



Australian Government
Department of Agriculture,
Water and the Environment

National Agricultural Workforce Strategy literature review



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Summary

Context and current situation

The Australian agriculture industry and related services and supply chain industries (hereafter agribusiness and related industries) and the communities they are embedded in are changing. These changes have consequences on the workforce needs of these industries and their ability to attract that workforce.

Over the past decades, Australian agriculture has become more market oriented, internationally competitive and consumer focused. This has been driven by product, service and technological innovation throughout the sector. There have also been changes in the structure of industries and the organisation and operation of farm businesses. Large farms (with receipts over \$1 million per year in real terms) have increased from around 3% to around 16% of the farm population over the past 4 decades, while their share of output has increased from 25% to around 60% of the value of output (Jackson, Zammit & Hatfield-Dodds 2018).

Changes in the structure and organisation of the industry, coupled with technological innovation, have flow-on consequences for the agricultural workforce, both in terms of the number of people that work in the industry and the skills they need to have. The nature of work has changed, with increased demand for skilled farm labour capable of operating sophisticated technologies. At the same time, business owners need more advanced management skills to manage larger, more complex businesses.

At the same time these changes in the agriculture industry have occurred there have been fundamental changes in Australian society. These changes include:

- general migration from rural and regional areas, where most primary industries businesses are located, to urban areas (Charles-Edwards et al. 2018; Joyce 2019), decreasing the potential labour pool in some regions
- the continued aging of the workforce, which puts downward pressure on domestic labour supply (Brown & Guttmann 2017), which increases competition for available labour
- the growth of the services economy (Adeney 2018), which provides attractive and dynamic job opportunities in competition to the agricultural sector

Industry groups report widely held concerns about the supply of skilled, semi-skilled and low skilled workers to meet industry's needs. A number of agribusiness and related industries report significant challenges in recruiting the staff they need. These existing workforce challenges fuel concerns about potential greater future challenges if socio-economic and demographic trends continue.

Institutional arrangements to support agricultural workforce development is shared across the Australian Government and state and territory governments—across portfolios within government—and across industry representative bodies and private sector businesses.

At the Australian Government level:

- the education and employment portfolios are responsible for education policy and program settings
- the Department of Home Affairs is responsible for visa policy and program settings
- within the agriculture portfolio, responsibility for agriculture research, development and extension (RD&E) has been decentralised to 15 separate Rural Research and Development Corporations (RDCs).

At a state and territory government level:

- education portfolios have constitutional authority over education in Australia
- agriculture portfolios deliver RD&E programs.

At an industry and community level:

- an active community of teachers and agriculture representatives are passionate about teaching agriculture, especially in primary and secondary schools.
- agriculture industry representative bodies deliver activities designed to attract people to work in the sector
- private sector businesses establish their own employment conditions and recruit and train people.

The current drought and the long-term effects of climate change add to the already complex and dynamic context in which this strategy is being developed. While droughts are normal for Australia, they are likely to become more frequent, severe and longer in some regions due to climate change. This will have consequences on agricultural businesses and communities in those regions and also on the perceptions of careers in the industry.

Workforce trends

There are varying estimates about the future growth in the agriculture, fisheries and forestry workforce. The then Department of Employment projected a small decline of 1.2% in employment in these industries between 2019 and 2024 (DESSFB 2019a). In contrast, Shah & Dixon (2018) project an increase of 18% based on the lower value of the Australian dollar and expanding free trade agreements with countries in east Asia, although this estimate does not consider the effects of the current drought. Further, the extent the contribution of migrant workers is taken into account in these estimates is limited.

New research by the CSIRO (Wu et al. 2019) suggests the key influences on agriculture workforce going forward will be regional development and the extent technology advances are taken up. This research recognises that these factors will not be uniform; as such workforce implications will vary across agriculture sectors and locations.

Regardless of future growth or decline in the agricultural workforce overall, available evidence indicates the industry's workforce needs to be continually refreshed as people leave the industry and need to be replaced.

Traditionally, family members have been the main source of labour for farms. This is changing. Farm consolidation and corporatisation has resulted in more reliance on labour from outside of the family unit, in turn increasing demand for qualifications, training and higher skill middle management jobs such as leading farm hands, supervisors and orchard managers. The move to salaried employees has also increased exit rates in the industry.

Recruitment challenges

Government and independent reports show that some employers are experiencing recruitment challenges in filling a range of low skilled, semi-skilled and skilled occupations in agribusiness and related industries. These include important service industry roles, such as agronomists, veterinarians and automotive and engineering trades and lower and semi-skilled roles in horticulture, intensive livestock and meat processing sectors.

In the on-farm production sector, businesses aggregation, intensification and corporatisation are driving changes in the workforce by:

- increasing reliance on labour from outside of the family unit, which increases the training requirements for the workforce and the higher industry exit rate of salaried employees (Barr forthcoming)
- creating new, relatively higher skilled job roles that did not exist under small family-farm business models. These include middle management jobs such as leading farm hands, supervisors and orchard managers (Dufty, Martin & Zhao 2019; Howe et al. 2019; Santhanam-Martin & Cowan 2017)
- changing the distribution of industries, leading to some industries being concentrated in regions with comparative advantage (Barr forthcoming).

It appears to be these factors—rather than a rapid growth in aggregate workforce requirements at a national level—that are the key drivers of the recruitment challenges and the demand for training in the on-farm production sector.

New technology is also leading to changes in the skills needs of jobs in agribusiness and related industries. Technologies such as the internet of things, artificial intelligence, automation and robotics are already changing the nature of jobs and it is generally accepted that the pace of change is picking up. In addition to these new skills, many traditional skills are also likely to remain in demand in the future (Joyce 2019).

Research by the CSIRO (Wu et al. 2019) suggests that in the period to 2030 the key areas of uncertainty with regard to the supply and demand of the agricultural workforce will be the level of regional development and the extent of technology advancement and uptake across the sector. Current evidence supports a spectrum of possible regional development and technology outcomes in the future, with outcomes likely to vary across industries and across locations.

Agriculture in primary and secondary schools

A lack of understanding of modern agribusiness could threaten the industry's ability to attract young people to work in the sector. This is particularly a risk if dated perceptions of agriculture as an industry and career path are too widely held in the community. To address this, it has been

suggested that more agriculture related teaching materials be used in schools as a way to increase interest in agricultural careers. However, it is uncertain if including more agriculture related subject matter in schools can shape students future career interests (Bray & Cay 2018).

Reports indicate that some occupations in agribusiness and related industries are perceived poorly or are not understood by younger people. Efforts to attempt to change how occupations are perceived would require a multi-faceted approach that engages both individual students and broader society (Bray & Cay 2018). These efforts may also require changes in the nature of work, pay and conditions associated with these roles.

Agriculture features in the National Curriculum through the Food and Fibre theme (ACARA 2019). State and territory governments have constitutional authority for education and place different levels of focus on agriculture in their curricula. Individual schools and teachers decide on what content they use to deliver on the standards required under the Australian Curriculum. The next review of the Australian Curriculum is expected in 2020, but giving agriculture greater prominence may be difficult in a congested and competitive curriculum.

A question for policy makers and advisers is about the relative efficiency of additional investment in including more agriculture related subject matter in schools, compared to other approaches aimed at increasing student interest in agricultural careers, such as strengthening agricultural career advice or arrangements to support the transition from secondary school to work. There are further questions about how teaching resources can be designed to best support their use by teachers.

Agriculture education and training

Although the percentage of the agriculture workforce with tertiary qualifications has increased over the past decade, agriculture industry employees still tend to have lower levels of formal education than the general Australian workforce.

Historically most workers in the on-farm production sector have acquired their skills through on-the-job learning, with the addition of some targeted short courses of study (NFF 2018). There is debate about whether this approach remains appropriate given technological changes and the greater need for management skills in the sector (Pratley & Archer 2017). Formal education and training has a stronger history in some related service and supply chain industries, such as the advisory and trades sectors.

The delivery of unaccredited education and training courses (industry extension) has been widespread in the agriculture, fisheries and forestry sectors. Over the past 30 years there has been a trend toward increased private sector delivery of these services. These unaccredited courses are likely to continue to be important—or possibly will become increasingly important—for up-skilling and re-skilling the workforce (Australian Qualifications Framework Review 2019).

Enrolments in Vocational Education and Training (VET) relevant to agribusiness and related industries have fallen since 2015. While all VET training package program enrolments fell over that period by 15%, program enrolments in agriculture training packages fell by almost 23%. When government funded VET enrolments are considered, agriculture experienced one of the largest declines in enrolments of all fields of education of 26%.

The Australian Council of Deans of Agriculture's (ACDA) longitudinal study on the number of graduates produced by Australian universities from undergraduate agriculture and related courses (animal science, horticulture/viticulture and agribusiness) showed a decline in graduate numbers from around 1,300 in 2001 to around 550 in 2014. Enrolments (the total number of students across all years studying such courses) declined from 4,300 in 2001 to a low of less than 2,300 in 2012 increasing to 2,500 in 2014, with student intake data suggesting the increase to continue in the medium term (Pratley 2017a).

There is a thin market for tertiary education in agriculture, especially for specialist courses or degrees. Owing to Australia's size, demand for some specialist courses or for new courses is diffuse and may not be readily apparent to providers. In this context, employers, industry representative bodies or RDCs can play a role in aggregating this demand and working with Registered Training Organisations and universities to redesign existing courses or establish new courses required by the market.

Agriculture workplace conditions

Workplace conditions, including wage rates, leave entitlements, opportunities for career progression and other management practices play a critical role in attracting and retaining workers to the agriculture sector. Farm employers and employees both report uncompetitive wages as a factor influencing the agriculture industries ability to attract and retain employees (Nettle 2015). In addition, some agriculture service and supply chain professions are also unattractive or are perceived to be unattractive.

Relatively high rates of turnover and exit of staff in the agriculture industry lead to questions about the relative priority of measures to attract people to work in the sector, compared to measures to retain people in the sector. The adoption of progressive human resource management practices, which could ameliorate recruitment difficulties and staff turnover, has been patchy across the agriculture sector. Small agricultural business face additional challenges in this area due to an inability to offer internal career development pathways or training.

New generations of workers are likely to have new expectations on desirable work environments. If the industry does not modernise its human resource management arrangements to accommodate these expectations, it may find itself disadvantaged relative to other industries that do.

Some agricultural jobs are inherently 'low quality'. In the longer term, innovations such as mechanisation could change these occupations, making them more attractive to the domestic workforce. In the near-term, temporary migrant workers will continue to make up the shortfall that exists in the supply of labour from the domestic market.

Migration and visa programs

There are a suite of visa arrangements and programs that allow for overseas workers to work in agriculture and related industries. These workers can fill a range of positions from short-term, lower skilled to long-term and higher-skilled roles and contribute significantly to the workforce of some agricultural sectors, including horticulture, intensive livestock and meat processing.

Current policy settings seek to strike a balance among a suite of competing objectives and stakeholder perspectives to ensure industry can access migrant workers where local workers are unavailable to fill positions. These arrangements are dynamic and continue to adapt to labour market needs. It will take some time for the effect of recent changes to visa programs and the introduction of new visa programs to be known.

1 Introduction

1.1 Purpose

The Australian Government committed \$1.9 million in the 2019-20 Budget to develop a National Agricultural Workforce Strategy (the strategy). This commitment builds on the outcome of the Agriculture Ministers' Forum (AGMIN) meeting on 8 February 2019, at which ministers agreed to a review of agricultural education. During the 2019 federal election, the Australian Government committed to establish a National Agricultural Labour Advisory Committee to help progress the strategy and advise the government on farm labour and agricultural sector workforce challenges more broadly.

The strategy will consider the role of agricultural education in meeting Australia's current and future workforce needs in food and fibre industries and identify where access to a migrant workforce will be necessary to meet the industry's workforce needs. The full terms of reference to guide the operation of the committee and the drafting of the strategy are at Appendix A.

This literature review aims to inform the work undertaken to develop the strategy. Guided by the terms of reference, this literature review compiles information about:

- current and expected future agriculture industry workforce and skill needs
- current and expected supply of labour to meet future agriculture industry workforce and skill needs, including migration arrangements
- current education and training arrangements, including programs designed to promote agricultural careers to students
- selected government and industry initiatives which are underway to help the agriculture industry secure its current and future workforce requirements.

The literature review represents the start of a broader discussion about the contents and direction of the strategy—it does not presume the strategy's future direction or areas of focus. It was distributed to the National Agricultural Labour Advisory Committee prior to the committee's first meeting on 17 January 2020.

1.2 Background

The Australian agriculture industry and the communities that surround it are changing. These changes have consequences on the industry's workforce needs and its ability to attract that workforce.

The drivers of this situation are common across other developed and many developing countries. Reflecting on the agriculture workforce challenges internationally, Nettle (2015) observed that the industry is amid a 'perfect storm' for labour supply and growing future skills: relatively small proportion of the total workforce (that is, less power to influence); transitioning from lower to higher skills and capabilities for modern farming (that is, limited current 'critical mass' of the higher skills to provide 'scale' for education) and shifts in social expectations of work (that is, the need to demonstrate farms meet millennial expectations).

1.2.1 Australian agriculture and its workforce needs are changing

Over the past 30 years Australian agriculture has become increasingly market oriented, internationally competitive and consumer focused. This has required agricultural businesses to become more competitive fuelling product, service and technological innovation through-out the sector.

The need to reduce costs and become more efficient has led to changes in the structure of agriculture sectors and the organisation and operation of farm businesses. With greater aggregation of farms, greater specialisation, intensification and automation of production, there have been flow-on consequences for the agricultural workforce, both in terms of the number of people that work in the industry and the skills they need to have.

Technological innovations of recent decades have permeated all aspects of society, including the operation of our food and fibre industries. This has changed the nature of work and increased demand for skilled farm labour capable of operating these sophisticated technologies. At the same time, business owners need more advanced management skills to manage larger, more complex business, larger workforces, and to adopt new ways of farming to manage climatic and marketing risks.

1.2.2 Human capital underpins industry productivity

Productivity growth has been central to the continued viability, profitability, and competitiveness, of Australian farm businesses over the past 30 years (Boult & Chancellor 2019). Increasing resource-use efficiency is a basis for improving productivity. While there has been significant focus in the agricultural industry on the more efficient use of natural resources and capital—predominantly by adopting new production technologies and practices—there has been less focus on the productivity gains of improving labour-use efficiency and effectiveness (NRAC 2013).

Building human capital through improving labour availability and skills is one policy response through which industry and government can help promote future industry productivity growth (Gray, Oss-Emer & Sheng, 2014). This includes by building technical skills, but also the workforce planning and human resource management capabilities of agricultural employers, which can increase their ability to attract and recruit staff (NRAC 2013).

Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) research has shown that farmer educational attainment has a positive and significant impact on farmers' innovativeness, in terms of the number of new practices or technologies implemented by farm businesses that they are likely to continue using (Nossal & Lim 2011). This mirrors findings about firms in the broader economy, which found those firms with higher levels of strategic management capability—underpinned by more educated principal managers—achieved higher levels of productivity (Moran et al. 2018).

