relevant to Australian conditions” (p.30). The document lays out the skills required for planning and designing a green roof, wall or façade (see below). These are indicative of the complexities of rooftop and vertical gardens and the range of skills and knowledge that require worker training:

1. Site analysis

It is crucial to identify site characteristics because they will not only influence feasibility and cost but be crucial in determining the practical requirements of a commission.

1.1 Climatic factors on-site

Climatic factors will vary with geographic and site location (including height and shading from surrounding buildings). These variables inform decisions about plant species selection:

- Wind: wind speeds are greater with distance from ground level and around the edges of buildings, meaning plants require adequate shelter and adequate root depth.
- Rainfall and irrigation: a water source (to supplement natural rainfall) must be established and stored to supply an irrigation system.
- Solar radiation: light and shade levels are crucial variables for plants’ establishment and survival.
- Temperature: heat tends to increase with elevation, and extreme weather events must be factored into species selection.
- Microclimate: Enclosed spaces between urban buildings can create microclimatic conditions whereby wind turbulence, humidity, temperature and pollution are intensified, thus impacting on growing conditions.

1.2 Weight loading

The load-bearing capacity of a building must be known before planning a green roof, wall or façade. This requires direct, effective communication with structural engineers to achieve design outcomes. The following variables must be accounted for:

⁴⁹ University of Melbourne, *Designing Green Roofs and Walls (HORT90046)*, accessed April 2019, <<https://handbook.unimelb.edu.au/2018/subjects/hort90046>>

⁵⁰ State of Victoria, 2014, *Growing Green Guide: A guide to green roofs, walls and facades in Melbourne and Victoria*, Department of Environment and Primary Industries

- Dead load: the total weight of all elements of the development, including plants, structural items and water retention.
- Live load: the combined weight of people and mobile equipment that may populate surface areas for recreation or maintenance (both at any one time and considering cumulative stress over time).
- Transient load: itinerant weight added; for example, water-logged surfaces during seasonal or sudden rainstorms.

1.3 Drainage

Prior to design, sites must be assessed for existing primary (for regular, low-level water flows) or secondary (overflow relief) drainage systems and roof surface slopes. Considerations when implementing a new drainage system include:

- The amount of rainfall that lands directly on the site and overflows from adjacent surfaces.
- The extent of weather events: the volume and speed of extreme rainfall must be factored into drainage design.
- The capacity of drains being installed (sites can be damaged with water-logging caused by insufficient drainage).

1.4 Existing structure, size and regulations

- The condition of the roof or vertical surface must be assessed, e.g. for existing water-proofing and exposure to other vegetation/weeds.
- The design must take account of the various ways in which surrounding spaces are used; for example, windows must not be obstructed (in terms of view or from opening).
- Roof/wall slope: different methods are required for rooftops and vertical walls.
- Building regulations, including public space laws, must not be contravened.

1.5 Access

Development and maintenance of a site may require that it be accessible to:

- Heavy machinery during the installation process.
- Cranes (to lift materials on to the site)
- The public/residents (which may require stairways/lifts/viewing platforms to be installed, including disabled access).

2. Design and Planning

In addition to the site analysis, the design and planning stage must take account of:

- Overall design outcomes sought from the project, which may include:
 - Maximising a building's thermal insulation through green roof substrate coverage⁵¹, aiding heat retention and the reduction of energy use and bills.
 - Creating biodiversity and wildlife habitats, e.g. for birds and bees⁵²
 - Providing an aesthetically attractive social space for meeting and relaxing⁵³

⁵¹ Li, W.C. and Yeung, K.K.A., 2014, A comprehensive study of green roof performance from environmental perspective, *International Journal of Sustainable Built Environment*, 3, p.134

⁵² United States General Services Administration, 2011, The Benefits and Challenges of Green Roofs on Public and Commercial Buildings,

<https://www.gsa.gov/cdnstatic/The_Benefits_and_Challenges_of_Green_Roofs_on_Public_and_Commercial_Buildings.pdf>

⁵³ Hort Innovation, 2018, Expanding the Living Architecture in Australia, accessed April 2019,

<<https://opus.lib.uts.edu.au/handle/10453/119804>>

- Water management and run-off quality⁵⁴
- Increasing the lifespan of a roof by protecting it from the elements⁵⁵
- Urban rooftop micro-farms
- Maintenance inputs
- Sourcing the right information and expertise
- The design differences between green infrastructure being retrofitted on to existing buildings and integrated into new buildings⁵⁶
- Budget
- Relevant building industry codes and planning assessment tools
- Plant selection and establishment⁵⁷

These variables are crucial to the successful design of a green roof, wall or facade, and must be satisfactorily concluded prior to construction.

If the relevant skills and knowledge are not acquired, there are various risks associated with the installation of green roofs and vertical gardens. The correct handling, installation and maintenance of plant species ensures viability; however, inadequately planned gardens risk failure due to plant loss, slope instability, inadequate drainage conditions, and soil erosion from wind and water. Urban rooftop micro-farming depends on the successful maturation of crops for viable produce, and crop failure compromises the integrity of entire businesses and contracts.

Inexperienced green roofing contractors may cause budget over-runs and improperly installed green roofs due to inadequate planning and activities coordination⁵⁸. Both gardens and buildings may be irreparably damaged if, for example, insufficient drainage systems are implemented, thus signifying physical and financial risks. Understanding rooftop micro-climates is crucial for ensuring that loose debris does not become hazardous, or that the effects of wind do not uproot large shrubs and trees with potentially dangerous consequences. Without effective communication with expert colleagues, for instance structural engineers, there are further hazards associated with the integrity of building structures and so risks to the public.

Timeline for Latest Changes

There are no current qualifications or units of competency for this industry.

Low enrolments and New Components

Key new knowledge and skills components specific to rooftop and vertical gardening include:

- Design factors specific to elevated and vertical environments;
- Knowledge of environmental factors of microclimates and plant selection;
- Installation of vertical water delivery systems, filtration systems and drainage facilities;

⁵⁴ Carvajal Munoz, J.S. and Carmona Garcia, C.E., 2015, Global research trends in green roofs: benefits, main developments and future needs. *SciELO Rev. P+L*, vol.10, no.2, p.174.

⁵⁵ Green Roofers, Advantages and Disadvantages of Green Roofs, accessed April 2019, <<http://www.greenroofers.co.uk/green-roofing-guides/advantages-disadvantages-green-roofs/>>

⁵⁶ United States General Services Administration, 2011, The Benefits and Challenges of Green Roofs on Public and Commercial Buildings, <https://www.gsa.gov/cdnstatic/The_Benefits_and_Challenges_of_Green_Roofs_on_Public_and_Commercial_Buildings.pdf>

⁵⁷ Perkins, M. and Joyce, D., 2012, *Living Wall and Green Roof Plants for Australia*, Australia Government, Rural Industries Research and Development Corporation

⁵⁸ United States General Services Administration, 2011, The Benefits and Challenges of Green Roofs on Public and Commercial Buildings, p.80, <https://www.gsa.gov/cdnstatic/The_Benefits_and_Challenges_of_Green_Roofs_on_Public_and_Commercial_Buildings.pdf>

- Waterproof barrier selection;
- Nutrient requirements and the challenges of maintaining plant health in unusual environments;
- Working at heights on elevated work platforms;
- Long- and short-term maintenance;
- Local government regulation and building codes;
- Root plate consideration to withstand wind velocity.

There are no relevant units of competency which include these new components, with the potential exception of working at heights on elevated platforms, which may be equivalent to skills needed in arboriculture or construction. The relevant unit relating to working at heights is currently under review in relation to arboriculture and construction qualifications and suitability can't be assessed until the completion of these reviews.

It is estimated that up to 15 new units of competency may be required to address these skills needs.

In addition, new Skill Sets may be developed based on the units developed for the qualification. These will be designed to provide needed skills relating to work undertaken on particular components of the delivery of rooftop and vertical gardens. There may be a need to develop four Skill Sets:

- Working on a Rooftop garden project
- Working on a Vertical garden project
- Identifying plants for rooftop and vertical gardens
- Water delivery, filtration and drainage for rooftop and vertical gardens

Existing Components and cross-sector approaches

Existing AQF level 3, 4 or 5 components in the AHCLSC unit sector may form core and elective components of the qualification. Current units that will be considered for importation as core or elective units include:

- AHCLSC307 - Implement a retaining wall project
- AHCPM302 - Provide information on plants and their culture
- AHCIRG431 - Supervise irrigation system installation
- AHCLSC401 - Supervise landscape project works
- AHCPM401 - Recommend plants and cultural practices
- AHCPGD401 - Design plant displays
- AHCWHS401 - Maintain work health and safety processes
- AHCDSE501 - Design sustainable landscapes
- AHCPM503 - Specify plants for landscapes
- AHCPM504 - Design specialised landscape
- AHCPER403 - Design an urban permaculture system
- AHCARB701 – Analyse tree biomechanics
- AHCIRG306 – Troubleshoot irrigation systems
- AHCPDG402 – Plan a plant establishment program

There may be opportunities to import units from the *Construction, Plumbing and Services Training Package*, with identified possibilities currently under review. This will also require the acceptance of equivalence of health & safety units to meet prerequisite requirements. Potential units for importation include:

- CPCCCM2010 - Work Safely at Heights
- CPCPRF4011B - Design and size roof drainage systems
- CPCPRF2023A - Collect and store roof water
- CPCPCM5012A - Design complex stormwater and roof drainage systems
- CPCCCA3004A - Construct wall frames

Data

As this is an emerging trade with no current qualifications or funding, there is no relevant data to provide. Employment data at this specific level cannot be obtained from standard sources.

Ministers Priorities Addressed

Obsolete and duplicate qualifications removed from the system

This priority will not be addressed in this project.

More information about industry's expectations of training delivery is available to training providers to improve their delivery and to consumers to enable more informed choices

Information will be made available to training providers to assist in developing training in rooftop and vertical gardening. This will include information on potential market opportunities and relevant industry organisations.

The training system better supports individuals to move more easily between related occupations

The proposed qualification is an advanced trade-level qualification and will allow current workers in the industry to expand their current market offerings and meet new demand. This will provide additional career path options to current and future industry workers.

Improved efficiency of the training system through units that can be owned and used by multiple industry sectors

This priority will be addressed by utilising current units in the AHC and CPC Training Packages to minimise the need to develop new units.

Foster greater recognition of skill sets

It is likely this project will result in the identification and development of additional Skill Sets, particularly relating to working in particular parts of rooftop and vertical garden projects to extend current skills of experienced workers.

Consultation Plan

The AHLCLM IRC will oversee and be consulted on consultation, including identification of relevant experts and stakeholders. Initial development work will be undertaken in consultation with relevant subject matter experts. Drafts changes will be created and reviewed by the experts. The drafts will then be made available for public consultation and feedback, with consultation sessions to be held around Australia. Following this, the final drafts will be validated through further consultation and Quality Assurance processes. The Case for Endorsement will be finalised and submitted to the AHLCLM IRC for review and final approval, prior to submission to the AISC.

Stakeholders for Consultation

The AHLCLM will consult with the *Construction, Plumbing and Services* Industry Reference Committee concerning the importation of relevant units, and to ensure they are aware of the increasing demand for rooftop and vertical gardens and can ensure any additional construction needs are addressed.

Stakeholders may include but will not be limited to the following:

- Australian Institute of Horticulture
- Arboriculture Australia
- Landscaping Australia
- Parks and Leisure Australia
- Nursery and Garden Industry Australia
- Australian Conservation Foundation
- Australian Institute of Landscape Architects
- Australian Institute of Landscape Designers and Managers
- The Greenwall Company
- Turf Australia
- Green Roofs Australasia
- National Parks Australia Council
- Soils for Life
- Australian Association for Environmental Education
- Community and Public Sector Union
- Australian Services Union
- Facility Management Association

Other bodies

- RTOs with potential to offer the training
- Industry Training Advisory Bodies
- State/Territory Training Authorities

Scope of Project Overview

Overall timing: eight months from delivery of signed Activity Order

Expected Date for Endorsement: August 2020

Table 6: Key Activity Timing

Months	Activity
1	Project planning and briefing, identification of experts and consultation with IRCs
2	Workshops with subject matter experts including research and functional analysis
3-4	Development of draft documents in preparation for public consultation
5	Public Consultation
6	Review of public consultation and Equity Review
7	Validation and Quality Assurance, final consultation for STA
8	Approval of Case for endorsement to IRCs and submission to AISC

Summary of Components

All work is within the AHC Training Package.

Qualification

- New – 1 new qualification will be developed

Units of Competency

- Review – No units will be reviewed
 - Existing units may be examined for suitability for import
- New – up to 15 units will be developed

Skill Sets

- Review – there are no existing Skill Sets to be reviewed
- New – Up to four new Skill Sets will be developed

Project 3 (APH IRC): Nationally Accredited Diploma of Agronomy

Description

The proposed project is to create a nationally endorsed Diploma of Agronomy based on the current Victorian accredited qualification 22273VIC Diploma of Agronomy. The project will review and update units which have not been reviewed for more than five years and fill any gaps based on new skills needs.

Rationale

The agricultural and production horticulture industry continue to look for competitive market advantages and improved methods of production. While agronomy degrees are producing scientists capable of guiding soil management and field crop production, the industry has identified a skills shortage in applied agronomy.

Victoria has been offering a state-accredited 22273VIC Diploma of Agronomy program, which was approved in 2009, based on a scoping study conducted in 2007 (current accreditation is due to expire June 2019). Feedback from the industry is that this program teaches useful and needed skills which, if they were widely available, would benefit the industry.

The accredited qualification was developed with the support of the Victorian Grains Industry Training Network. The 2007 scoping study identified the differing needs of industry between the public sector and large enterprises, which were best met through University programs, and the private sector, which needs hands-on skills and applied knowledge in different situations⁵⁹. In 2014, the Victorian re-accreditation application noted that industry believes that while degree graduates have valuable research and scientific skills, they often lack the technical and applied skills required for a career in agronomy. Recent consultations have elicited that applied agronomy also gives farmers and horticulturalists the ability to make informed decisions regarding production systems when dealing with agronomists employed by retail-based companies.

Demand appears to be growing since the original 2007 scoping study. The Australian Government Department of Jobs and Small Business released an update in March 2018 noting the increase in demand for Agricultural Scientist/Consultant (ANZSCO 2341-11, 12). The Victorian Skills Commissioner identified agronomy as a needed skill in the 2017 Mallee Regional Skills Demand Profile.

There was support from a diverse range of stakeholders during direct consultations, including Elders Agronomy Services, RDA Riverina, Sunraysia Institute of TAFE (Mildura), Queensland Agricultural Training College (based on advice from their industry advisory group), Longerenong College and various farmer-led research groups across Australia.

Changes in job roles, workplace or industry

The Victorian Skills Commissioner has noted that one of the higher-level challenges facing Victorian agriculturalists in the Mallee Region is finding specialists with expertise in agronomy. This is having an impact on their ability to introduce scalable automation and to address labour demands. The Grains Research and Development Corporation has also identified that skills in the emergent practice of *precision* agronomy will be required.⁶⁰

VegPro developed a *Vegetable Industry Training Needs and Gaps Analysis* as part of their work on Hort Innovations project VG15028, which notes that there has been an increasing reliance on independent agronomy services. Partially this is due to the changing nature of departmental support

⁵⁹ N. Wachsmann and J. Goldsmith, 2010, The development and delivery of a new Diploma of Agronomy Course, *The Regional Institute*

⁶⁰ Grains Research and Development Corporation, 2012, *PA in Practice II: Using precision agriculture technologies: a guide to getting the best results*, SPAA Precision Agriculture Australia, accessed April 2019, <<https://grdc.com.au/resources-and-publications/all-publications/bookshop/2012/10/painpractice2>>

which has been directed into other areas and away from extensions services previously provided by trained staff.