1.2.3 Australian communities are changing

At the same time these changes in the structure, organisation and operation of the agriculture industry have occurred there have been fundamental changes in Australian society. These changes include:

- general migration from rural and regional areas, where most primary industry businesses are located, to urban areas (Charles-Edwards et al. 2018; Joyce 2019), reducing the labour pool in some regional areas
- the continued aging of the workforce, which puts downward pressure on domestic labour supply (Brown & Guttmann, 2017), increasing competition for workers
- the growth of the services economy (Adeney 2018), which provides attractive and dynamic job opportunities in competition to the agricultural sector.

Adding to the potential difficulties that the industry has in attracting its future workforce, many secondary school students are unaware of the diverse array of career paths in agriculture, with some holding outdated perceptions of what a career in the industry looks like. A recent survey of Year 9-12 students in Western Australia found that careers in agriculture were ‘so far off their radar’ (see section 3.2) and that they needed to be actively promoted to students through a suite of channels (YouthInsight 2017). These findings come despite strong efforts by industry and government to engage young people in the industry and the career opportunities it offers (Pratley 2017a).

1.2.4 Some agricultural jobs and some industries are experiencing workforce challenges

Industry groups report widely held concerns about the supply of skilled and unskilled workers to meet industry’s needs. A number of agricultural sectors or related supply chain industries and related services sectors report significant challenges in recruiting the staff they need from the domestic labour market (see page 18). These include:

- the horticulture sector, particularly seasonal harvest labour
- the meat processing industry
- intensive livestock sectors, such as dairy, pork and chicken
- agricultural support services roles, including veterinarians and agronomists.

These existing workforce challenges fuel concerns about potential greater future challenges if socio-economic and demographic trends continue.

1.2.5 Agricultural workforce challenges are common internationally

The socio-economic drivers that contribute to agricultural workforce challenges are common across all high-income countries. Domestic agricultural workers tend to become increasingly scarce as a consequence of the long-term process of economic development through which countries’ incomes rise and workers move out of agriculture and into non-farm jobs in manufacturing and services industries. At the same time, commercial farm business models displace small family farm business models, leading to the increased importance of hired labour (that is non-family labour). However, a collection of factors—the seasonality of production, uncertainty of employment, aversion to follow-the-crop migration and the disagreeableness of working conditions—lead to decreased interest in workers doing this work. As a consequence, agriculture’s dependence on migrant workers invariably increases (Taylor & Charlton 2019).

1.3 Agricultural industry workforce development is a shared task

Agricultural workforce policy cuts across federal and state and territory governments—across portfolios within governments—and across industry representative bodies and private sector businesses.

At the Commonwealth level, responsibility for assisting jobs seekers to find work lies with the Department of Education, Skills and Employment, as well as national policy and regulation of vocational education and training. The Department of Education is responsible for national policies and programs that help Australians access quality and affordable early child care and childhood education, school education, higher education, international education and research. The Department of Home Affairs is responsible for managing Australia's migration and visa programs.

The states and territories have constitutional authority over education in Australia. But ultimately, it is up to schools and teachers to determine the content they use to deliver on the standards required under the Australian Curriculum (more generally referred to as the national curriculum).

The Commonwealth's Rural Research and Development Corporations and State and Territory government primary industry agencies, invest in a range of industry specific workforce development initiatives. Agriculture industry representative bodies deliver activities designed to attract people to work in the sector, and private sector businesses establish employment conditions and recruit and train people.

1.4 Our approach

This literature review aims to inform the work undertaken by the National Agricultural Labour Advisory Committee to develop the National Agricultural Workforce Strategy. It draws upon peer reviewed publications, government and industry reports and web content and other grey literature. Most literature cited has been published in the past five years by Australian authors, but some older material and some international material (originating from developed countries, with similar social context to Australia) is drawn upon on a limited basis. It also draws upon an earlier project done by the Australian Government Department of Agriculture (the department) to prepare a snapshot of work underway to introduce agriculture to students at school.

The literature review builds on some work undertaken by the department in collaboration with its state and territory counterparts to prepare an assessment of Australia's agricultural workforce and factors affecting workforce attraction and retention. This includes the outcomes of targeted consultation undertaken with some Rural Research and Development Corporations and industry representative bodies to understand the initiatives they have underway.

The strategy's Terms of Reference require the strategy to consider the agriculture, fisheries and forestry industries and their closely allied service and supply chain sectors (Box 1). Insofar as possible this literature review considers this broader supply chain context. However, in some cases, such as agriculture in schools, the available literature considers agriculture in a more traditional primary production context.

Box 1 What is an agricultural occupation?

The agricultural industry encompasses an extensive range of occupations. An analysis of the Australian Bureau of Statistics 2016 Population Census employment data against the Australian and New Zealand Standard Classification of Occupations identified that Census respondents worked in around 400 occupations in the agriculture, fisheries and forestry industries. The top 20 occupations by the number of people employed were:

- Livestock Farmers
- Crop Farmers
- Mixed Crop and Livestock Farmers
- Livestock Farm Workers
- Crop Farm Workers
- Farmers and Farm Manager (not further defined)
- Agricultural, Forestry and Horticultural Plant Operators
- Garden and Nursery Labourers
- Packers
- Mixed Crop and Livestock Farm Workers
- Truck Drivers
- Deck and Fishing Hands
- Shearers
- Farm, Forestry and Garden Workers (not further defined)
- Bookkeepers
- General Clerks
- Gardeners
- Agricultural and Forestry Scientists
- Other Farm, Forestry and Garden Workers
- Office Managers.

Agricultural businesses rely upon a range of allied support services. However, the strength of this 'alliance' varies as some occupations provide general support functions or are more strongly allied with other industries (e.g. pay roll clerks; ag pilots), whereas others are more strongly allied with the on-farm production sector (e.g. agronomy services, veterinarians, agricultural engineering). Similarly, some processing industries, such as wine manufacturing or meat processing, tend to be closely allied to the agricultural sector compared to others, such as bakery product manufacturing.

In addition to a traditional understanding of agriculture, many roles now require skills that have not traditionally been associated with the sector, such as telecommunications, computer sciences, advanced machinery engineering and robotics, and business and people management skills (Heath 2017).

1.5 Recent initiatives

The National Agricultural Workforce Strategy is being developed in the context of a number of recent policy reviews, policy changes and new programs in relation to aspects of the education sector, agricultural education and Australia's migration frameworks (Table 1). This literature review reflects upon these new policy and program initiatives and their potential implications for the agricultural sector insofar as can be known at this time.

Table 1 Recent reviews and new policy and program initiatives

Initiative	Synopsis
Independent Review into Regional, Rural and Remote Education (April 2018)	The review examined the challenges faced by rural, remote and regional students and recommended solutions to help them succeed at school and beyond.
Changes to existing visa frameworks (November 2018)	In November 2018 the government made changes to the Working Holiday Maker visa program, the Seasonal Worker Programme and the Pacific Labour Scheme to help farmers' access seasonal harvest labour.
Strengthening Skills: Expert Review of Australia's Vocational Education and Training System (April 2019)	The review examined Australia's vocational education and training (VET) sector and made 77 recommendations to improve the uptake and performance of the VET education sector.
Educating kids about agriculture (Election Commitment, May 2019)	Up to \$10 million for two initiatives with the aim to bring kids to farms and farming experiences to kids The intended outcome of these initiatives is to increase kids' understanding of where and how their food and fibre are produced; and the role and importance of agriculture to Australia's way of life, regional communities and the economy
Seasonal Agriculture Labour Demand and Supply Package (2019-20 Budget, May 2019)	To improve the understanding of the agricultural labour force, this package provides \$4.7 million over four years (and \$1.0 million ongoing from 2022-23) for ABARES to improve the collection and analysis of agricultural labour force data, building on previous work. The first release from the expanded survey is scheduled for early 2020.
New Regional Visas (2019-20 Budget, May 2019)	Two new skilled regional provisional visas commenced on 16 November 2019: <ul style="list-style-type: none"> • Skilled Employer Sponsored Regional (Provisional) visa: for people sponsored by an employer in regional Australia. • Skilled Work Regional (Provisional) visa: for people who are nominated by a State or Territory government or sponsored by an eligible family member to live and work in regional Australia. • The definition of regional Australia was also refined for skilled migration purposes to add incentives for skilled migrants to settle into Australia's regions.
Fair Farms Initiative (July 2019)	Improving workplace practices and the reputation of the industry as a fair and ethical in employment conditions.
National Regional, Rural and Remote Education Strategy (August 2019)	The strategy aims to reduce the disparity between country and city students. The government is yet to announce its response to the report.
Australian Qualification Framework Review (October 2019).	This review recommended changes to the AQF so the framework continues to meet the needs of students, employers, education providers and the wider community.

Table 1 continued.

Regional Agriculture Migration Package (19 November 2019)	Horticultural growers in the Mallee have greater access to labour migration programs including the Seasonal Worker Programme and Pacific Labour Scheme. The package is designed to improve the supply of horticultural workforce with a focus on seasonal labour; eliminate illegal employment practices; and encourage an increase in appropriate accommodation stocks."
Horticulture Industry Labour Agreement (1 January 2020).	Businesses in Australia's horticulture industry are able to apply for the new Horticulture Industry Labour Agreement to access to skilled and semi-skilled migrant workers for the horticulture industry, where appropriately qualified Australians are unavailable.

Separate to these new initiatives, there are a large number of initiatives and programs run by state and territory governments, Rural Research and Development Corporations (RRDCs), agriculture industry bodies and other government and non-government agencies that are relevant to developing the agricultural workforce. This literature review draws on examples of some of this work, to illustrate key points and emerging trends and to propose critical success factors for these types of activities. It is not an exhaustive list of all the work that is underway by various agencies across the country.

Figure 1 Factors affecting the agricultural workforce

2 Agricultural workforce: statistics and trends

Observations

- Farm aggregation, intensification and corporatisation are driving changes in the size, structure and skills needs of the agricultural workforce.
- Corporatisation and consolidation are increasing the training requirements for the workforce due to increased reliance on labour outside of the family unit and to retain salaried employees.
- Visa holders (or non-citizens) make important contributions to the workforce of the horticulture, intensive livestock and meat processing industries.
- Government and independent reports show that employers are experiencing recruitment challenges in a range of unskilled and skilled occupations in the agriculture industry and related service and supply chain industries.
- Workforce exit rates—rather than a rapid growth in workforce requirements—are the key driver for the demand for training in the sector.
- Government and independent reports suggest that the size of the agricultural workforce will remain largely static (325,600 to 324,100) or increase (373,000) in the period 2018 to 2023. Predictions of a growth in the size of the workforce do not consider the effects of the current drought.
- New technologies have already changed the skills needs of jobs roles in the agriculture, fisheries and forestry industries and their related supply chain sector. However, many job-specific traditional skills will remain in demand in the future.
- Research by the CSIRO suggests that in the period to 2030 the key areas of uncertainty with regard to the supply and demand of the agricultural workforce will be the level of regional development and the extent of technology advancement and uptake across the sector.
- Although the percentage of the agriculture workforce with tertiary qualifications has increased over the past decade, agriculture industry employees still tend to have lower levels of formal education than the general Australian workforce.
- Historically most workers in the on-farm agriculture sector have acquired their skills through on-the-job learning, with the addition of some targeted short courses of study. There is debate about whether this approach remains appropriate given technological changes and greater need for management skills in the sector.
- Formal education and training has a stronger history in some related service and supply chain industries, such as the trade sector.

2.1 Employment in agricultural and related industries

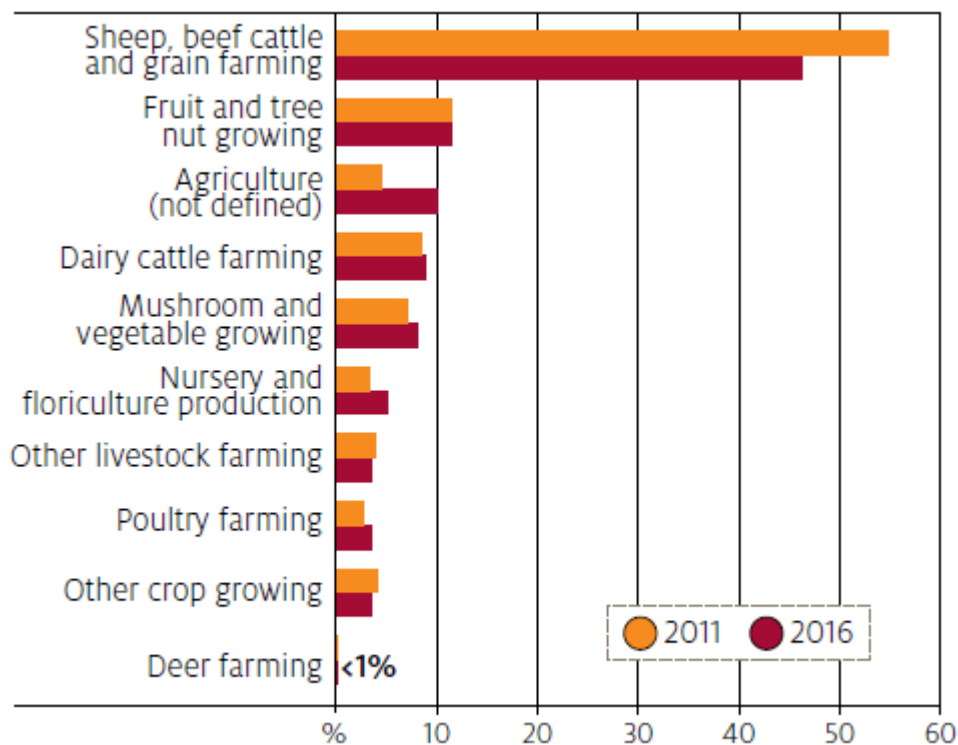
In 2016, 247,595 people were directly employed in the agriculture, fisheries and forestry industries. The number of people working in the industries increased by 5.2% from 234,611 between 2011 and 2016, following a decrease of 11.4% from 264,709 between 2006 and 2011. The primary production sectors have links through the supply chain. When employment in related support services sectors and downstream processing and wholesaling sectors is included, the total employment was around 536,000 in 2016 (Table 2).

Table 2 Employment in agriculture, fisheries and forestry and related supply chain industries 2006, 2011 and 2016

Industry or industry subsector	2006 (no. employees)	2011 (no. employees)	2016 (no. employees)
Agriculture	248,096	221,168	232,133
Forestry and logging	6,873	5,392	6,023
Fishing and aquaculture	9,740	8,051	9,439
Agriculture, fisheries and forestry (primary production sectors)	264,709	234,611	247,595
Agricultural services	13,654	12,690	15,987
Food processing and manufacturing	189,152	192,697	193,930
Agricultural wholesaling	50,594	46,445	28,340
Forestry support services	2,050	2,168	2,957
Wood product manufacturing	47,312	41,666	29,040
Pulp, paper and concerted paper manufacturing	28,012	19,359	13,964
Fishing processing	2,002	1,785	1,536
Fishing wholesale	4,201	3,982	2,477
Total	597,164	555,395	535,826

Source: ABS Census of Population and Housing.

Around 94% of people employed in agriculture, fisheries and forestry were employed in the agriculture industry (Table 2). In 2016, 46% of all people working in agriculture were employed in sheep, beef cattle or grain farming (Figure 2).