Examples of job roles that may be held on completion of the qualification include:

- Agronomist
- Agronomy or Agricultural Consultant
- Horticulturist
- Permaculturist
- Farmer
- Organic Farmer

The qualification may allow for a career path option in a number of roles, and movement between roles may also be aided by achieving the qualification. Examples of roles that may currently be held by prospective learners include:

- Agronomist
- Farm Manager
- Production Horticulture Manager
- Horticulture Manager
- Permaculture Manager
- Sustainable Fruit and Vegetable Farmer
- Farm Supervisor
- Fruit and Vegetable Farm Supervisor
- Mushroom Farm Supervisor
- Irrigation Master Technician
- Senior Farmhand

Need for graduates

The VegPro needs and gaps analysis noted that agronomy training is currently very limited, and mostly directed towards product sales. The analysis identified a lack of applied agronomy skills availability needed, in particular in applied areas such as field production and advanced crop management.

Specific recent graduate information related to the current Victorian program is not available, however Victorian Diploma level graduates in this and related fields have an 89 per cent satisfaction rate with the training, and more than half have improved employment status within six months of completion of the program. The recent ANZSCO update from the Department of Jobs and Small Business identifies the increase in demand for Agricultural Scientist/Consultant (ANZSCO 2341-11, 12).

Timeline for latest changes

The qualification retains the structure which was established and approved at State level in 2009, but has not been converted to a nationally-accredited program. The most recent work on the units of competency to be reviewed took place in November 2016 and involved transition of Agriculture, Horticulture and Conservation and Land Management (AHC) Units of Competency to meet the new Training Standards and conversion of VU Units to AHC Units. One VU Unit remains in the Diploma and has not been worked on since at least the June 2014 renewal of state-based accreditation.

Two relevant units will not be reviewed as part of this project. One unit of competency related to irrigation is currently being reviewed and will be updated this year, while a unit related to soil has been included

in AHC Project 1 previously submitted to the AISC. After consideration, it is submitted that Unit should be reviewed in the other project, should that project receive AISC approval.

Low enrolments and new components

Enrolment data for the 22273VIC Diploma of Agronomy shows that 224 students have enrolled in the last three years, a reasonable enrolment number for this level of qualification.

Table 7: Diploma of Agronomy enrolments

Qualification	2015	2016	2017	Total
22273VIC - Diploma of Agronomy	70	67	87	224

Source: NCVET VOCSTATS, TVA program enrolments 2014-2017

The AHC units of competency mostly have enrolment numbers in line with expectations (see Attached Excel Spreadsheet tab: Table A – Units), although two units relating to agricultural technology have low enrolments. As a critical area of applied agronomy, these units should be reviewed and updated to ensure uptake of enrolments. This may require the introduction of new units (including the incorporation of precision agronomy skills).

New components may need to be included from the *BSB Training Package* and to cover new skills in crop and pasture agronomy.

Existing components and cross-sector approaches

There are 13 current units of competency requiring review. It is likely that these will be updated and that there will be limited deletions.

This project is not amenable to coverage using cross-sector approaches.

Data

Detailed data is included in relevant sections of this Skills Forecast and in the Table A document separately submitted to the AISC.

Ministers Priorities Addressed

Obsolete and duplicate qualifications removed from the system

No obsolete or duplicated qualifications will be removed from the system.

More information about industry's expectations of training delivery is available to training providers to improve their delivery and to consumers to enable more informed choices

Information will be made available to training providers to assist in developing training and options in growth areas, particularly outside of Victoria as the Diploma has not been available in these regions previously.

The training system better supports individuals to move more easily between related occupations

The Diploma of Agronomy opens pathways towards the business and management of agricultural enterprises, as well as in the applied fields of soil management and advanced crop production. Current graduates of the Victorian Diploma have undertaken further studies at advanced and graduate diploma levels, as well as degree levels. Qualifications in agronomy also provide opportunities for consultancy and sales organisations.

Improved efficiency of the training system through units that can be owned and used by multiple industry sectors

The units utilised in the Diploma of Agronomy currently are used in other Diploma level qualifications in the AHC training package, and have also allowed RTOs to develop specialist streams within existing qualifications. This is not expected to change after the review.

Foster greater recognition of skill sets

This priority will not be addressed in this project.

Consultation Plan

The APH IRC will oversee and be consulted on consultation, including identification of relevant experts and stakeholders. Initial development work will be undertaken in consultation with relevant subject matter experts. Drafts changes will be created and reviewed by the experts. The drafts will then be made available for public consultation and feedback, with consultation sessions to be held around Australia. Following this, the final drafts will be validated through further consultation and Quality Assurance processes. The Case for Endorsement will be finalised and submitted to the APH IRC for review and final approval, prior to submission to the AISC.

Stakeholders for consultation

Stakeholders may include but will not be limited to the following:

- National Farmers' Federation
- Australian Oilseeds Federation
- Cane Growers
- Cotton Australia
- Dairy Australia
- Growcom
- Vegetables WA
- Ausveg
- Grain Growers
- Hort Innovation
- Irrigation Australia
- Irrigation Council of Australia
- Maize Association of Australia
- Ricegrowers' Association of Australia
- Wool Producers Australia
- NSW Farmers
- NT Farmers
- Pastoralists and Graziers Association of Western Australia
- Primary Producers SA
- Queensland Farmers' Federation
- Tasmanian Farmers and Graziers Association
- Victorian Farmers Federation
- WA Farmers
- Australian Workers Union

Other bodies

- RTOs with potential to offer the training
- Industry Training Advisory Bodies
- State/Territory Training Authorities

Scope of Project Overview

Overall timing: eight months from delivery of signed Activity Order

Expected Date for Endorsement: August 2020

Table 8: Key activity timing

Months	Activity
1	Project planning and briefing, identification of experts and consultation with IRCs
2	Workshops with subject matter experts including research and functional analysis
3-4	Development of draft documents in preparation for public consultation
5	Public Consultation
6	Review of public consultation and Equity Review
7	Validation and Quality Assurance, final consultation for STA
8	Approval of Case for endorsement to IRCs and submission to AISC

Summary of Components

All work is within the AHC Training Package.

Qualifications

The 22273VIC Diploma of Agronomy will be reviewed to develop a new replacement nationally-accredited Diploma of Agronomy.

Units of Competency

- Review – 13 Units will be reviewed
 - Update – up to 13 Units
 - Deletion – up to two units
- New – up to two units

Skill Sets

No new skills sets will be developed.

IRC SIGNOFF

This IRC Skills Forecast and Proposed Schedule of Work was agreed as a result of a properly constituted Industry Reference Committee decision.

Signed for and on behalf of the two **Industry Reference Committees** by its appointed Chairs:

Amenity Horticulture, Landscaping, Conservation and Land Management IRC



Signature of Chair

Esther Ngang

Date: 18th April, 2019

Agriculture and Production Horticulture IRC



Signature of Chair

Geoff Harvey

Date: 24th April 2019

APPENDIX 1: AHC TRAINING PACKAGE DATA

Enrolments

Table 9: AHC Training Package enrolments

2014	2015	2016	2017	Total
79,749	72,520	73,553	72,135	297,957

Source: NCVER VOCSTATS, TVA program enrolments 2014-2017

Table 10: Program enrolments relating to the APH and AHLCLM IRCs

Qualification Code	Qualification Name	2014	2015	2016	2017	Total
AHC10416	Certificate I in Permaculture	0	0	0	0	0
AHC21116	Certificate II in Irrigation	11	10	0	0	21
AHC21716	Certificate II in Permaculture	0	0	0	0	0
AHC32216	Certificate III in Commercial Composting	35	13	0	12	60
AHC32416	Certificate III in Irrigation	173	135	122	135	565
AHC33816	Certificate III in Permaculture	0	0	33	108	141
AHC30318	Certificate III in Rural and Environmental Pest Management	0	0	0	0	0
AHC41116	Certificate IV in Irrigation	58	25	12	5	100
AHC42116	Certificate IV in Permaculture	0	0	9	87	96
AHC41716	Certificate IV in Pest Management	0	0	0	0	0
AHC51616	Diploma of Irrigation Management	9	4	3	3	19
AHC52116	Diploma of Permaculture	0	0	0	13	13
AHC51316	Diploma of Pest Management	8	7	4	1	20
		294	194	183	364	1,035

Source: NCVER VOCSTATS, TVA program enrolments 2014-2017

nb. Data includes enrolments in superseded qualifications that are both equivalent and not equivalent to the current qualification

Table 11: AHLCLM IRC-related program enrolments

Qualification Code	Qualification Name	2014	2015	2016	2017	Total
AHC10116	Certificate I in Conservation and Land Management	818	1,676	3,624	2,886	9,004
AHC10316	Certificate I in Horticulture	0	0	0	29	29
AHC20516	Certificate II in Arboriculture	340	355	265	82	1,042
AHC20916	Certificate II in Sports Turf Management	24	18	18	49	109
AHC20816	Certificate II in Retail Nursery	2	0	0	0	2
AHC20416	Certificate II in Horticulture	9,586	9,637	7,829	7,473	34,525
AHC21616	Certificate II in Landscaping	441	303	245	253	1,242
AHC20716	Certificate II in Production Nursery	32	33	47	18	130
AHC20616	Certificate II in Parks and Gardens	87	238	324	338	987

AHC21016	Certificate II in Conservation and Land Management	4,572	3,312	3,567	3,774	15,225
AHC31216	Certificate III in Retail Nursery	48	40	32	44	164
AHC32316	Certificate III in Conservation Earthworks	34	0	0	0	34
AHC31616	Certificate III in Lands, Parks and Wildlife	6	0	0	150	156
AHC31016	Certificate III in Parks and Gardens	1,751	2,545	2,210	2,188	8,694
AHC31116	Certificate III in Production Nursery	310	261	254	273	1,098
AHC30916	Certificate III in Landscape Construction	3,485	4,233	4,453	5,024	17,195
AHC31716	Certificate III in Natural Area Restoration	139	73	87	61	360
AHC31316	Certificate III in Sports Turf Management	900	950	964	1,111	3,925
AHC31416	Certificate III in Conservation and Land Management	1,942	1,826	2,006	3,253	9,027
AHC30816	Certificate III in Arboriculture	1,801	1,768	1,729	1,623	6,921
AHC32516	Certificate III in Aboriginal Sites Work	0	0	14	41	55
AHC30716	Certificate III in Horticulture	5,604	5,978	5,857	5,998	23,437
AHC31516	Certificate III in Indigenous Land Management	151	218	106	18	493
AHC40516	Certificate IV in Parks and Gardens	15	7	2	0	24
AHC40716	Certificate IV in Retail Nursery	0	0	0	0	0
AHC42016	Certificate IV in Landscape	0	0	0	0	0
AHC40916	Certificate IV in Conservation and Land Management	800	828	560	399	2,587
AHC40816	Certificate IV in Sports Turf Management	63	43	51	41	198
AHC40416	Certificate IV in Horticulture	1,340	677	475	593	3,085
AHC41916	Certificate IV in Arboriculture	0	0	0	7	7
AHC40616	Certificate IV in Production Nursery	10	8	6	3	27
AHC51216	Diploma of Community Coordination and Facilitation	6	34	32	17	89
AHC50916	Diploma of Retail Nursery Management	0	0	0	0	0
AHC50716	Diploma of Parks and Gardens Management	4	5	4	4	17
AHC50616	Diploma of Landscape Design	441	496	637	684	2,258
AHC52016	Diploma of Landscape Project Management	0	0	0	0	0
AHC50416	Diploma of Horticulture	670	877	1,314	1,060	3,921
AHC50816	Diploma of Production Nursery Management	2	1	4	2	9
AHC50516	Diploma of Arboriculture	343	348	349	356	1,396
AHC51116	Diploma of Conservation and Land Management	987	1,107	1,102	1,150	4,346
AHC51016	Diploma of Sports Turf Management	111	90	115	123	439
AHC60415	Advanced Diploma of Conservation and Land Management	19	27	13	18	77
AHC60216	Advanced Diploma of Horticulture	16	16	7	4	43

AHC60516	Advanced Diploma of Arboriculture	0	0	0	0	0
AHC80116	Graduate Diploma of Arboriculture	0	0	0	0	0
		36,900	38,028	38,302	39,147	152,377

Source: NCVET VOCSTATS, TVA program enrolments 2014-2017

nb. Data includes enrolments in superseded qualifications that are both equivalent and not equivalent to the current qualification

Table 12: APH IRC-related program enrolments

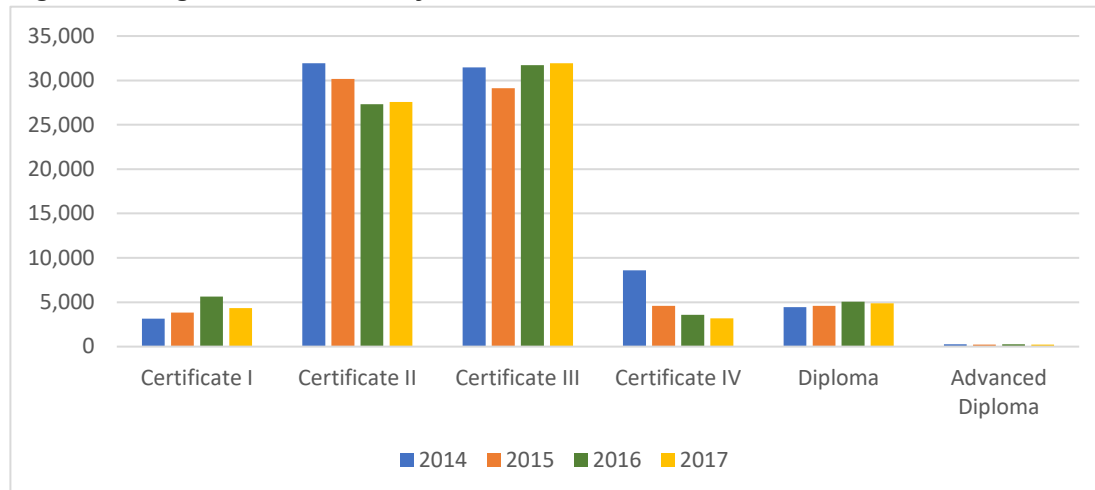
Qualification Code	Qualification Name	2014	2015	2016	2017	Total
AHC10216	Certificate I in AgriFood Operations	2,298	2,135	1,997	1,383	7,813
AHC20116	Certificate II in Agriculture	11,350	10,604	9,270	9,481	40,705
AHC21516	Certificate II in Floriculture	0	0	0	0	0
AHC21316	Certificate II in Shearing	510	442	228	295	1,475
AHC21216	Certificate II in Rural Operations	3,937	4,351	4,985	5,337	18,610
AHC21416	Certificate II in Wool Handling	490	367	235	273	1,365
AHC20316	Certificate II in Production Horticulture	529	476	281	176	1,462
AHC21116	Certificate II in Irrigation	11	10	0	0	21
AHC30116	Certificate III in Agriculture	6,382	6,303	7,164	6,290	26,139
AHC33216	Certificate III in Floriculture	0	0	0	3	3
AHC31818	Certificate III in Beekeeping	7	13	50	113	183
AHC32816	Certificate III in Rural Operations	3,889	2,404	4,742	3,762	14,797
AHC30416	Certificate III in Pork Production	338	288	211	185	1,022
AHC33116	Certificate III in Advanced Wool Handling	262	135	101	73	571
AHC30516	Certificate III in Poultry Production	190	127	24	76	417
AHC33316	Certificate III in Feedlot Operations	16	6	7	146	175
AHC32416	Certificate III in Irrigation	173	135	122	135	565
AHC32116	Certificate III in Commercial Seed Processing	11	0	0	0	11
AHC30616	Certificate III in Production Horticulture	1,358	455	254	394	2,461
AHC30216	Certificate III in Agriculture (Dairy Production)	774	587	327	459	2,147
AHC33516	Certificate III in Seed Testing	0	0	0	0	0
AHC33016	Certificate III in Wool Clip Preparation	291	254	657	134	1,336
AHC32716	Certificate III in Rural Merchandising	17	1	0	0	18
AHC33416	Certificate III in Seed Production	0	0	0	0	0
AHC31918	Certificate III in Rural Machinery Operations	39	0	0	0	39
AHC32916	Certificate III in Shearing	384	147	121	103	755
AHC41416	Certificate IV in Seed Production	0	0	0	0	0