Figure 2 Employment in agriculture sub-industries, 2011 and 2016

Source: Binks et al. 2018

Australian Bureau of Statistics (ABS) Labour Force Survey and Population and Housing Census 2016 produced different estimates of the number of workers in the industry. The Census data used to produce Table 2 tends towards a lower estimate of total employment in the agriculture sector as it takes place in August and only captures seasonal employment in that month (Dufty, Martin & Zhao 2019). The ABS Labour Force Survey estimated that in 2017-18, 279,000 Australians were employed in agriculture. This does not include migrant workers. The ABS Economic Activity Survey asks businesses about the number of employees regardless of residential status and reported 407,000 jobs in agriculture in 2017-18. Although, by counting one person with multiple jobs, there is a risk that the estimates are inflated. (Dufty, Martin & Zhao 2019).

2.2 Workforce needs vary across industries and between businesses

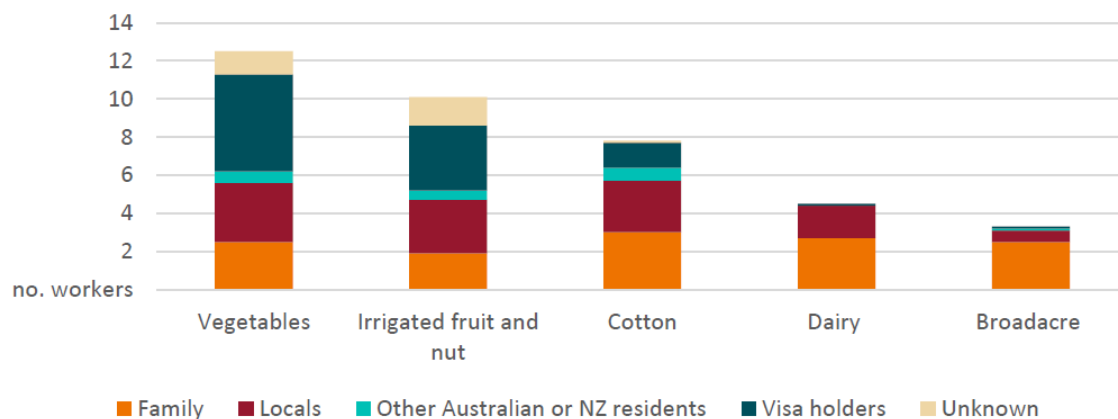
In recent years ABARES has released reports on the agricultural labour force data in the dairy, horticulture, vegetable and cotton industries based on its industry surveys (Dufty, Martin & Zhao 2019; Dufty et al. 2018; Valle, Millist & Galeano 2017). This work, together with work funded by ABARES (Barr forthcoming and Wu et al. 2019) is fundamental to a better understanding of the characteristics of the on-farm workforce and the future work needs of the industry.

Differences in the production systems of agricultural sectors and in farm sizes shape the workforce needs and workforce composition on farms. The number of employees engaged varies from farms with only the owner-manager to those with over 500 people (Dufty, Martin & Zhao 2019). Self-employment is very common in agriculture, fisheries and forestry (reflecting

the large number of workers in this industry who own and operate their own business), with 54% of people in the sector self-employed in 2018 (DJSB 2019a). This is the highest rate of self-employment across all sectors of the economy.

Workforce needs vary between sectors reflecting differences in the degree of mechanisation in different production systems and different industry structure. Many horticultural crops are harvested by hand, which leads horticultural businesses to have significantly larger average workforce requirements than dairy or broadacre grazing and cropping businesses. Cotton farms are intermediate, reflecting a large degree of mechanisation, but also large average farm sizes and seasonal irrigation requirements (Figure 3).

Figure 3 Average workers per farm and their origin, 2017–18



Source: Dufty, Martin & Zhao 2019

2.2.1 Workforce composition

Country of origin

Farmers meet their labour needs through their own labour or using family members, local residents, Australians from outside the local area or overseas workers. ABARES survey of selected agricultural industries shows family and other Australian workers made up the large majority of the workforce (Dufty, Martin & Zhao 2019; Dufty et al. 2018; Valle, Millist & Galeano 2017). Overseas workers make a particularly important contribution to the seasonal horticulture workforce, filling on average between 30% to 60% of peak seasonal jobs on horticulture farms (Dufty, Martin & Zhao 2019; Valle, Millist & Galeano 2017; Figure 3). Only a small proportion of dairy and broadacre farms used overseas workers. However, the large number of farms in these industries means they employ a significant number of overseas workers in total (Dufty, Martin & Zhao 2019; Dufty et al. 2018).

Barr (forthcoming) used ABS Census data on Australian citizenship to estimate the contribution of non-citizen workers to the industry. Although visiting overseas workers do not have occupation data recorded in the Census, the data does report clear trends in differences in the contribution of non-citizens among industry sectors, including intensive livestock and the meat processing sectors, which were not included in the ABARES farm survey. The percentage of non-citizen lower skilled employees was highest for the vegetable and mushroom sector (31%), meat and chicken processing sector (30%), fruit and nut sector (25%), services to agriculture

and fishing sector (19%) and poultry and pigs sector (15%). Similar trends were apparent for higher skill non-citizen employees.

Over the period 2001 to 2016 the ABS Census data reveals a consistent increase in the contribution of non-citizens to the agricultural workforce, from 5% to 15% for higher skill employees and 6% to 16% for lower skill employees (Barr forthcoming).

Reports suggests that overseas workers without necessary work rights are present in agricultural workforce. These workers are known as undocumented workers or illegal workers. Howe et al. (2019) defined three types of undocumented workers:

- 1) visa overstayers — who originally held a valid visa, which has since expired
- 2) visa holders without a right to work — typically, these involve migrants on tourist visas that do not contain a right to work in Australia
- 3) visa holders in breach of a visa condition allowing a limited right to work — these are usually international students in breach of the restriction preventing them from working for more than 40 hours a fortnight during semester.

With regards to the horticulture sector, Howe et al. 2019 reported that undocumented workers were prevalent in the sector, but that it was impossible to determine the extent and nature of their involvement. Estimates provided to Howe et al. (2019) by industry members suggested that undocumented workers composed up to 90% of the workforce in some major horticulture production regions, for example the Sunraysia region of north-west Victoria. In early 2019 the Victorian Farmers Federation surveyed horticulture farmers in the region and found that undocumented workers represented 28% of the total workforce or around 5,000 workers (VFF 2019).

The prevalence of undocumented workers in the agricultural industry is widely reported in other countries. For example, in the United States it was estimated that just under 50% of hired crop workers lacked the immigration status needed to work legally (Zahniser et al. 2018)

Gender

In 2016, the ABS Census recorded 72,722 women (32% of the total Australian workforce) as working in the agriculture industry, up from 68,514 in 2011 (Binks et al. 2018). Barr's analysis (forthcoming) of 2016 ABS Census data found the female composition of the owner-manager category was unremarkable when compared with the share across all sectors of the economy. It is close to average at a little under 30%. However, for both higher and lower skill employees the agricultural sector had a much lower female composition than the workforce as a whole. This was most obvious for skilled employees, 20% of whom are female compared to over 40% of the workforce as a whole.

Barr (forthcoming) also noted significant variation in gender composition between agricultural sectors. For example, the female composition in the higher skill employee category ranged from 10% in the beef industry to more than 35% for nursery and floriculture. Barr (forthcoming) also notes gendered occupational choice across occupational categories in the industry, with female composition ranging from 96% for bookkeepers to 0% for motor mechanics.

Age

Some authors have expressed concerns about the consequences of the aging agricultural workforce on future workforce needs (for example, The Allen Consulting Group 2012; NFF 2014). However, different demographic trends are apparent in the owner-manager and employee categories.

According to the 2016 Census the median age of all categories of agricultural industry workers was 49 years (compared to 50 in 2011). This is older than the median age of the general Australian workforce, which was 40 years in 2016. Based on his analysis of Census data, Barr (forthcoming) showed that the median age of owner-managers has been gradually increasing since 1981, to be more than 55 years in 2016. This leads to high retirement-replacement demand, with Shah & Dixon (2018) estimating that 63.3% of the 80,900 job openings for farmers and farm managers (10,100 per year) over the forecast period 2017 to 2024 being due to retirement-replacement demand. However, the rate may be slightly over-estimated, as many farmers tend to continue working past the age of 70 years, the cut-off age used to model for compulsory retirement (Shah & Dixon 2018).

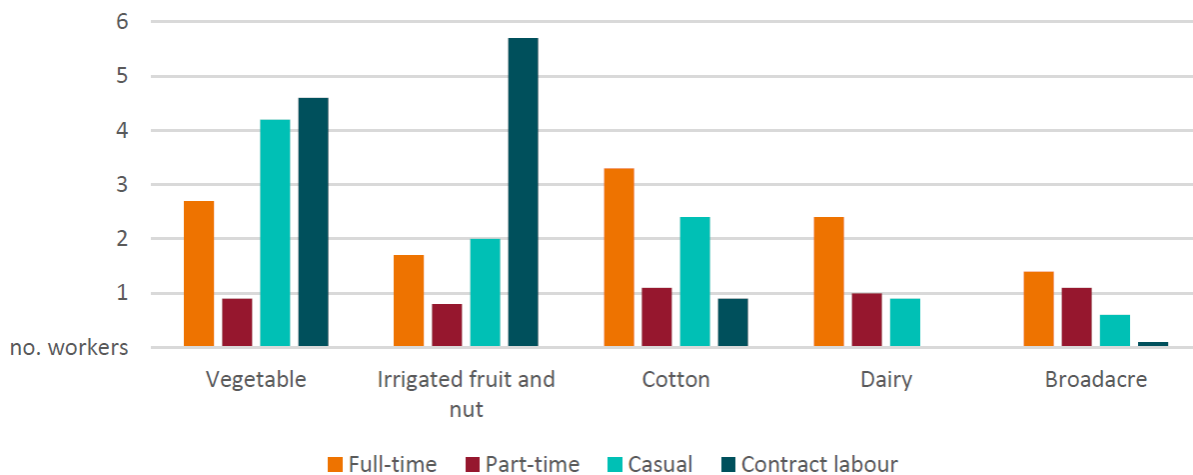
According to Barr (forthcoming), unlike owner-managers, the median age of agricultural employees has shown little indication of aging, having remained below 40 years since 2001. Higher skill employees (managers, professionals and trades) in agriculture have a median age close to that of the total Australian workforce. Whilst the median age of these employees has been slowly rising, the rate of rise is not large compared to that observed in the rest of the workforce. Further, the age profile of lower skilled agriculture employees (for example labourers and drivers) is not structurally aging, unlike many other industry sectors (Barr forthcoming).

2.2.2 Type of employment on farms

Workers may have long-term engagement with the farms (hired on a full-time, part time or casual basis) or work to meet seasonal short-term needs. The type of employment offered varies between agricultural sectors, reflecting differences in production systems including:

- many horticultural crops are picked and pruned by hand, requiring large numbers of lower skilled labourers for intensive but relatively short-periods of time. This is reflected in the higher use of casual and contract employment in the horticulture sector
- cotton production is machinery intensive and the industry employs a larger proportion of ongoing full-time, part-time and casual staff in skilled positions
- a large proportion of dairy farms are owner-operated and dairy production is less seasonal in nature, with farms generally milking on a year-round basis. This limits demand for short-term casual or contract employees
- the majority of farms in the broadacre sector are owner-operated and employ few permanent or part time staff beyond the operator and their partner (Dufty, Martin & Zhao 2019).

Figure 4 Average number of workers per farm at the peak, by tenure and industry, 2017–18



Note: vegetable farms results reported for 2016–17. Irrigated fruit and nut farm results are based on farms surveyed in the southern Murray–Darling for 2016–17.

Source: Dufty, Martin & Zhao 2019

Full-time and part-time positions across all sectors (Figure 4) are generally filled by family or local residents. The majority of casual and contract workers on horticultural farms are visa holders, but broadacre and dairy farms sourced most of their casual and contract labour needs locally (Dufty, Martin & Zhao 2019).

Separately, businesses may use independent contractors as an additional source of labour, where labour is generally hired with equipment as a unit. This enables farm businesses to outsource labour and capital costs to another provider without ongoing machinery and employment costs. This includes services such as contract planting, spraying or harvesting (Dufty, Martin & Zhao 2019).

2.2.3 Types of occupations and skills needs

The Australian Bureau of Statistics' ANZSCO framework classifies all occupations and jobs in the Australian and New Zealand labour markets on the basis of the skill level required to competently perform the set of tasks required for that occupation. ANZSCO assigns occupations to one of five skill levels. The greater the range and complexity of the set of tasks, the greater the skill level of an occupation. Skill level is measured by:

- the level or amount of formal education and training
- the amount of previous experience in a related occupation
- the amount of on-the-job training required for that occupation, based on the advice of employers, industry training bodies, professional organisations (ABS 2013). Based on the ANZSCO framework, occupations in the agriculture sector range from Level 1 for managers and professionals, to Level 5 for clerical/administrator or labourer roles (Table 3).

Table 3 Worker occupation definitions

Occupation	Examples	Skill levels	Indicative qualifications
Managers	Farmer or farm manager chief executive or general managers specialist manager—such as in advertising, sales, administration, ICT.	1	Bachelor degree or higher qualification or at least five years of relevant experience.
Professionals	Agronomist, veterinarians, human resources specialist, plant scientist, lawyer, marketing engineer, environmental scientist, accountants.	1	Bachelor degree or above in specific field.
Technicians and trades	Skilled animal or horticultural workers, construction trade (e.g. plumber and carpenter), mechanic.	2,3	Associate Degree, Advanced Diploma or Diploma, or at least three years of experience (ANZSCO Skill Level 2); or Certificate III including at least two years of on-the-job training, or Certificate IV or at least three years of relevant experience (ANZSCO Skill Level 3)
Clerical and administrators	Bookkeeper, project administrator, secretary office support.	2,3,4,5	Associate Degree, Advanced Diploma or Diploma, or at least three years of relevant experience (ANZSCO Skill Level 2); or Certificate III including at least two years of on-the-job training, or Certificate IV, or at least three years of relevant experience (ANZSCO Skill Level 3); Certificate II or III, or at least one year of relevant experience (ANZSCO Skill Level 4); or Certificate I, or compulsory secondary education (ANZSCO Skill Level 5)
Machinery operators and drivers	Harvester operator, forklift operator, processing machine operator.	4	Certificate II or III (ANZSCO Skill Level 4) or at least one year of relevant experience. In some instances relevant experience and/or on-the-job training may be required in addition to the formal qualification.
Labourers	General farm hand, wool handler, stable hand, vegetable or fruit picker, packers, meat processing worker.	5	AQF Certificate I, or compulsory secondary education or a short period (or no) on the job training (ANZSCO Skill Level 5)

Source: ABS 2013; Dufty, Martin & Zhao 2019

On average, farms in horticulture, dairy, cotton and broadacre grazing and cropping sectors employed just more than one manager per farm, with horticulture farms employing more labourers than other sectors and cotton and broadacre grain farms employing more machinery operators. Few farms employed technicians or professional staff, with these people with these skills likely being hired in as required (Dufty, Martin & Zhao 2019).

The owner-operator class with agriculture, fisheries and forestry has a low level of formal educational attainment compared to most other sectors of the economy. Further, higher skilled employees have the lowest educational attainment of any industry category (Barr forthcoming). Barr considers this to reflect the limited relevance that has historically been given to educational attainment by employers in the sector and the nature of the workforce, being dominated by older owner-operator cohort, with low levels of formal education.