AHC41016	Certificate IV in Agribusiness	143	329	415	288	1,175
AHC41516	Certificate IV in Seed Testing	0	0	0	0	0
AHC42216	Certificate IV in Shearing Contracting	0	0	0	0	0
AHC40316	Certificate IV in Production Horticulture	298	174	140	67	679
AHC41616	Certificate IV in Organic Farming	29	11	6	3	49
AHC40116	Certificate IV in Agriculture	5,369	2,058	1,438	1,156	10,021
AHC41116	Certificate IV in Irrigation	58	25	12	5	100
AHC41316	Certificate IV in Wool Classing	441	422	462	531	1,856
AHC50316	Diploma of Production Horticulture	77	92	101	112	382
AHC51316	Diploma of Pest Management	8	7	4	1	20
AHC51816	Diploma of Organic Farming	106	44	49	58	257
AHC50216	Diploma of Pork Production	0	0	3	12	15
AHC51616	Diploma of Irrigation Management	9	4	3	3	19
AHC51416	Diploma of Agribusiness Management	507	469	319	296	1,591
AHC51516	Diploma of Viticulture	31	45	62	79	217
AHC50116	Diploma of Agriculture	1,122	989	955	900	3,966
AHC60316	Advanced Diploma of Agribusiness Management	119	79	101	171	470
		41,565	33,981	34,842	32,499	142,887

Source: NCVET VOCSTATS, TVA program enrolments 2014-2017

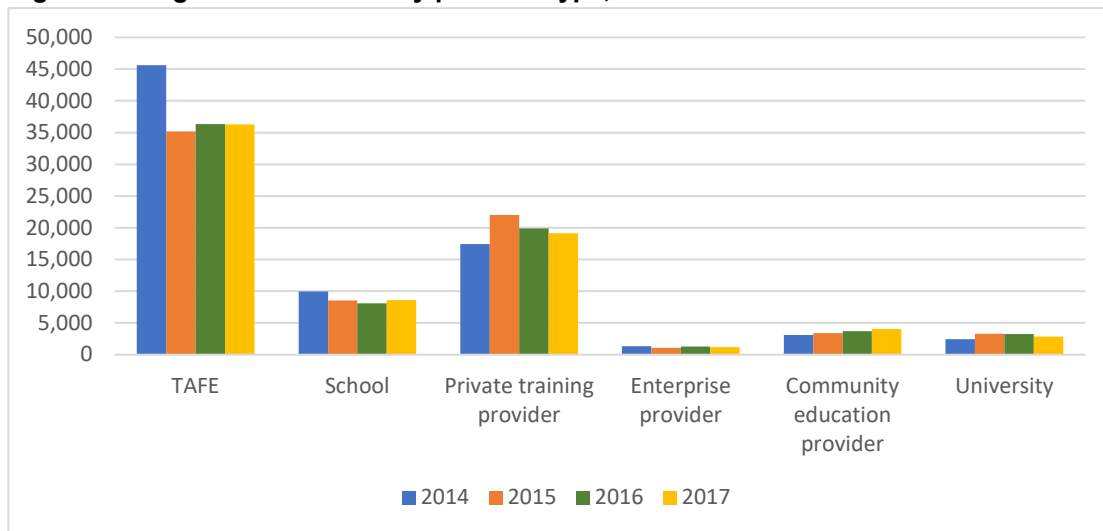
nb. Data includes enrolments in superseded qualifications that are both equivalent and not equivalent to the current qualification

Figure 8: Program enrolments by AQF level, 2014-2017



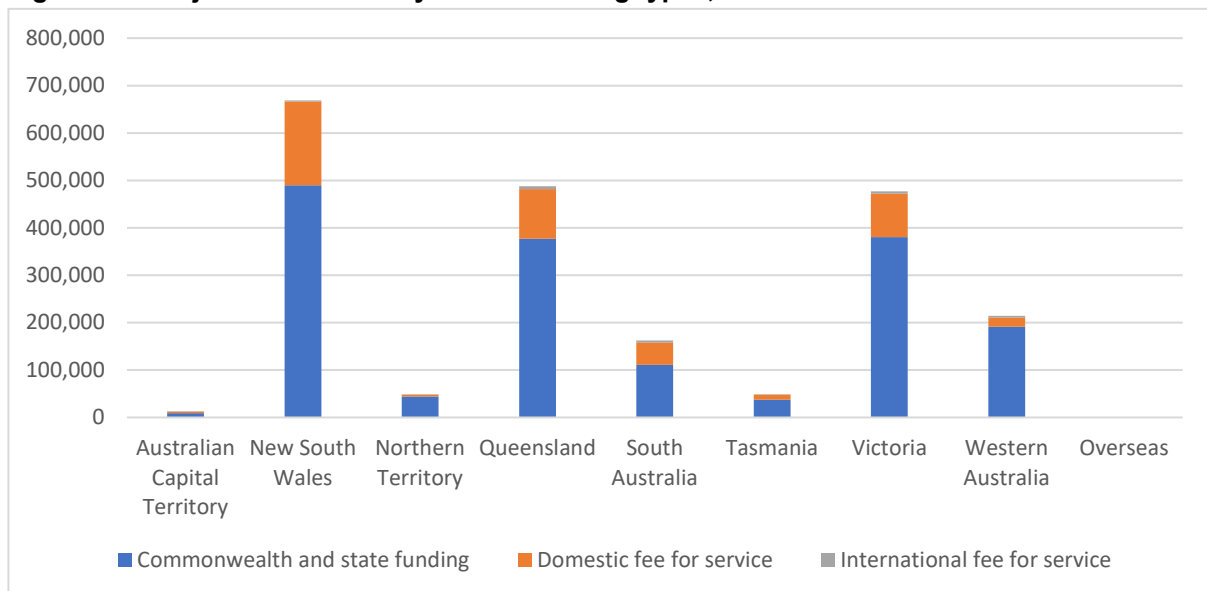
Source: NCVET VOCSTATS, TVA program enrolments 2014-2017

Figure 9: Program enrolments by provider type, 2014-2017



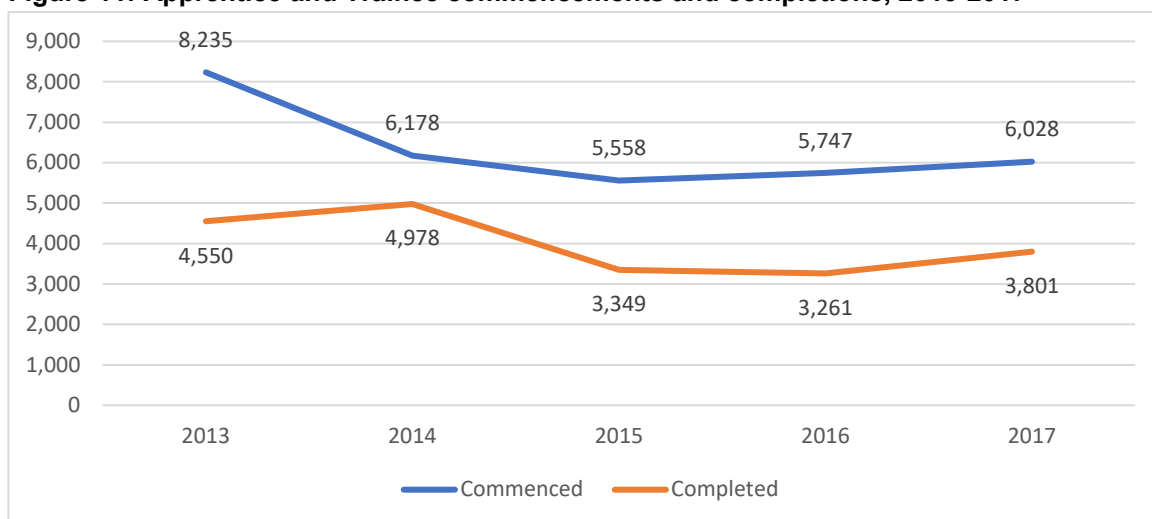
Source: NCVET VOCSTATS, TVA program enrolments 2014-2017

Figure 10: Subject enrolments by state & funding types, 2014-2017



Source: NCVET VOCSTATS, TVA subject enrolments 2014-2017

Figure 11: Apprenticeship and Trainee commencements and completions, 2013-2017



Source: NCVER, SAS Visual Analytics Viewer

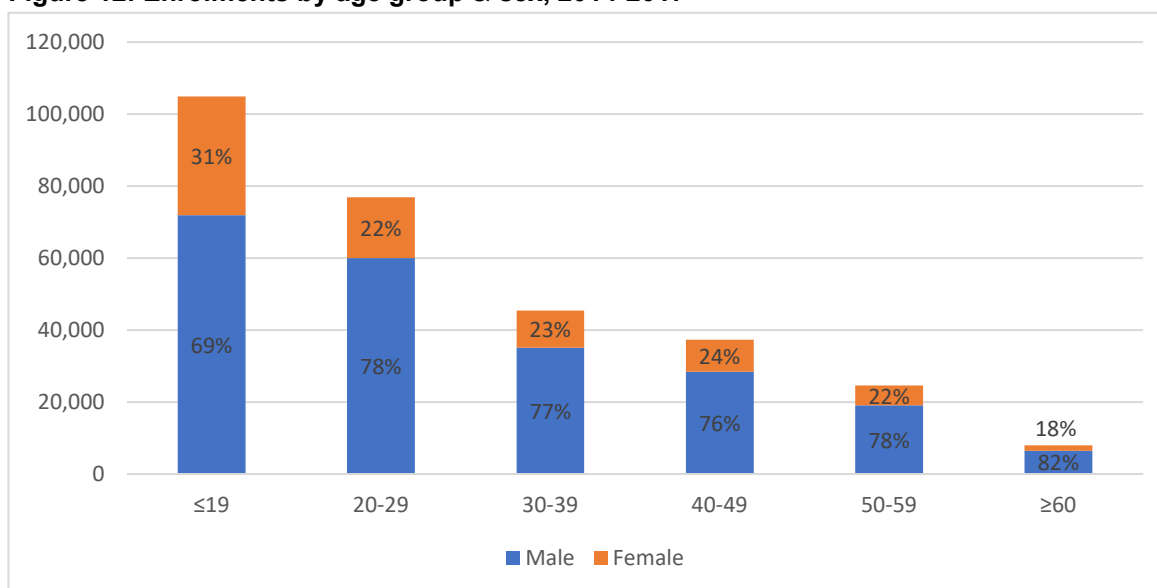
There were 12,240 AHC enrolments in the VET in Schools program in 2017, the highest on record. Subject enrolments have remained relatively stable since 2009, with 113,151 in 2017.

Student Profile

Between 2014 and 2017, women accounted for 26 per cent of enrolments (see Figure 12), which is below the average (35 per cent) and median (27 per cent) of all Training Packages.

People under 20 years-old accounted for 35 per cent of the AHC Training Package's enrolments during this period, which is above the proportional average of 25 per cent (and median of 23 per cent).

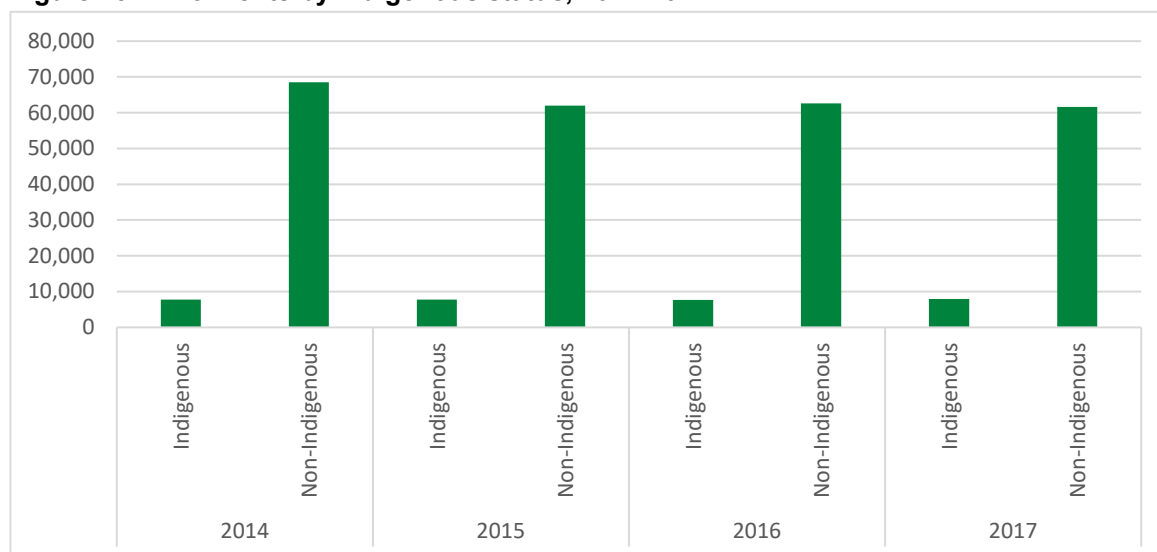
Figure 12: Enrolments by age group & sex, 2014-2017



Source: NCVER VOCSTATS, TVA program enrolments, 2014-2017

Between 2014 and 2017, Indigenous people accounted for 31,080 enrolments (the fifth highest count of all training packages), which is equivalent to 11 per cent of all AHC enrolments (the fourth highest proportion of all training packages). This is well above the all training packages average (8,809) and median (1,105) of enrolments by Indigenous people.

Figure 13: Enrolments by Indigenous status, 2014-2017



Source: NCVET VOCSTATS, TVA program enrolments, 2014-2017

Between 2014 and 2017, people with disabilities accounted for 23,812 enrolments (the seventh highest count of all training packages), which is equivalent to 10 per cent of all AHC enrolments (see Table 13). This is well above the all training packages average (10,143) and median (2,150) of enrolments by people with disabilities.