2.3 Workforce outlook: drivers of change

The size and structure of the agricultural workforce has changed in response to changes that have occurred in the agricultural industry. Based on a time series analysis of Australian agriculture workforce data from the ABS Australian census of Population and Housing in the period 1983–2016 Barr (forthcoming) identified four underlying trends that are changing the size and nature of the agricultural workforce:

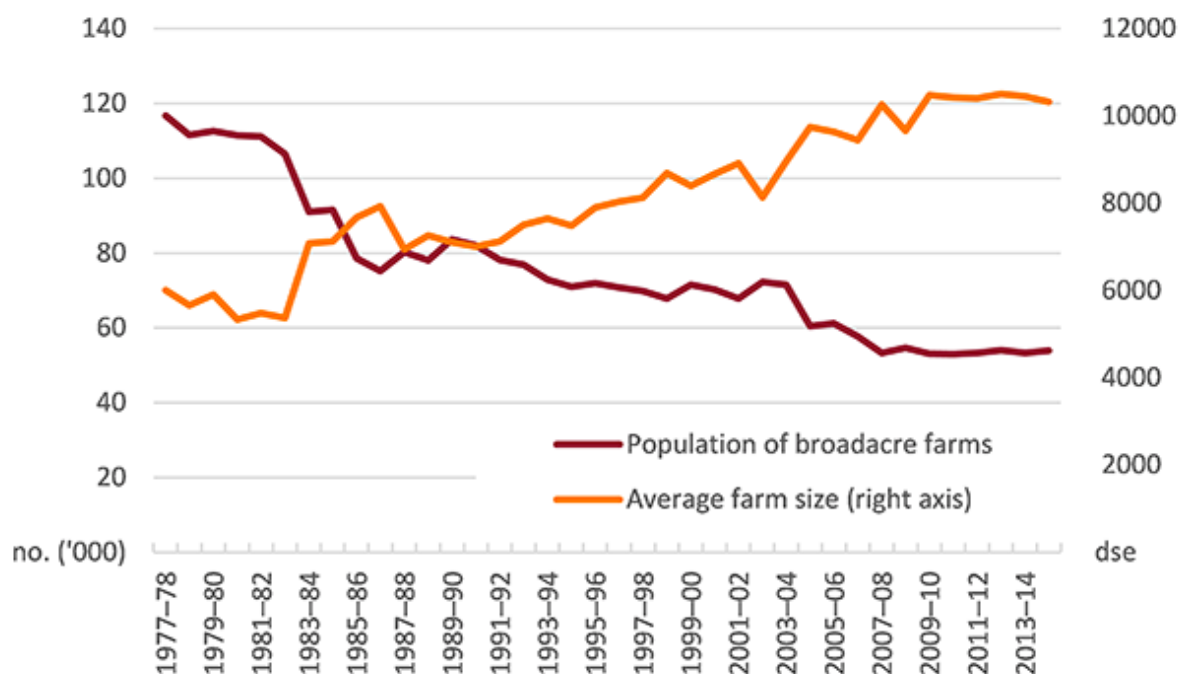
- 1) aggregation of farms
- 2) intensification of production
- 3) gentrification
- 4) corporatisation

2.3.1 Aggregation

The long-term trend in the reduction in the number of farms and the increase in farm size (Figure 5) driven by a combination of:

- technological developments, which increase labour productivity
- competition for labour with other sectors of the economy
- larger farms tending to be more productive than smaller farms, possibly due to benefits from economies of scale (ABARES 2018).

Figure 5 Farm population and average farm size, all broadacre industries, Australia 1977-78 to 2014-15



Source: Xia et al. 2017

Aggregation has led to a reduction in share of owner-managers as a proportion of the industry's workforce from around 55% in 2001 to around 35% in 2016 (Barr forthcoming). In contrast the

lower-skill employee share is increasing in most agricultural industries. The situation for higher skill employees is mixed. Higher-skill share is declining in broadacre industries, but increasing in intensive animals, dairy and horticulture (Barr forthcoming).

Intensification

The restructuring of agricultural industries as resources, such as water and land, shift from relatively lower productive uses to more highly productive uses. As Barr (forthcoming) notes, data on intensification is challenging to produce, but some examples include:

- the shift in irrigation water from pasture and broad-acre crop production to the production of fruit and nuts, particularly almonds, in the Murray-Darling Basin (Gupta & Hughes 2018)
- the shift in land-use from grazing and dry-land agriculture to irrigation in Tasmania as a result of the expansion of irrigation schemes (or mangoes in the Northern Territory)
- expansion of the fresh berry sector in response to consumer demand for year-round snackable fruit
- the shift in sectors from areas that have high-cost production systems to areas with low-cost production systems, such as the growth of the rain-fed pasture based dairy production in southern Australia.

The process of intensification may have consequences for the workforce, as intensification of resource-use generally increases the number of workers required and/or the skills they need.

Gentrification

The gradual transformation of some farming areas from industrial farming landscapes towards amenity landscapes, particularly in areas within commuting or weekend access to major population centres. This can result in an increase in farm ownership by semi-retired farm operators.

Corporatisation

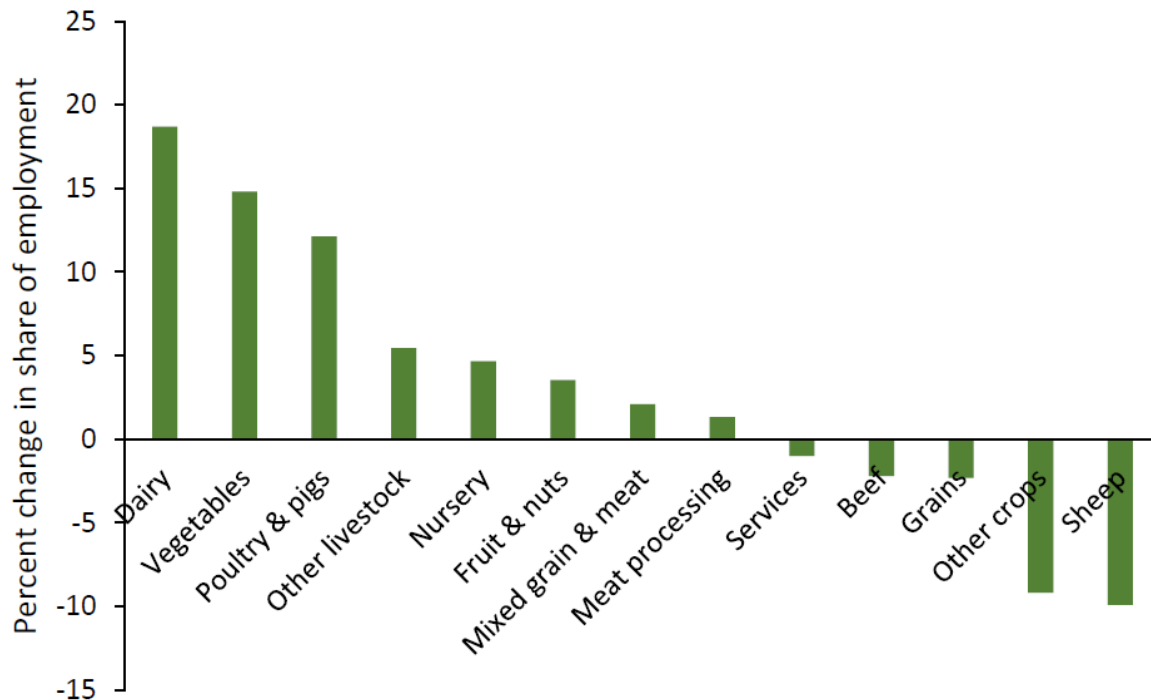
Corporatisation refers to the adoption of a more business-like approach to agriculture either by shareholder-owned corporates or 'family corporates'. This can be seen as an implication of increasing farm-scale, with fewer farms that are only owner operated (Barr forthcoming; ABARES pers. comm., November 2019). Corporatisation has consequences for the workforce as the traditionally large contribution made by owner managers or family members is replaced by salaried employees, resulting in an increase in employee intensity (Figure 6). This trend is most acute for the dairy industry and appears common across major international dairy producing countries, such as New Zealand, Ireland and Canada (Nettle 2018).

Corporatisation and consolidation have consequences for the training requirements of the industry for two reasons:

- 1) traditionally farming skills were passed between generations within the family through informal off-farm experience. Increased reliance on labour from outside the family unit could increase reliance on formal training or require more investment in on-the-job training (Dufty et al. 2018)
- 2) salaried employees have a higher industry exit rate (40-70% in a five year period) compared to owner managers (25-30% in a five year period). As a result, the growth in the salaried workforce means there will be an increased loss of skills from the sector due to the

higher exit rate of skilled staff (Barr forthcoming) and therefore an increased requirement for training.

Figure 6 Percent change in share of employment held by employees in Australian agriculture sectors between 2001 and 2016.



Source: Wu et al. 2019.

2.4 Recruitment challenges and skills shortages

In recent years Australia has experienced strong labour market activity, with the unemployment rate falling to five percent in December 2018. As a result, employers across Australia in the majority of industries are having greater difficulty recruiting staff. The Department of Education, Skills and Employment's Survey of Employers' Recruitment Experiences showed 44% of employers reported having difficulty in 2017-18 compared with 37% in 2016-17 (DJSB 2019b). There were shortages in almost all Technician and Trades Worker occupations assessed in 2017-18. The most commonly cited reasons given by employers for difficulty in recruiting were:

- a lack of qualified or experienced applicants
- applicants lacking interest in the positions
- applicants lacking employability skills
- the nature of the work, leading jobs seekers to have no interest in the occupation
- competition with other employers (DJSB 2019b).

2.4.1 Agriculture service occupations

The Department of Education, Skills and Employment carries out research on skilled occupations in the Australian labour market. The research results provide information about

workforce shortages at the state, territory and/or national level. The analysis indicates that a number of occupations in the agriculture industry and related supply chain services sectors are currently experiencing labour market shortages (Box 2).

Box 2 Skilled occupations in shortage

Agricultural consultant/scientist

This agriculture service sector occupation has been in and out of shortage in recent years. Only 45% of surveyed vacancies were filled in 2018 and around two thirds of employers has at least one unfilled vacancy. However in 2019, these reported shortages had abated, with 71% of vacancies filled. Although employers attracted relatively large fields of applicants, few were regarded as suitable, due to the lack of required experience or skill (DESSFB 2019b).

Arborist

This occupation experiences a persistent shortage of labour. In 2018 around 15% of vacancies were filled and more than half of the employers surveyed attracted no suitable applicants. Around 90% of applicants were considered unsuitable, most commonly because they lacked qualifications or experiences or appeared unreliable (DESSFB 2019c).

Veterinarian

Employers continue to experience difficulty filling advertised roles, with shortages apparent for the third consecutive year. This has led to widespread shortages regardless of location or specialisation. In 2019 around 29% of vacancies were filled and 23% of advertised positions failed to attract any applicants (DESSFB 2019d).

Automotive trades

This occupation experiences a persistent shortage of labour. In 2018 around 30% of vacancies were filled and more than 50% of employers did not attract any suitable applicants for their advertised vacancies. A lack of required qualifications, insufficient work experience or inadequate technical skills were the main reasons for unsuitability. Other factors contributing to recruitment difficulties included the remote location of the employer's workplace. (DESSFB 2019e)

Engineering trades

Employers generally had difficulty filling engineering trades vacancies in 2018, with 49% of vacancies filled. More than three quarters of qualified applicants were considered unsuitable because they lacked specific experience or technical skills, had a poor work history or did not have the communication skills required. (DESSFB 2019f)

Engineering professions

Employers continue to experience greater difficulty recruiting engineering professionals, with 60% of vacancies filled in 2019. Although employers experienced large fields of qualified candidates, more than 80% were not considered suitable due to a lack of sufficient experience or industry specialisation, insufficient technical skills and weak general employability (DESSFB 2019g).

Box 2 continued.**Butcher and smallgoods maker**

Employers had difficulty filling their vacancies in 2018, with 44% of vacancies filled. More than two thirds of applicants lacked the required qualifications and more than half of the qualified applicants were considered unsuitable due to poor communication or trade skills (DESSFB 2019h).

2.4.2 On-farm positions

In addition to skills shortages observed by the Department of Education, Skills and Employment reports suggest some business face recruitment difficulties in attracting unskilled workers in sectors such as horticulture. This appear patchy affecting only some regions and some businesses. For example, in their assessment of workforce challenges in the horticulture industry, Howe et al. (2019) reported that recruitment challenges were most acute in areas:

- that experience strong peaks in seasonal labour demand
- in which it is difficult to attract working holiday makers (also known as 'backpackers'), either because they are not eligible postcodes for working holiday maker visa extension, were too remote or had poor transport services
- with low unemployment rates and strong competition from other industries, including competition between agricultural sectors.

Dufty, Martin & Zhao (2019) made similar observations about the patchy nature of workforce shortages on farms finding that:

- location affected recruitment difficulty: farms located further from large population centres had more difficulty recruiting, with recruitment difficulties increasing from 25% of employers located within 40km of a medium sized town to 47% of employers located more than 40km from a small town. The exception being farms close to major cities, which reported 49% recruitment difficulty, reflecting increased competition for workers from other industries or because they are not in eligible postcodes for working holiday maker visa extension.
- large farms had more difficulty in recruiting: large horticultural and dairy farms reported more difficulty recruiting. The situation was most acute in the dairy sector, where 60% of dairy farms with more than 10 workers had recruited and more than 50% reported a difficulty.
- broadacre and dairy farms reported more difficulty: 48% of dairy farms that recruited and 40% of broadacre farms that recruited reported a difficulty. Despite these reported difficulties dairy farms reportedly filled 96% of vacancies and broadacre farms filled 90% of vacancies. Most horticultural farms did not report difficulty recruiting workers, with 18% of farms that had attempted to recruit in 2016-17 reporting a lot or some difficulty in recruiting. This low reporting of difficulty is likely to reflect the low skilled nature of most positions and the use of contract labour and foreign workers to fill vacancies.

Structural consolidation in the agriculture industry is leading to the creation of new job roles that did not exist under family-farm business models. These include middle management jobs such as leading farm hands, supervisors and orchard managers. Some reports suggests that

employers have difficulty in filling these managerial or ‘skilled labourer’ roles (Dufty, Martin & Zhao 2019; Howe et al. 2019; Santhanam-Martin & Cowan 2017; NRAC 2013).

2.4.3 Intensive livestock and meat processing

Beyond the agricultural sectors surveyed by ABARES, reports suggests that intensive livestock and meat processing have a lot of difficulty in recruiting local workers. The difficulty that these sectors have in recruiting local workers is reflected in the high proportion of non-Australian citizens that the ABS Census shows are working in these sectors (Barr forthcoming).

Australian Pork Limited (APL) reports that the pork industry has significant and long-standing difficulties attracting and retaining skilled piggery workers. APL surveyed producers in August 2017 and found 68 percent of respondents said they had vacancies occupations from basic stockperson to farm manager. Ninety-four percent of respondents to APL’s labour survey said that the perceived unattractiveness of the pig industry was the main impediment to recruiting Australian workers (APL 2017; Section 2.2.1).