Table 13: Enrolments by disability status, 2014-2017

AHC enrolments	2014	2015	2016	2017	Total
People with a disability	5,911	5,973	5,941	5,987	23,812
People without a disability	60,552	53,695	53,287	52,004	219,538

Source: NCVET VOCSTATS, TVA program enrolments, 2014-2017

In addition, AHC is, by proportion of enrollees, one of the most significant training packages outside of major cities. Out of all the training packages, it shows the ninth highest proportion of enrollees in 'inner regional' areas, the sixth highest in 'outer regional' areas, the fourth highest in 'remote' areas, and fifth highest in 'very remote' areas.

APPENDIX 2: INDUSTRY REGULATIONS AND STANDARDS

The Australian agriculture, horticulture and conservation and land management industry sector operates under a high level of regulation.

Regulation of genetically modified crops

Genetically modified (GM) crops in Australia, including seeds, are regulated under the [Gene Technology Act 2000](#) (Cth.) through the Office of the [Gene Technology Regulator](#). The regulatory policy seeks to protect the health and safety of both people and the environment. The regulator identifies risks posed by, or as a result of, gene technology, and manages these risks. This Act regulates all dealings with live and viable genetically modified organisms (GMOs) in Australia, including research, manufacture, import, production, propagation, transport and disposal of GMOs. There is also corresponding legislation in each state and territory.

Environmental regulations

Most horticultural production systems are highly reliant on irrigation, fertilisers and pesticides. Laws governing environmental protection and management by horticultural producers include numerous federal, state and local Acts and regulations. Generally, these regulations relate to fertiliser and pesticide supply, handling, usage and storage; disposal of empty chemical containers and contaminated wastes; water usage; wastewater generation and the treatment of waste arising from production; biodiversity; and land and soil management.

National environmental legislation and regulations relevant to the industry include:⁶¹

- Environment Protection and Biodiversity Conservation Act 1999 (Cth.)
- Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cth.)
- Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 (Cth.)
- Water Act 2007, Water Amendment Act 2008 (Cth.) and associated water regulations
- National Water Quality Management Strategy
- National Environment Protection (Assessment of Site Contamination) Measure 1999
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- Australian Drinking Water Guidelines (2011)
- Australia New Zealand Food Standards Code
- National Residue Survey
- National Environment Protection (Air Toxics) Measure.
- Vegetation Management Acts per state
- Biosecurity legislation per state
- State legislation for the management of threatened species

State/territory government agencies regulate water usage via the allocation of water licences and dam management. They also decide on the timing and amount of water able to be accessed by irrigators. Water legislation focuses on developing efficient water usage for agriculture, while limiting its

⁶¹ Horticulture for Tomorrow and Horticulture Australia Limited, 2014, Guidelines for Environmental Assurance in Australian Horticulture, viewed April 2017, <<http://horticulturefortomorrow.com.au/manage/wp-content/uploads/2014/05/Environmental-Assurance-Guidelines-2014-full-version-2.pdf>>

environmental effect, particularly in the Murray–Darling Basin, which supports a large proportion of Australia’s fruit and vegetable crops.

Food regulations

Food Standards Australia New Zealand (FSANZ) establishes standards relevant to the agriculture industry, particularly for poultry, meat, dairy, eggs and egg products, and seed sprout. FSANZ aims to strengthen food safety by reducing the incidence of foodborne illness associated with seed sprouts and eggs or egg products. In addition, dairy standards outline the implementation of documented food safety programs for primary dairy production and for the collection, transportation and processing of raw milk, as designed to protect public health across all jurisdictions.

The majority of fresh horticultural produce in Australia is grown under industry-based food safety schemes.⁶² These schemes, and several state/territory regulations and guidelines, work to minimise risks linked to microbiological, chemical and physical factors that may be present in fresh produce for sale in Australia.

State/territory government regulations and guidelines include the following:

- Food Act 2003
- Food Standards Code
- The Food (Plant Products Food Safety Scheme) Regulation (2005) (NSW) provides specific control measures to manage the safe production and supply of seed sprouts, fresh-cut fruit and vegetables, and juices.
- The Food Production (Safety) Regulation (2014) (QLD) sets out requirements for the transport and processing of fresh primary produce.
- The NSW Food Authority’s Industry Guide for the Development of a Food Safety Program (High Priority Plant Products Industry) (2005) covers seed sprouts, fresh-cut fruits and vegetables, unpasteurised juice, and vegetables in oil.
- *Guidelines for On-Farm Food Safety for Fresh Produce* (2004) was published by the Australian Government Department of Agriculture, Fisheries and Forestry, now the Federal Department of Agriculture and Water Resources.

Industry food safety schemes in Australia include:

- HACCP Australia
- Freshcare
- Harmonised Australian Retailer Produce Scheme (HARPS)
- GlobalGAP
- supermarket quality and food safety schemes.

Grape growing legislation

The Australian viticulture sub-sector is subject to a number of federal and state/territory laws and regulations, including the [Australian Grape and Wine Authority Act 2013](#) (Cth.) and the [Australian Grape and Wine Authority Regulations 1981](#) (Cth.). These Acts provide for, among other things, the Label Integrity Program and the Register of Protected Geographical Indications and Other Terms.

⁶² Food Standards Australia New Zealand, 2014, ‘Horticulture’, viewed April 2017, <<http://www.foodstandards.gov.au/code/primaryproduction/horticulture/Pages/default.aspx>>

Livestock management legislation

The Department of Agriculture and Water Resources (DAWR) provides policies and legislation concerning aspects of livestock management and biosecurity, including live exports and supply of agricultural chemicals. DAWR is responsible for Australia's livestock export licences, and regularly carries out inspections to ensure that biosecurity, traceability and animal welfare requirements are being met for both export-licensing and importing countries. DAWR also manages quarantine controls at borders and provides import and export inspection and certification.

In addition, state/territory governments are responsible for livestock management, disease response and welfare arrangements within their jurisdictions, in terms of both enforcing national standards and agreements, and administering state/territory legislation.

Legislation relating to livestock management includes:⁶³

- Agricultural and Veterinary Chemicals (Control of Use) Act 1992 (VIC)
- Agricultural and Veterinary Chemicals (Control of Use) Regulations 2007 (VIC)
- Impounding of Livestock Act 1994 (VIC)
- Impounding of Livestock Regulations 2008 (VIC)
- Livestock Disease Control Act 1994 (VIC)
- Livestock Disease Control Regulations 2017 (VIC)
- Livestock Management Act 2010 (VIC)
- Livestock Management Regulations 2011 (VIC)
- Prevention of Cruelty to Animals Act 1986 (VIC)
- Prevention of Cruelty to Animals Regulations 2008 (VIC)
- Prevention of Cruelty to Animals (Domestic Fowl) Regulations 2016 (VIC)
- Stock (Seller Liability and Declarations) Act 1993 (VIC).

Australian ruminant feed ban

Australia has an inclusive ban on the feeding of restricted animal material (RAM), including meat and bone meal derived from all vertebrates including fish and birds, to all ruminant animals. An enforceable ban seeks to minimise the risk of spreading the infectious agent in bovine spongiform encephalopathy ('mad cow disease'), in the unlikely event that it is introduced to Australia. The ruminant feed ban is nationally coordinated by Animal Health Australia, and is part of a comprehensive national TSE (transmissible spongiform encephalopathy) Freedom Assurance Project. The prohibition and program target livestock producers and other end users of manufactured stockfeed, retailers of manufactured stockfeed, and stockfeed manufacturers. Each Australian state/territory adopted the ruminant feed ban in legislation, indicating feeding prohibition and requirements for labelling and RAM content.