The meat processing sector regards access to labour as one of its biggest issues (Australian Meat Processing Corporation (AMPC; 2018). Employment in the sector has grown by approximately 60% or around 17,000 people between 2001 and 2016 (Barr forthcoming). At the same time:

- increased competition for land seen the has relocation of meat processing from cities to rural and outer-urban areas, reducing much of the earlier supply of meat-processing labour
- the size of individual plants has grown (larger processing capacity and the introduction of second shifts), increasing demand for workers local to those plants
- the relative attractiveness of other occupations has increased (in terms of pay and occupational status; Norton & Rafferty, 2010).

2.5 Employee exits contribute to recruitment challenges and training needs

Exit rates are an indication of the job opportunities for new entrants and also of the education and training needs of the sector. Barr’s (forthcoming) assessment of exit patterns from the agricultural sector found exit rates were lowest for owner-managers, being between 25% and 30% per five years or approximately 6% per annum. The exit rate for high skill employees, who are generally younger, is from 40% to 50% per five years and for low skill employees from 60% and 70% per five years. Employee exit rates for owner-managers, higher and lower skill employees in the agriculture industry are similar to those of other industry sectors.

Shah & Dixon’s (2018) assessment of future job openings found that over the 8 year period from 2017 to 2024 there would be 123,000 job openings in the agriculture, fisheries and forestry industries under the most likely modelled scenario. Of these, 71,800 (or 58%) were replacement demand (that is job openings created by people exiting the industry) and 51,000 were expansion demand. A large proportion of these, 80,900 openings (10,100 openings per annum), were expected to be for farmers or farm managers, with replacement demand the source of 63% of these openings. As noted by the authors, this is likely to be an over-estimate because many farmers tend to continue working past 70 years of age, which leads their model to over-estimate

the actual replacement rate for the occupation. It is also likely that some of these positions will not be refilled as structural consolidation in the industry continues (Barr forthcoming).

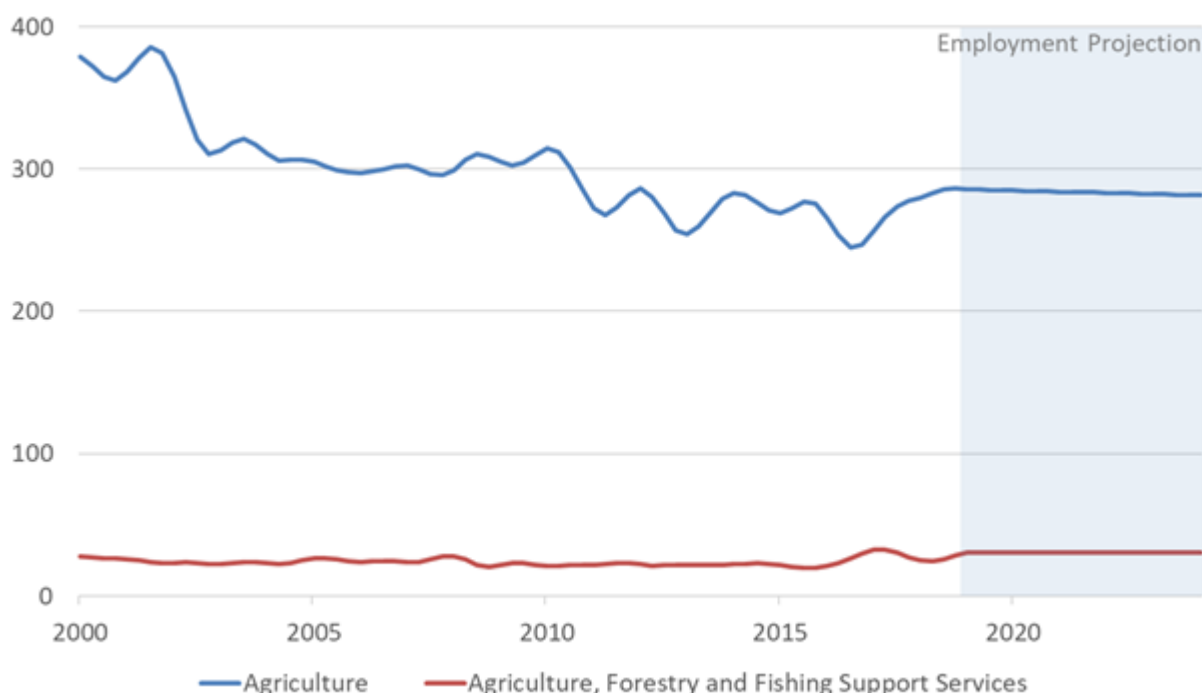
Exit rates for higher and lower skill employees contribute to demand for training in the sector as new entrants are upskilled into the new positions. As noted by Barr, the need for more training in the sector is not caused by the sectors rapid growth, but by the sectors inability to retain staff—which is a common problem for all industry sectors across the economy. However, costs of labour turnover for the sector may be greater than other sectors of the economy due to the recruitment challenge created by the dispersed and relatively remote location of many businesses (Barr forthcoming).

2.6 Near to medium-term trends and drivers

2.6.1 Workforce trends

The Department of Employment, Skills, Small and Family Business projected a small decline in the employment in the agriculture, fisheries and forestry industry from 332,900 in May 2019 to 329,100 in May 2024, a fall of 3,800 or 1.2% (Figure 7). This is in line with the longer term history of employment declines in the industry that have largely been driven by technology advancement (DESSFB 2019a). In contrast, Shah & Dixon (2018) project an increase in the industry, up from 316,000 to 373,000 in 2024. This is based on the lower value of the Australian dollar relative to other currencies and expanding free trade agreements with countries in east Asia. These estimates are based on ABS Labour Force Survey data and do not include non-Australian-residents, who make a significant contribution to the agricultural workforce.

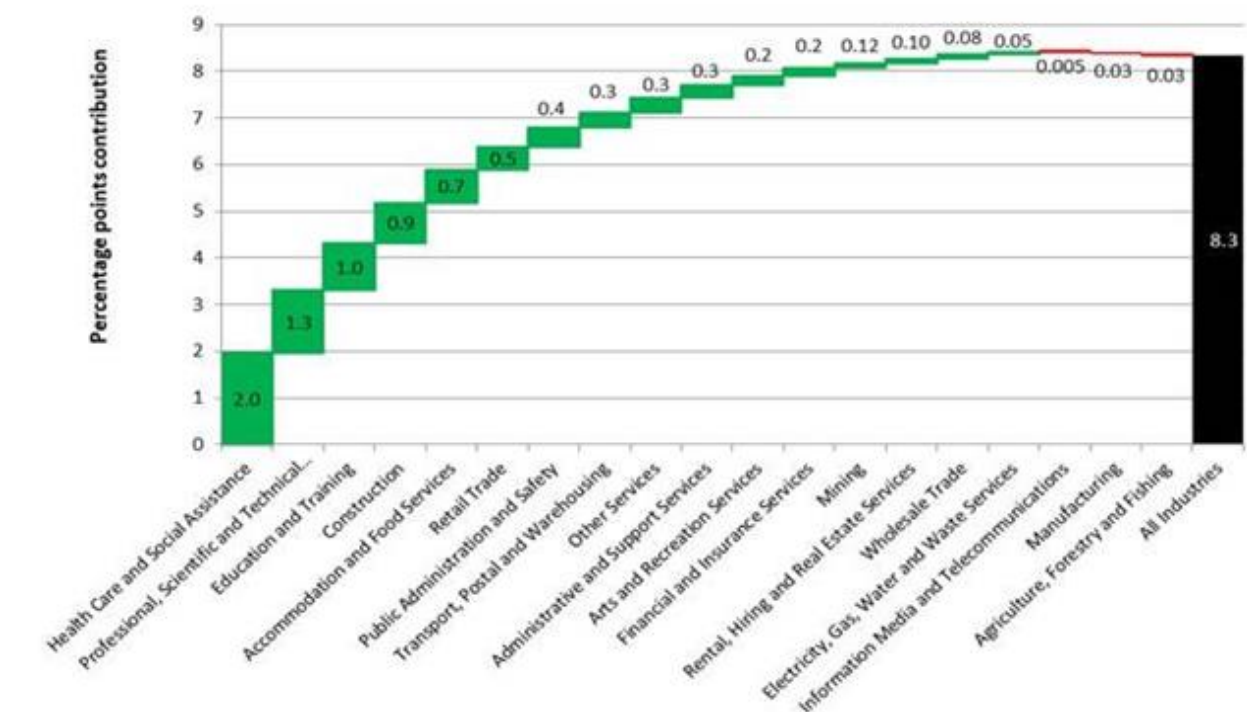
Figure 7 Agriculture and agriculture and fishing support industries, 2000 to 2019 employment level and 2024 employment projects



With regard to supply, strong projected growth in other sectors of the economy, such as health care and social assistance (up by 252,600 or 15.0%) and professional, scientific and technical

services (up by 172,400 or 15.1%) could be expected to keep the labour market highly competitive for agriculture employers into the medium term to 2024 (DESSFB 2019a).

Figure 8 Projected contributions to the rate of total employment growth by each industry (percentage points) – five years to May 2024



Source: DESSFB 2019a

No single measure can fully capture the complexity and extent of underutilisation in the labour market. The number of unemployed and the unemployment rate, however, do provide some indication of available labour resources and effective labour supply. While Australia's seasonally adjusted average unemployment rate was 5.2% in November 2019 (ABS 2019a), parts of Australia (particularly regional Australia) have unemployment rates that are much higher than the national average. Indeed, while there is significant disparity in unemployment rates across Australia's key horticulture regions, the unemployment rate in at least some of these regions is well above the national average, suggesting that spare capacity may be evident within those regions to fill seasonal labour demands.

In addition, while there are some agricultural regions with a low unemployment rate in November 2019 (ABS 2019b), there are still significant numbers of unemployed people in these regions. For instance, in the Warrnambool and South West SA4 (Victoria), where the Agriculture, Forestry and Fishing industry accounts for 19.9% of total employment in the region and the unemployment rate stood at 2.9%, there were 2,000 unemployed persons in November 2019. In the Western Australian Wheat Belt SA4, where 21.2% of the workforce is employed in Agriculture, Forestry and Fishing, the unemployment rate stood at 3.1% in November 2019, below the 5.2% recorded nationally (in November 2019). Despite the low unemployment rate, there were 2,400 unemployed people in the Wheat Belt SA4 in November 2019.

As noted in Section 2.4, other factors which effect the willingness or ability of people to work in an industry, such as a lack of interest in an occupation due to the nature of the work, are difficult to model.

2.6.2 Skills trends

New technologies are changing the skills needs of jobs roles in the agriculture, fisheries and forestry industries and their related supply chain sectors. Technologies such as the internet of things, artificial intelligence, automation and robotics are already changing the nature of jobs and it is generally accepted that the pace of change is picking up (Joyce 2019). Skills Service Organisations consult with industry to understand emerging skills needs across the economy to inform the design and review of VET packages. Recent reports on the emerging skills needs of agriculture and related supply chain businesses indicate:

- In the agricultural machinery sector, as vehicles become more advanced, the diagnostic equipment used to maintain them progresses, including the use of remote and on-board diagnostics and software tools to manage parts inventories and service histories. This is raising the bar for technician roles significantly (PricewaterhouseCoopers 2018)
- In the transport and logistics sector, the increasing use of automated and semi-automated vehicles and interconnected devices enabling remote diagnostics, smart routing, and improved efficiency are reshaping the workforce's skills needs (Transport and Logistics Industry Reference Committee 2019)
- In the aquaculture and fishing industries, major processes and technologies are emerging for real-time, distant operations, including uncrewed vessels and vehicles to enable more efficient monitoring, welfare and biosecurity practices. Technology is also being used for diving operations, on-deck vessel work, harvesting, hatchery and sample collections. Some large business are already undertaking introducing these technologies and many others are planning for their future introduction (Aquaculture and Wild Catch Industry Reference Committee 2019)
- In the forestry industry, advanced technologies, including biotechnology (clonal propagation, marker aided selection and breeding); geospatial technologies (remote sensors, drone technology and new generation satellite imagery) and robotics, automation and scanning technologies (log-measuring and cutting optimisation systems, remote-controlled felling are requiring the development of digital skills and capabilities (Forest Management and Harvesting Industry Reference Committee et al. 2019)
- In the meat processing sector, the increased use of automation or mechatronics on the processing line is helping to address a labour gap, increasing production efficiency and yields, reduce the risk of employee injury and increase food safety. This is changing the skills required by process workers, with a greater emphasis on operating automated machinery and process oversight (Meat Industry Reference Committee - 2019)
- In the food processing sector, computerisation and advancements in technology are delivering more efficient food processing operations requiring skills in operating digitalised screens and equipment (Food, Beverage and Pharmaceutical Industry Reference Committee 2019)

- In the agriculture sector, the future agricultural workforce is likely to be influenced by technologies and digital solutions that with either augment or automate the way people work, including navigation robotics, process automation and decision support tools. There is current a consistent lack of proficiency in operating these digital technologies and devices (Trindall 2019).

As noted by Joyce (2019), although there is a focus on ‘new skills’, many job-specific ‘traditional-skills’ are in high demand and will remain in high demand in the future. For example, the NFF (2019) identified a diverse range of skills required for broad-acre and dairy industry workers, including tractor and heavy machinery operation, mechanical servicing and repairs and chemical application.

2.6.3 Education trends

Although the percentage of the agriculture workforce with tertiary qualifications has increased over the past decade (Barr forthcoming; Wu et al. 2019), agriculture industry employees still tend to have lower levels of formal education than the general Australian workforce (Table 4). In 2016, 45% of agriculture industry workers held a non-school qualification, which in most cases was a certificate level qualification. In 2016, 45% of the agricultural workforce had completed year 12 or equivalent, compared with 67% of the Australian workforce (Binks et al. 2018).

Table 4 Comparison of completed formal qualifications, 2016

Qualification	% of agricultural workforce	% of Australian workforce
Postgraduate degree level	2	7
Graduate diploma and graduate certification level	1	3
Bachelor degree level	10	22
Advanced diploma and diploma level	9	11
Certificate level	23	24
No recognised non-school qualification	55	33

Source: Binks et al. 2018, based on ABS Census of Population and Housing data.

Occupations in the agriculture, fisheries and forestry sectors cover a broad range of skill levels from unskilled to those requiring a degree level qualification (Table 3). As noted by the NFF (2019), historically most workers in the on-farm agriculture sector have acquired their skills through on-the-job learning, with the addition of some targeted short courses of study. A range of reasons for the relatively low share of workers in the agriculture industry with higher levels of educational attainment have been suggested, including:

- the long history of unofficial extension activities which farmers have relied on to share information and improve farm management and practices
- the remote location of workers and subsequent lack of access to formal education and training opportunities
- a lack of training service delivery from the VET sector

- the traditional family business structures found in the industry
- the perceptions of many individual rural industry employers and the sector's wider scepticism of the need and value of higher-level qualifications
- post-secondary education is of limited relevance as a means of achieving career change or promotion for most farmers (NFF 2019; Barr forthcoming).

However, Pratley & Archer (2017) are critical of the paradigm that farming can be learnt on the job and of the low perceived value of formal education by the sector. They suggest that technological change and the need for greater management skill have created a new imperative for education in the industry. It is increasingly expected that some formal qualifications would be an advantage for agribusiness positions, with VET level qualifications for farm machinery, some merchandise and intensive livestock handling positions (Pratley & Hay 2010). This change would already appear to be underway with the National Committee for Agriculture, Fisheries and Food (2017) concluding the professionalization of agriculture was happening, driven by increased levels of educational attainment in the sector.