In addition, the industry implements the FeedSafe accreditation program through the Stock Feed Manufacturers' Council of Australia. To achieve FeedSafe accreditation, feed manufacturing sites are required to address the elements of the Code of Good Manufacturing Practice for the Feed Milling Industry, particularly methods to ensure effective cleaning, flushing and sequencing between different types of stockfeed, to minimise the possibility of cross-contamination.

Biosecurity legislations

The Department of Agriculture and Water Resources is responsible for developing and reviewing biosecurity policies for the safe importation of animals and animal products. The Department co-

⁶³ Agriculture Victoria, 2016, 'Livestock management', viewed April 2017, <http://agriculture.vic.gov.au/agriculture/farm-management/legal-information-for-victorian-landholders/livestock-management>.

administers the *Biosecurity Act 2015* (Cth.) with the Department of Health, replacing the *Quarantine Act 1908* (Cth.).

In addition, state/territory biosecurity agencies develop policy, standards, delivery systems and services that reduce the threat of invasive plants and animals to agriculture and the natural environment; protect animals and plants from pests and diseases; enhance food safety; ensure minimal and effective chemical use; protect the welfare of animals; and preserve and expand market access for primary industries.

Live-animal export legislation

Two bills were enforced in Australia to amend the *Australian Meat and Live-stock Industry Act 1997* (Cth.) and *Export Control Act 1982* (Cth.) in response to animal welfare concerns in the live-cattle export trade.

The *Live Animal Export Prohibition (Ending Cruelty) Bill 2014* (Cth.) and the *Live Animal Export (Slaughter) Prohibition Bill 2014* (Cth.) were introduced to prohibit the export of livestock for slaughter on or after 1 July 2017, and to compel export licence holders to ensure all livestock are treated satisfactorily prior to slaughter.

Conservation laws

Government-managed nature reserves, including marine reserves, and conservation parks are licensed and regulated by federal, state and territory environment and conservation departments under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth.) (EPBC) and the *National Parks and Wildlife Act 1975* (Cth.). The EPBC Act contains an extensive regimen for the conservation of biodiversity.

Industry codes of practice

A number of codes of practice have been developed across the industry sub-sectors to set out industry standards of conduct, including the following:

- Horticulture Code of Conduct
- Growing Australian Grain
- Mandatory Port Access Code of Conduct for Grain Export Terminals
- Food and Grocery Code of Conduct
- Animal Welfare Codes of Practice
- Australian Animal Welfare Standards and Guidelines (for cattle and sheep)
- Animal Welfare Code of Practice – Commercial Pig Production
- RSPCA Approved Farming Scheme
- Australian Wine Industry Code of Conduct
- Code of Good Manufacturing Practice for the Feed Milling Industry
- Code of Practice: Amenity Tree Industry (WorkCover)
- Model Code of Practice for the Welfare of Animals – Domestic Poultry
- National Farm Biosecurity Manual – Poultry Production
- Farm Biosecurity Manual for the Duck Meat Industry
- Guide for managing the risks of machinery in rural workplaces

Grain trade standards and legislation

Grain Trade Australia oversees standards for wheat and coarse grain trade in the domestic and international markets.

International regulations and access to markets

To ensure access to European markets, Australian beef producers must follow a series of European Union regulations, laws and other rules governing beef cattle farming. These measures take the form of chain-of-custody certification involving cattle properties, feedlots and processors, and integrate the National Livestock Identification Scheme, which allows for the permanent identification of cattle using electronic microchips.

Industry certification programs

The industry has developed and implemented integrity systems to verify and assure food safety and other quality attributes of livestock. Examples of industry certification programs include:

- Livestock Production Assurance – an on-farm food safety certification program for cattle, sheep and goats
- National Feedlot Accreditation Scheme – encompassing animal health and welfare, environmental conservation, food safety and product integrity
- Australian Dairy Food Safety Scheme – monitoring compliance with food standards to ensure the integrity of the dairy supply chain
- Australian Pork Industry Quality Assurance Program – providing standards for Australian pig producers
- Egg Corp Assured – a quality assurance program administered by the National Egg Corporation
- Q-Alpaca – a quality assurance program for voluntary use by Australian alpaca breeders and owners
- B-QUAL – a voluntary program for apiarists and honey-processing businesses that ensures honey bee industry standards meet best practice, and domestic and international market demands
- FeedSafe – the quality assurance program for the Australian stockfeed industry
- Freshcare – the largest on-farm HACCP assurance program
- Harmonised Australian Retailer Produce Scheme (HARPS) implemented in 2018 as the one standard for all retailers of fresh food.

APPENDIX 3: INDUSTRY PRIORITY FOR GENERIC SKILLS

Industry Reference Committees were consulted on ranking the generic skills priorities for the industry from a list provided by the Department of Education and Training. The following table outlines the advice received.

Table 14: Industry priority for generic skills

Rank	Generic skill
1	Learning agility/Information literacy/Intellectual autonomy and self-management skills
	<p>Ability to identify a need for information.</p> <p>Ability to identify, locate, evaluate, and effectively use and cite the information.</p> <p>Ability to discriminate and filter information for importance.</p> <p>Ability to do more with less.</p> <p>Ability to quickly develop a working knowledge of new systems to fulfil the expectations of a job.</p> <p>Ability to work without direct leadership and independently.</p>
2	Managerial/Leadership skills
	<p>Ability to effectively communicate with all functional areas in the organisation.</p> <p>Ability to represent and develop tasks and work processes for desired outcomes.</p> <p>Ability to oversee processes, guide initiatives and steer employees toward achievement of goals.</p>
3	Financial skills
	<p>Ability to understand and apply core financial literacy concepts and metrics, streamlining processes such as budgeting, forecasting, reporting and stepping up compliance.</p> <p>Ability to manage costs and resources, and drive efficiency.</p>
4	Technology use and application skills
	<p>Ability to create and/or use technical means and understand their interrelation with life, society and the environment.</p> <p>Ability to understand and apply scientific or industrial processes, inventions, methods, etc.</p> <p>Ability to deal with increasing mechanisation, automation and computerisation.</p> <p>Ability to do work on mobile devices rather than from paper.</p>
5	Science, Technology, Engineering and Maths (STEM) skills
	Sciences, mathematics and scientific literacy.
6	Language, Literacy and Numeracy skills
	Foundation skills of literacy and numeracy.
7	Environmental and Sustainability skills

	Ability to focus on problem solving and the development of applied solutions to environmental issues and resource pressures at local, national and international levels.
8	Communication/Collaboration, including virtual collaboration/Social intelligence skills
	Ability to understand and apply the principles of creating more value for customers with fewer resources (lean manufacturing), plus collaborative skills. Ability to critically assess and develop content that uses new media forms, and leverage these media for persuasive communications.
9	Design mindset/Thinking critically/System thinking/Solving problems skills
	Ability to adapt products to rapidly shifting consumer tastes and trends. Ability to determine the deeper meaning or significance of what is being expressed via technology. Ability to understand how things that are regarded as systems influence one another within a complete entity or larger system. Ability to think holistically.
10	Entrepreneurial skills
	Ability to take an idea, whether it be a product or service, and turn that concept into reality, bring it to market and make it viable. Ability to focus on the very next step to get closer to the ultimate goal. Ability to weather the ups and downs of any business. Ability to sell ideas, products or services to customers, investors, employees, etc.
11	Data analysis skills
	Ability to translate vast amounts of data into abstract concepts and understand data-based reasoning. Ability to use data effectively to improve programs, processes and business outcomes. Ability to work with large amounts of data: facts, figures, number crunching, analysing results.
12	Customer service/Marketing skills
	Ability to interact with others, whether helping them find, choose or buy something. Ability to meet customer wants and needs via face-to-face interactions or digital technology. Ability to manage online sales and marketing. Ability to understand and manage digital products.
13	Other generic skills
	Responses included: emotional intelligence, social media, broad blueprint of general knowledge, human resources, people management, observation skills.