Formal education and training has a stronger history in some related service and supply chain industries, such as the trade sector, which have established apprenticeship and traineeship arrangements and other higher level advisory roles, such as agronomy and veterinarian science, which typically require bachelor level qualifications.

2.7 Longer-term trends and drivers

Wu et al. (2019) explored key trends and influencing factors that will affect the agriculture workforce across the agriculture sector and related services over the decade to 2030. The authors found that two critical areas of uncertainty were likely to drive these changes:

2.7.1 Level of regional development

As 82% of people employed in agricultural businesses are located in regional areas (Binks et al. 2018), factors that influence the attractiveness of regional areas for working age people effect the potential supply of the agricultural workforce. The future direction of regional development will be impacted by various factors, including internal migration, population policy, climate change, the viability of agricultural businesses and the ability to attract workforces to service industries. Current evidence supports a spectrum of possible regional development outcomes in the future, ranging at the extremes from limited regional development through to substantial regional development (Box 3; Figure 9).

2.7.2 Extent of technology advancement and uptake across the sector

There is a consensus among authors that technological developments will be a key driver of the future workforce needs of the agriculture industry (Houghton 2019; Regional Australia Institute 2018; Pratley 2017b; Leonard et al. 2017) and the broader economy (World Economic Forum 2019; Taylor et al. 2017; Hajkowicz et al. 2016). Technology has already led to significant changes in farming systems and this could potentially continue, producing significant effects on the size, demographics and skills of the agricultural workforce. As a guide to potential scale of benefits the Accelerating Precision to Decision Agriculture (P2D) project the implementation of digital agriculture across all Australian production sectors could lift the gross value of

agricultural (including forestry, and fisheries and aquaculture) production by \$20.3 billion (a 25% increase on 2014-15 levels; Leonard et al. 2017).

Box 3 Future regional development

Evidence supporting limited regional development

- consolidation of the agricultural sector, leading to high exit rates among agricultural employees
- rural out-migration of young people, driven by a combination of lifestyle and economic factors
- recent migrants to Australia tend to reside in urban areas
- declines in key services in regional communities, making in-migration less likely

Evidence supporting substantial regional development

- housing price pressure and congestion in Australian capital cities could drive regional migration
- Australian Government policies support regional migration and infrastructure investment
- the increased popularity of teleworking, making regional living more feasible for many professionals.

Source: Wu et al. 2019.

The current evidence considered by Wu (et al. 2019) supports a spectrum of possible outcomes regarding the future development of technology and uptake in the agriculture sector, ranging at the extremes from limited development and adoption of agriculture technology through to substantial development and adoption (Box 4; Figure 9).

Box 4 Future technological advancement

Evidence supporting limited advancement

- many farms have poor internet access
- relatively low domestic spending on R&D
- barriers to adoption, including difficulty in evaluating options and integrating technology into on-farm practices, cost and lack of skills.

Evidence supporting substantial advancement

- important advances in sensing and monitoring technology that allow improved management of agriculture resources
- investments in new agriculture platforms by large technology companies, such as Google
- improved overall farm productivity, from better decision making, new efficient production systems and reduced labour costs.

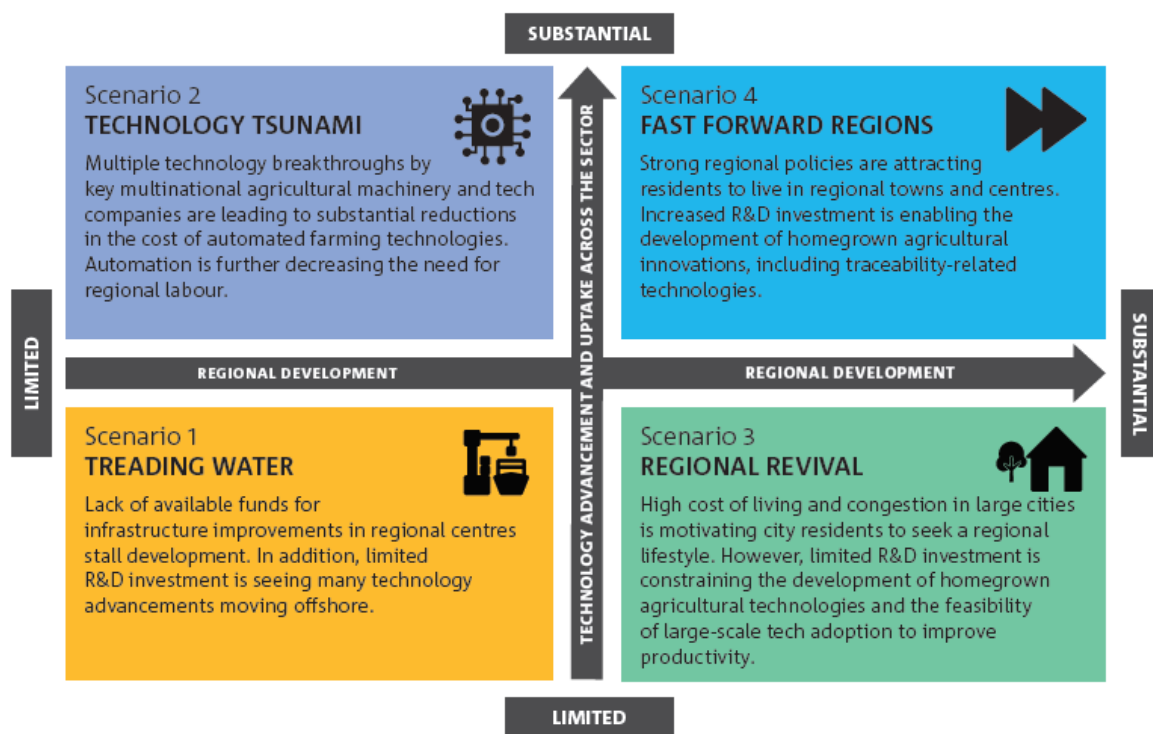
Source: Wu et al. 2019.

2.8 Farm businesses views on future labour issues

ABARES (Dufty, Martin & Zhao 2019; Dufty et al. 2018; Valle, Millist & Galeano 2017) has surveyed farm businesses about their future labour needs and issues. From this work the majority of farmers surveyed reported they did not expect any change to their businesses over the next five years. On average horticultural farms expected to require a similar number of

workers in five years (0-1% increase), cotton and broadacre farms expected 2% fewer workers and dairy farmers expected to have 5% fewer workers. This is likely to reflect low profitability in the dairy industry in recent years. With regard to future skills needs, farm businesses responded that farm managers would need to keep up with new work practices, technology and legislation. Access to appropriately experienced workers was a common problem as was the ability to attract people to remote locations and provide them with suitable accommodation.

Figure 9 Scenarios for the Australian agricultural workforce in 2030



Source: Wu et al. 2019

3 Agriculture in primary and secondary schools

Observations

- There is debate about the role the inclusion of agriculture related subject matter in primary and secondary schools can play in shaping students future career directions.
- Although including more agriculture related teaching materials in schools will not do any harm in terms of future workforce development, a question for policy makers and advisers is about the relative efficiency of additional public investment in this area, compared to other possible points of intervention aimed at achieving the same objective.
- Efforts to attempt to change how agricultural occupations are perceived will require a multi-faceted approach that engages both the individual and the broader socio-economic system and may not work.
- States and territories place different levels of focus on agriculture in their curricula. Giving agriculture greater prominence is difficult in a congested and competitive curriculum.
- Effective agricultural teaching resources, tailored to the needs of teachers, may provide long-term benefits to the agricultural industry and provide additional spill-over benefits to the broader education agenda in STEM, critical and creative thinking or entrepreneurship.
- Recent reviews suggest the need to strengthen careers advice and the transition from secondary school to work.

3.1 Introduction

A lack of understanding of what the modern agricultural industry entails could threaten the agricultural industry's ability to attract young people to work in the sector. This is particularly a risk if dated perceptions of agriculture as an industry and career path are too widely held in the community. To address this, the inclusion of more agriculture related teaching materials in schools has been proposed as a possible long-term mechanism to increase interest in agricultural careers. For example, in his review of agricultural education and training in NSW, Pratley (2013) recommended a suite of measures designed to strengthen agriculture's presence in NSW schools, including:

- New South Wales school systems, schools and TAFE NSW Institutes establish an "Agriculture and Food Week" within the annual school year to celebrate and appreciate the role that agriculture and food make to the health, wealth and wellbeing of society
- the Board of Studies NSW develops a 'Statement on teaching about agriculture in primary school', including guidance and advice for teachers about Key Learning Area opportunities and availability of resources
- the NSW Institute of Teachers, New South Wales universities and school authorities initiate a review of the training and ongoing professional development of primary teachers in science, including agriculture and food, to ensure that primary teachers have the

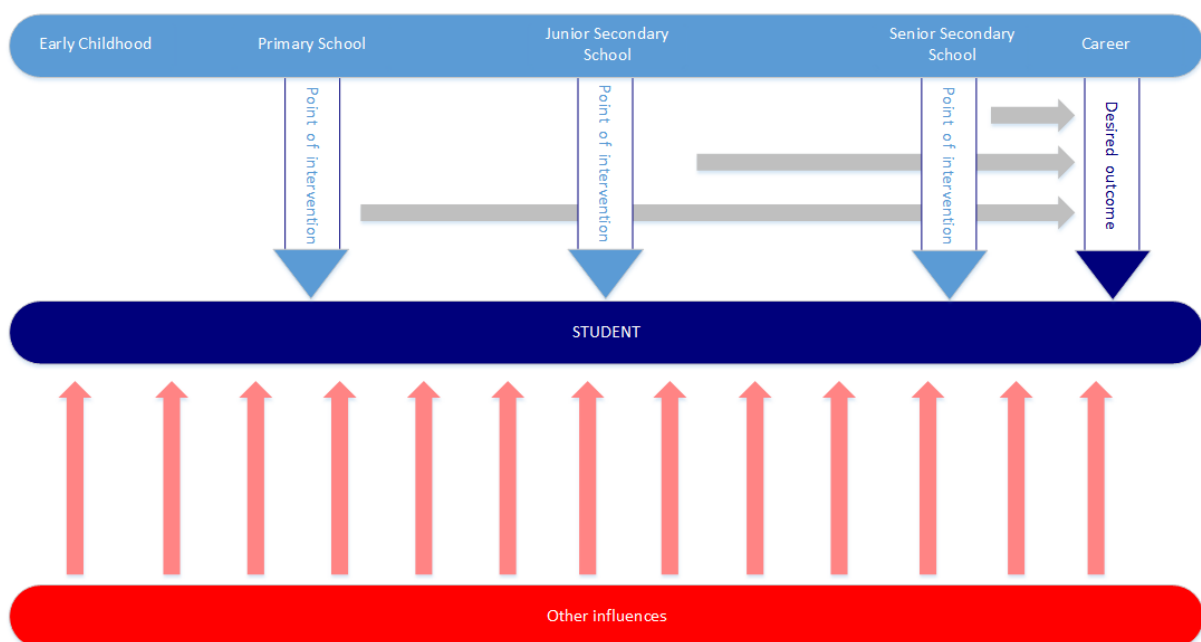
confidence, sufficient expertise and up-to-date knowledge to deliver quality science education in schools

- that in the teaching of Technology in each of Years 7 and 8 of secondary school, the NSW government ensure at least one content area be based on agriculture, food and fibre
- the NSW Institute of Teachers undertakes a review of the qualifications of teachers in agriculture and primary industries to determine future directions in recruitment to ensure strong depth of expertise in these areas
- that the agricultural high schools in New South Wales be considered 'specialist schools' for education and training in agriculture and primary industries for secondary students.

Although some authors support greater exposure of agriculture in schools, there is debate about the role the inclusion of agriculture in schools can play in shaping students future career direction. For example, Bray & Cay's (2018) review of food and fibre education in Australia and internationally found there was little evidence that including agriculture in the school curriculum led to increasing numbers of students undertaking post-secondary agriculture education and training.

This section will explore current approaches to the inclusion of agriculture in primary and secondary schools. Although including more agriculture related teaching materials in schools will not do any harm in terms of future workforce development, a question for policy makers and advisers is about the relative efficiency of additional public investment in this area, compared to other possible points of intervention aimed at achieving the same objective (Figure 10). This is particularly the case given the agriculture is only one sector of the economy, its workforce constitutes around 3% of the total workforce, and some roles have closer affinity to logistics or accountancy than production agriculture, fisheries and forestry.

Figure 10 Amount of time and effect of other influences between points of intervention and desired outcome



3.2 A suite of factors influence young people's career decisions

There is an extensive literature base that seeks to explain the process of vocational choice and vocational development, which has its origins in human psychology and sociology (Leung 2008). The significance of a person's early childhood years is common among many of the major career development theories (Maree 2017). For example, Super's Self-concept Theory (1990), one of the most recognised career choice and development theories, considers career development as an ongoing process that begins in the early years of a person's life and lasts for the duration of their lifespan (Table 5). During the growth stage, children develop their self-concept as they explore their environment and meeting important adult role models and develop interests, autonomy, self-esteem and a sense of future. In the next stage, exploration, people narrow their vocational interests in order to make a career choice, based on decisions about their needs, interests and abilities.

Table 5 Super's five career development stages

Stage	Age	Characteristics
1: Growth	0-14	Development of self-concept, attitudes, needs and general world of work.
2: Exploration	15-24	"Trying out" through classes, work experience, hobbies. Tentative choice and skill development.
3: Establishment	25-44	Entry-level skill building and stabilisation through work experience
4: Maintenance	45-64	Continual adjustment process to improve position
5: Decline / disengagement	65+	Reduced output, prepare for retirement

Source: Careers New Zealand, 2012

Patton & McMahon (1999; 2006) attempted to unify multiple career theories into a single overarching theory, based on the individual and their social and environmental context. The characteristics of the individual and social and environmental-societal system that influence career decision making according to this theory are listed below, under characteristics of the individual and broader context that influence career decision making. In addition to these characteristics, the theory also recognises discontinuous change within a person's career, the nonlinearity of a person's career over time and the role of chance or unpredictability of influences within each system (Patton 2008).

The factors that influence career decision making are complicated and multi-faceted. Efforts to attempt to change how certain occupations are perceived will require a multi-faceted approach that engages both the individual and the broader system. It also requires the need to confront that some occupations are perceived unfavourably, because they are unfavourable (Bray & Cay 2018) and that changes to workplace conditions, and not just career marketing, may be required to improve these circumstances. For example, in considering the challenge of attracting and retaining staff to the New Zealand dairy industry, Eastwood (et al. 2018) suggested that future dairy farms needed to be designed around people to increase the desirability of dairying as a career.

Box 5 Career decision making influences

The individual system

- gender
- skills
- values
- personality
- health
- world-of-work knowledge
- sexual orientation
- age
- disability
- self-concept
- ability
- physical attributes
- interests
- ethnicity
- beliefs
- aptitude

The social system

- family
- peers
- community groups
- education institutions
- media
- workplace

The environmental-societal system

- political decisions
- historical trends
- employment market
- geographic location

Source: Patton 2008.

3.2.1 A similar suite of factors influence young people's decisions to pursue agriculture careers

In addition to research on factors that influence career choice generally, factors that influence the choice of agriculture as a career have been studied internationally. The results of these studies largely conform with research into career choice more generally, emphasising that a range of individual, social and broader factors influence this choice, for example:

- Thompson and Russell's (1993) study of high school juniors in Illinois found that the beliefs of parents and career counsellors were influential to student's future plans to study agriculture
- Jones and Larke's (2003) study of African American and Hispanic agriculture graduates from Texas A&M university found that having a father whose occupation was agriculture-related strongly increased the likelihood that the child will pursue an agriculture related career as well (and vice versa). This study also highlighted the importance of role models of the same ethnicity and pay and conditions in career decision making
- Conroy, Scanlon and Kelsey's (1998) study of secondary school students in a rural American school district found students were more likely to select an agriculture occupation if their fathers worked in a farming job (possibly reflecting the student's lower socio-economic status) and males were more likely to select an agricultural occupation than females
- Esters' (2008) study of 312 student enrolled in agriculture at Iowa State University found that facilitating career exploration could be a priority to facilitate young people making an informed career choice. This includes encouraging students to explore their own skills, interests, values and personality characteristics and ensuring appropriate information is available on occupations, jobs and organisations
- Hamill's (2012) study of young people in regional Victoria found that training providers, employers and parents provided the strongest positive influences on a student's decision to undertake a career in agriculture. Hamill also observed that students from a farming family that had experienced financial hardship were less interested in farming as an employment option.

Observing the range of factors that affect young people's career choice, Bray & Cay (2018) noted that no single intervention with food and fibre production, for example only at school, was likely to be enough to engage a young person in food and fibre to consider it as a career choice. This explains why a child from an urban area, with no family members working in the agriculture sector would be less likely to consider a career in the sector than a child from a rural area with family members working in the sector, who is frequently exposed to the importance of the sector outside of school (Bray & Cay 2018).

3.3 Students' view of agriculture as a career

Studies on Australian student's views of agriculture as a career are scant and have produced divergent results. Hillman & Buckley (2011) surveyed 213 grade six students and 687 grade ten students nationally to assess their knowledge of primary industries. The survey found the majority of grade 10 students had heard of many of the careers presented to them in primary industries and 20% of these students were studying a subject related to the area. More than two-thirds of grade 10 students reported being able to access information about careers in the

primary industries. Approximately 16% of the older students had considered a career in the area.

Conversely, a recent survey of 512 year 9-12 and first year university students in Western Australia found many were unaware of the diverse array of career paths in agriculture (YouthInsight 2017). The report concluded that careers in agriculture were ‘so far off their radar’ (Table 6) and that they needed to be actively promoted to students through a suite of channels (YouthInsight 2017).

Table 6 Student answers when asked — ‘Which of the following types of jobs do you think are currently available in the agriculture industry?’

Job/profession	Student response
Farm hand	78%
Drone operator	40%
Marketing and advertising	34%
Accountant	26%
Lawyer	19%

Source: YouthInsight 2017.

3.4 Agriculture in the Australian curriculum

The Australian Curriculum was developed by the Australian Curriculum, Assessment and Reporting Authority (ACARA), the independent statutory body that conducts national assessment and reporting, and develops, monitors, and revises the curriculum. The Australian Curriculum was agreed upon by all education ministers in 2015 and is being implemented by the states and territories who have constitutional authority over education in Australia (ACARA 2019a). The curriculum prescribes high level content and achievements standards; however, there is significant flexibility in how states, territories, schools and teachers deliver these to students (DET 2018a).

The curriculum includes eight learning areas: English, Mathematics, Humanities and Social Sciences, Health and Physical Education, Technologies, Arts, Languages and Science. It also includes seven general capabilities (literacy, numeracy, information and communications technology capability, critical and creative thinking, personal and social capability, ethical understanding and intercultural understanding) and three cross-curriculum priorities: Asia and Australia’s engagement with Asia, Aboriginal and Torres Strait Islander histories and cultures, and sustainability (DET 2018a).

3.4.1 Agriculture features in the curriculum through the ‘Food and Fibre’ theme

In 2012 ACARA identified a need to refocus the agriculture curriculum through the lens of food and fibre production, in response to submissions received from agriculture industry organisations.

Since then, a significant body of teaching resources from foundation to Year 10 has been developed for the Food and Fibre curriculum connection to show how ‘food and fibre connections provide a framework for all young Australians to understand and value primary industries’. The Food and Fibre curriculum connection provides materials developed in consultation with representatives of primary industries including Primary Industries Education Foundation Australia (PIEFA), for use in teaching the curriculum through an agricultural lens, and covers key processes of production, consumption, use and marketing of resources and ‘paddock to plate’ or ‘forest to building’ concepts (ACARA 2019b; ACARA 2017).

A number of online repositories, such as Scootle (developed by Education Services Australia) (Box 6) and Primezone (developed by the PIEFA), contain curriculum resources developed by various organisations. ACARA does not endorse external material used to deliver the curriculum, meaning producers of material must self-assess its curricular alignment.

Box 6 Sources of agriculture teaching resources

Scootle

Scootle is a national digital database of teaching resources aligned to the Australian Curriculum. It was developed in consultation with state and territory governments with the aim of ensuring all Australian schools have equal access to content. Access to material is open to all Australian educators, from preschool to principals (Scootle 2019).

Currently, Scootle hosts over 20,000 resources ranging from interactive multimedia to work samples and curriculum resources. The search term ‘agriculture’ returns approximately 1300 results and ‘farming’ 1500 results at the time of writing this report, ranging from fact sheets on water resources and food production in California to assessment items on responsible fishing.

Primezone

The Primezone website is a PIEFA initiative. It provides teachers with single-point access to a range of primary industries education resources that have been developed by PIEFA, state government agriculture departments and Rural Research and Development Corporations. It contains around 500 individual learning resources and had around 300,000 resource download in 2017–18.

Source: Scootle 2019; PIEFA 2016.

ACARA regularly assesses and revises the curriculum, with yearly reporting and five-yearly independent reviews. The latest independent review and curriculum endorsement was in 2015, and the next is due in 2020.

3.4.2 States and territories place different levels of focus on agriculture in their curricula

To date, states and territories have implemented the Australian Curriculum in different ways across Australia. For example, while South Australia, Northern Territory, Tasmania and Queensland all deliver the curriculum as-is in their respective jurisdictions, New South Wales, Victoria and Western Australia deliver curricula that integrate elements of the Australian Curriculum with other content.

Tasmania’s ‘Grow, Make, Protect’ framework has been developed to put agriculture back in the school curriculum, through identifying key curricular units, links between industry, producers

and schools, and providing teacher support from Kindergarten to Year 12 (TAEN 2018). Additionally, the state has developed two accredited Year 11 and 12 courses for Agricultural Enterprise and Agricultural Systems. The 'Revitalising School Farms' initiative will provide an additional 10 staff for agricultural teaching in the state, alongside funding to upgrade existing school farms and establish 'hub schools' as models for agriculture education in the state.

In NSW, following the recommendations of Pratley (2013), NSW Education Standards Authority (NESA) has begun deploying a program incorporating agriculture into the mandatory technology syllabus of years 7 and 8 for 2019. The state has sought to increase the teaching of agriculture throughout primary and secondary school, exploring it in the science and technology syllabus in primary school, followed by the mandatory technology learning in years 7 and 8. It is intended to lead to greater enrolment in the year 9 and 10 agriculture elective subject, and primary industries studies at the High School Certificate (HSC) in years 11 and 12.

In Western Australia food and fibre is an optional subject in the design and technologies syllabus, with technologies being a mandatory area of study in Years 7-10. Two elective courses, in animal production systems and plant production systems, are also part of the Year 11 and 12 syllabus.

Consultation with the Northern Territory Department of Primary Industry and Resources revealed agricultural education in the Northern Territory occurs on an ad-hoc basis, most often linked to teachers who have a direct interest in the subject matter. Several schools also run Certificate I-III courses in rural operations across the Northern Territory.

Victoria currently includes several agricultural units in the Victorian Certificate of Education (VCE) Agricultural and Horticultural Studies, which is an element in the technologies pathway.

South Australia draws upon the National Curriculum for primary school and middle school and offers elective courses Agriculture (Year 11) and Agricultural Production and Agricultural Systems (Year 12) in the South Australian Certificate of Education (SACE). The SACE Board advised that in 2019 28 schools offered Agricultural Production and eight schools offer Agricultural Systems.

In Queensland, Agricultural Science and Agricultural Practices are included as units in the Senior Secondary Syllabus. Queensland has initiated its Agribusiness Gateway to Industry Schools Program (AGSIP) and Agriculture Schools Program to strengthen the delivery of agriculture related projects in participating schools. In 2019, 32 schools participated, undertaking a range of projects that exposed students to various aspects of the agricultural supply chain including: cropping, husbandry, data analysis, research, logistics, marketing and business management (QDAF 2019).

3.4.3 Agriculture-specific high schools

Agricultural high schools have a long history in Australia, providing education to students in an agriculturally-focussed curriculum. Today, these schools offer specialist agricultural education alongside the compulsory school curriculum. The structure of these schools is diverse, offering agricultural study in different forms. Some schools require compulsory study of agriculture from Year 7-12, others require compulsory study in Years 7 and/or 8, with the option to continue

further study as an elective. In comparison some agricultural colleges, for example the WA Colleges of Agriculture, only offer programs for Years 10, 11 and 12.

There are also several urban based high schools across the country. In NSW there are James Ruse Agricultural High School (Sydney) and Hurlstone Agricultural High School (Sydney), in addition to the regional Farrer Memorial Agricultural High School (Tamworth), and Yanco Agricultural High School (Riverina, NSW Department of Education 2019). At James Ruse, agriculture is a compulsory accelerated course for Years 7 to 10 and is optional for all students in Year 11. The school farm provides a hands-on environment where students are able to observe and actively participate in its running. A further seven high schools in New South Wales are designated agricultural 'light house' schools (Colo, Junee, Kempsey, Mount View, Murrumburrah, Pittwater and Tumut), which show-case best practice agricultural education and provide a platform for teacher and student teacher development (Pratley & Archer 2017).

Other agricultural high schools are located in South Australia (Urrbrae), Western Australia (Cunderdin, Denmark, Harvey, Morawa and Narrogin; WA Department of Education 2020). Tasmania has a network of 15 high school farms (Burnie; Cressy, Exeter, Hagley, Jordan River, Lilydale, Oatlands, Scottsdale, Sheffield, Sorell, St Mary's, Tasman, Winnaleah, Wynyard and Yolla; Tasmanian Government 2018). A number of high schools in Queensland have a strong agricultural focus (for example Dalby State High School; Rockhampton Grammar School), but are not formally known as agricultural high schools (QLD Department of Education 2020; RGS n.d.). Conversely, a number of agricultural high schools were originally established in Victoria, but their focus on agriculture has diminished over time.

3.5 Agriculture's prominence in the competitive curriculum

The addition of Food and Fibre in the Australian Curriculum has marked a turning point for the inclusion of agriculture in the national learning agenda. While tempting to suggest further work be undertaken to add agriculture content in Australian schools, even strong supporters of the inclusion of agriculture in the education system have noted constraints on the extent to which agriculture could expect to feature on the school curriculum into the future. For instance Pratley's (2013) review of agricultural education and training in New South Wales acknowledged 'it is unrealistic to expect that more and more information can be added to an already overcrowded curriculum or that there will be a special subject or stream provided for agriculture. In any case, it is an important principle that food and fibre become part of mainstream education rather than an adjunct to it'.

3.6 Better design of educational resources could support greater use by teachers

As an alternative to increasing the emphasis on agriculture in the Australian Curriculum, greater inclusion of agriculture in schools could be achieved by supporting the use of educational resources by teachers. Whilst it is evident that there is no shortage of resources existing for teachers in the field of agriculture (Box 6; Table 7), it is somewhat unclear as to whether these are being effectively used.

Bray, Cay & Allen (pending, in Bray & Cay 2018) identified that 75% of teachers they surveyed did not use agricultural education resources in their classroom. Greater use of agriculture related teaching resources could be achieved by:

- updating teaching materials to make them accessible or more user friendly to teachers to encourage greater use of the resources in schools
- updating materials so they support broader strategic objectives of the education system, such as promoting the delivery of STEM subjects or critical and creative thinking
- providing greater support to teachers to use the available resources.

Table 7 Range of industry resources available to teachers

Resource type	Example
Activity and fact sheets	Australian Melon Association - Crosswords, word searches, fact sheets and recipes for children
Videos	Canegrowers - Two videos detailing the 'paddock to plate' process and 'minimising runoff'
Games	Meat and Livestock Australia - Interactive board game designed for small groups to test their knowledge of sheep and cattle farming using a computer or smart device
Interactive programs	Cows Create Careers - (Box 7)
Competitions	Royal Agricultural Society of NSW - School poultry, pig and goat competitions, flower and garden competitions
Excursions	AgForce Ag Inspirations – students interested in agriculture visit agribusiness employers on site
Comprehensive education packs including lesson plans, videos, websites and demonstration kits	Cotton Australia - Two education kits available including a senior secondary education kit - which includes videos, websites, research, case studies, lessons and units; and a sampler kit - which includes a seed planting kit, brochures and cotton samples

3.6.1 Accessibility and relevance of agricultural content is key

Ensuring teaching resources are accessible, practical and relevant is critical if teachers are to use the resources in the classroom. Despite Food and Fibre featuring prominently in the curriculum, and the plethora of materials available to support teaching and learning about agriculture, anecdotal evidence suggests the way this information is provided can be overwhelming and inaccessible for teachers. Teachers may also preference working with topics with which they have some familiarity, reducing the frequency of agricultural material being utilised in the classroom (Bray & Cay 2018).

3.6.2 Lack of teacher support is a key barrier to delivery

The development of educational resources alone is not enough to impact the Australian school education system. Hillman and Buckley (2011) found that 85% of primary and secondary teachers did not study any primary industries subjects while at university, which results in a lack of familiarity with the topic. Teachers identified that they do not have the background knowledge or confidence to be able to teach the content, nor the resources or agronomic support (Bray, Cay & Allen pending, in Bray & Cay 2018). Therefore, teachers require support and engagement, including professional development, to deliver agriculture based education in their classrooms (Bray, Cay & Allen pending, in Bray & Cay 2018). Alternatively, digitally enabled resources or other forms of support are required that reduce the amount of content

knowledge needed by teachers. Dairy Australia's 'Cows Create Careers' program, detailed in Box 7 is an example of targeted teacher support, with significant voluntary support from dairy farmers in delivering the initiative.

3.6.3 Elements of effective education resources

The Education Council established the STEM Partnerships Forum as a national collaborative action under the National STEM School Education Strategy 2016-2026. This had the aim of facilitating a more strategic approach to school-based partnerships with industry to develop the engagement, aspiration, capability and attainment of students with STEM. The resulting report (ESA 2018) identified a number of common elements shared by successful STEM programs, which could be used to identify best-practice examples. These elements are:

- 1) scale to ensure that effective approaches are implemented broadly, to deliver efficiencies and make high quality programs accessible to a greater number of students.
- 2) a single point of contact for industry to work with a large number of schools to make the partnership easy for industry to engage with and work with a large number of schools or students.
- 3) integrated teacher professional learning to deliver longer term benefits to the teaching workforce
- 4) real world context to connect STEM education to real world experiences and improve student understanding of the different types of pathways they can take towards a STEM career
- 5) alignment with the Australian Curriculum to ensure that schools are not having to crowd out other areas of the curriculum in order to deliver engaging STEM programs in the mathematics, science and digital technologies learning areas.

Examples of two contemporary projects designed to engage student in agriculture are presented in Box 7. Dairy Australia's Cows Create Careers project is specifically designed to promote dairy industry careers for students. It is an enduring and large scale project that well supported by industry and participating schools. AgriFutures-startup.business Learning in Action project uses agriculture as a vehicle to support entrepreneurial skills that are aligned with general capabilities identified in the Australian Curriculum.

Box 7 Examples of projects designed to engage students in agriculture

Dairy Australia's Cows Create Careers – Farm Module

Cows Create Careers is a Dairy Australia program designed to promote dairy industry careers and industry education to students in years 7-11 by:

- introducing students to the education opportunities for both vocational and university pathways
- involving dairy farmers and industry advocates who have vision and dairy industry knowledge to encourage and support students with the project
- supporting students in making their careers decisions by providing and creating linkages to the education and employment sectors
- rewarding successful students and schools.

Box 7 continued.

14,525 students from 259 schools and 535 dairy farmers / industry advocates were involved in the initiative in 2018. 90% of students have a greater knowledge of where to find information about careers in the dairy industry. 490 students said they would like a career in the dairy industry when they left school and 1,762 students expressed interest in dairy as an option.

Since 2004, over 100,000 students have been involved in Cows Create Careers – Farm Module project

AgriFutures startup.business Learning in Action – Pilot Program

AgriFutures Australia partnered with startup.business in 2018 to launch an entrepreneurial learning program for high school students focusing on solving problems or creating efficiencies in rural industries.

Startup.business already delivered entrepreneurial learning programs to high school students and are experts in designing and implementing these programs with success.

Identifying the need to start attracting people into careers in agriculture earlier than at a tertiary level, AgriFutures Australia partnered with startup.business to develop a Pilot Program to introduce innovation into the high school curriculum with an agricultural focus.

In 2018, 152 students from seven schools participated the AgriFutures startup.business Pilot Program.

Startup.business focuses on 4 elements when developing programs for young people to introduce them to elements of entrepreneurial thinking. In the Pilot Program, startup.business applied these learnings through an agricultural lens. These elements are:

- Career development – Programs for young people and emerging leaders that focus on building personal and professional skills
- Innovation – Programs that support innovation and technology, including incubators, start-up ventures and commercialising ideas
- Networking opportunities – Programs that support collaboration and provide opportunities to build professional networks
- Technical / industry skills – Programs that focus on building specific technical skills or promote connections within industry.

Source: Dairy Australia, pers. comm., May 2019; Agrifutures Australia, pers. comm., May 2019.

3.7 Career advice and pathway information

As noted earlier, school careers advisers can influence the careers students consider (Section 3.2). Career advisers and students can access information on agricultural careers from number of different sources – state governments, universities, industry bodies and RRDCs. However, research suggests that career advisers that are generally unfamiliar with the agriculture industry and the careers that it offers (Bray & Cay 2018). Industry stakeholders provided similar concerns about the ability of careers advisers to advise on VET careers to the recent Joyce review (2019; Section 5.6.1). The National Career Education Strategy (DET 2019), the Regional, Rural and Remote Tertiary Education Strategy (Naphthine et al. 2019) and reports by the Victorian Skills Commissioner (2017; 2019) also support the need to strengthen career advisory arrangements, including links to local employers.

To help overcome the ‘information asymmetry’ that exists between those intimately connected with the industry and those that are not, industry bodies and government agencies support a

suite of initiatives to actively provide information about agricultural occupations and career paths to prospective students. Some of these are presented in Box 8.

Box 8 Career information programs

Victoria Government – Mallee region

The Victorian government announced funding to create new skilled training cadetships for agriculture and horticulture in the Mallee region in response to a report from the Victorian Skills Commissioner (Mallee Regional Skills Demand Profile 2017). The skills delivered through this program are intended to facilitate career pathways for the recipients who are being encouraged to work on local farms. To ensure this objective is fulfilled, the Victorian Skills Commissioner has developed initiatives to strengthen engagement between local schools, vocational training colleges (particularly TAFEs) and growers in order to expose students to the work opportunities available in horticulture and allow growers to identify potential candidates more easily. Howe et al. (2019) suggested this is an initiative that industry and state and local governments could look to replicate elsewhere.

Queensland – School to Industry Partnership Program

The School to Industry Partnership Program (SIPP) was established in 2004 by AgForce Queensland to deliver school engagement programs and events across Queensland. The program aimed to show primary school students where their food and fibre comes from and expose high school students to the wealth of career opportunities in agriculture and related industries. These objectives are now delivered through the Agribusiness Gateway to Industry Schools – Extension Program.

CSIRO STEM Professionals in schools program

The CSIRO STEM Professionals in Schools program connects primary and secondary school teachers with STEM professionals from a broad range of industries. STEM professionals volunteer their time to support teachers to increase STEM skills, knowledge and confidence through a range of activities including mentoring, career talks and hands-on activities. An evaluation in 2015 found teachers report improved motivation and engagement in science and mathematics teaching and an increase in quality of student work, and STEM professionals report increased passion in their work and improved communication skills (*Building Productive Partnerships for STEM Education: Evaluating the model and outcomes of the Scientists and Mathematicians in Schools program 2015*).

Primary Industries Education Foundation Australia

The Primary Industries Education Foundation Australia (PIEFA) is a tripartite, not-for-profit company, formed through the collaboration of the Australian Government, primary industries organisations and the education sector. Through its Primezone website, PIEFA provides teachers with a single-point access to a range of primary industries education resources. Primezone can be searched by type of resource (video, worksheet, website etc), subject and year level.

PIEFA also coordinate workshops for teachers and support and promote the National Association of Agricultural Educators.

Knowing and Growing

Knowing and Growing is a joint initiative of the Primary Industries Education Foundation of Australia, the Royal Agricultural Society of NSW, and the NSW Department of Primary Industries. The aim of the program is to facilitate teaching about primary industries in schools by providing quality professional development for all teachers. Courses are delivered using a variety of methods including face to face workshops, online courses and blended learning and are endorsed by the NSW Education Standards Authority.

Source: Agforce n.d.; CSIRO n.d.; RASNSW 2018; PIEFA 2015.

While these programs undoubtedly have a number of important benefits for school students, teachers and university staff who are involved, there is a lack of evidence to suggest they are leading to a noticeable increase in the number of students selecting agriculture programs at university level (The Allen Consulting Group 2012).

Joyce (2019) noted that the volume of careers information, of variable quality, available through various sources was creating problems for prospective students. In response, the Joyce review recommended, and the government has supported, the establishment and funding a National Careers Institute, to provide a single authoritative government source of careers information, with a particular focus on marketing and promoting vocational careers. In addition to the set-up of the National Careers Institute, Joyce made a suite of seven further recommendations about the operation of the Institute.

4 Unaccredited education and training

Observations

- Historically, the delivery of unaccredited education and training courses has been widespread in the agriculture, fisheries and forestry sectors. Over the past 30 years this has transitioned to increased private sector delivery. These arrangements may need to be strengthened to better meet the needs of external advisers and farmers.

4.1 Introduction

Historically, the delivery of unaccredited education and training courses has been widespread in the agriculture, fisheries and forestry sectors. Unaccredited education and training courses do not contribute to qualifications in the Australian Qualifications Framework. Consistent with this, the Allen Consulting Group (2012) described extension programs of relatively short duration as being a distinguishing feature of education and training in agriculture.

Unaccredited education and training initiatives in the agriculture industry fall into two broad categories:

- technical advisory and extension services
- industry leadership and personal development programs with some initiatives falling into both categories (for example the Young Dairy Network Australia; Box 10).

There is no formal data on the number of participants that take part in unaccredited education and training programs in the agriculture industry.

4.2 Technical advisory and extension services

The agriculture, fisheries and forestry sectors and related service industries have a long-history of participating in unaccredited education and training provided by publicly-funded advisory and extension services. The primary aim of public investment in extension is for a specific change to occur more quickly and more effectively than it would otherwise due to market forces alone (Coutts 2015).

Advisory and extension services include:

- short presentations by advisers, researchers or other professionals at industry or community events, such as field days and industry updates
- 1-2 day short courses on narrowly defined subject areas
- on-going facilitation, training or business benchmarking provided to small groups of participants
- One-to-one advice on agronomy, animal health and business management, often on a fee for service basis.

Examples of some advisory and extension programs are provided in Box 9.

Over the past 30 years there has been a transition to increased private sector delivery of these services (Coutts, Koutsouris & Davis, 2019; Keogh et al, 2017; Parliament of Australia, 2007), as an outcome of decreased public sector delivery, coupled with increased private sector delivery. The University of Melbourne (2018) categorised the different advisory organisations based on predominant income source and categorized these as public, private (or private-commercial), industry or non-government/community (Table 8).

Table 8 Typology of advisory and extension service organisations in Australia

Type of organisation	Example organisations	Definition
Government	Commonwealth (national), State agriculture and environment departments; Local government and 'catchment' (regional) organisations	Public
Research and Development Corporations (RDCs)	Sugar Research Australia, Dairy Australia, Meat and Livestock Australia, Horticulture Innovation, Australian Pork Limited, Grains Research and Development Corporation, Cotton Research and Development Corporation.	Industry (public-private co-investment)
Product re-sellers/farm input suppliers	Fertiliser, seed, feed merchants;	Private-commercial
Independent (fee-for-service) advisers	Farm management consultants, agronomists, specialist advisers (e.g. veterinary surgeons, crop specialists, breeding, etc.)	Private-commercial
Farmer-owned information, advice and support organisations	Local productivity services, farming systems groups, farmer business groups, Landcare groups	Private
Processing companies	Processing companies' farmers supply associated with dairy, meat, cotton, grains industries (co-operatives/commercial)	Private-commercial
Other	Community organisations/philanthropic organisations	Third-sector, NGO

Source: University of Melbourne 2018.

4.2.1 Relationship to accredited education and training

Historically, agriculture advisory and extension courses have not been designed with reference to Australian Qualifications Framework. Some types of extension services (short course and longer-term group facilitation) could be compatible with the delivery of individual skill sets or longer form qualifications.

In his review of the VET system, Joyce (2019) noted a number of examples of industry and employers avoiding and working around the VET system to build new qualifications or private credentialing. This was interpreted as reflecting concerns about the difficulty of developing and formally accrediting a course through the VET system. In the agriculture context, the use of advisory or extension services has a long history and is not necessarily related to difficulty of developing courses through the VET system (although this may be the case). Moreover, as noted by the Australian Qualifications Framework Review (2019), unaccredited courses are likely to

be increasingly important to learning for up-skilling and re-skilling both within the workplace and through education and training providers. For example proprietary training provided by machinery manufacturers to mechanics.

Box 9 Examples of agriculture extension and advisory programs

The Australian Mungbean Association certified agronomist training

The Australian Mungbean Association, in conjunction with Queensland Department of Agriculture and Fisheries (DAF) and Pulse Australia, conduct upskilling courses for agronomists to provide them with the technical knowledge and practical skills required to assist growers achieve more reliable and profitable mungbean production. The certification consists of four steps:

- Two-day technical workshop addresses the key issues identified by the industry as the main pre-requisites for more reliable and profitable mungbean production.
- Detailed in-field monitoring of at least two commercial mungbean crops, where the agronomists must demonstrate that they can apply the technical skills and processes covered in the initial workshop. This is the auditable component of the course and the main prerequisite for certification within the industry guidelines.
- In-crop training sessions. Agronomists are further supported by in-crop training sessions on insect scouting techniques and management, as well as disease diagnosis.
- Ongoing technical support on current research and reassessment of best management practices within the mungbean industry. The network of certified agronomists is also kept informed of any new and emerging issues within the industry, e.g. new pesticide registrations or permits.

Resource Consulting Services (RCS) Grazing for Profit™ School

RCS, a private advisory and extension provider, provides a six and a half day grazing business management training course, Grazing for Profit™. The course costs \$4,000 for the first person of a family or business, excluding accommodation and some meal costs, with subsidised rates for additional family or business members. The average school is 25-35 participants with a maximum number capped at 48. The course covers business and personal goal setting, business and financial management, grazing management, drought preparedness and the principles of livestock nutrition and reproduction. More than 5,500 participants have attended the course over the past 30 years.

Private Forests Tasmania (PFT)

Private Forests Tasmania is a government authority with a legislated role to facilitate and expand the development of Tasmania's private forest resource in a manner which is consistent with sound forest and land management practices. PFT supports private forest owners by responding to their enquiries organising field days and market forums, development of planning tools and information services. The functions of Private Forests Tasmania are partially supported through a levy paid by private forest growers based on the net area of a forest operation permitted pursuant to the certification of a forest practices plan by the Forest Practices Authority.

Each year, more than 850 people contact PFT for assistance and advice on a range of matters relating to their forests or forestry in general. The type of assistance provided varies - ranging from verbal advice over the phone to field inspections that may take half a day, or more, often with further follow up required.

Source: Australian Mungbean Association, 2019; RCS 2019; PFT 2019

As noted by the OECD (2015), the progressive reliance of farm businesses on external advisers may compensate for any possible skills gap among farmers. Generally, these types of advisers

would be expected to hold bachelor level qualifications. However, these advisers require further education and training themselves to ensure they are up to date with the contemporary need of their clients. This further education can be provided through accredited or unaccredited training (Box 9).

In some instances, these further education mechanisms may need to be strengthened to better meet the contemporary needs of advisers. For example Ayre (2018) investigated ways to improve the private advisory sectors engagement with precision agriculture, in light of the unexpectedly slow uptake of precision agriculture technology by farmers and agricultural advisers. Ayre concluded that private sector advisers required greater support to confidently provide advice to their clients on new digital technologies and recommended two education and training initiatives be developed to provide this support:

- a typology of precision agriculture innovation challenges (common to agricultural sectors) to better target industry and government support for capacity building of private agricultural advisers through information provision, professional development and incentives for participation in R&D for precision agriculture
- a professional development package for private agricultural advisers to support knowledge and skills development in precision agriculture based on common issues such as data curation and management, remote sensing applications and new digital tools (i.e. drones).

A consortium of research and development corporations is examining what education and training will be required to increase the digital literacy of the agricultural workforce to address the digital capability skills gap. Based on this, a framework will be developed to guide the industry's investment in education and training programs to address that gap (Trindall 2019).

4.3 Industry leadership and personal development courses

In addition to technical training courses, a range of unaccredited training courses are provided in the area of industry leadership and personal development. These courses generally include between 12-15 participants per annum and are supported by industry representative bodies, RRDCs and non-for profit organisations. Examples of some of the courses are provided in Box 10.

The specific objectives of these courses and their structures vary. However, their broad aim is to encourage and support existing industry participants, to help retain them in the industry, offer them career development opportunities and encourage them to consider leadership roles in the future. Some programs have a particular focus on supporting young people or women in the sector.

Historically, these courses have not been designed with reference to Australian Qualifications Framework, although some courses (short course and longer-term group facilitation) could be compatible with the delivery of qualifications. For example, Hort Innovation has worked to establish a Global Masterclass program, which aligns to the Australian Government's higher education standards framework, with participants eligible to be awarded a Diploma in Horticultural Business (Box 12).

Box 10 Example industry leadership and personal development courses

Fisheries Research and Development Corporation National Seafood Industry Leadership Program (NSILP)

The ability to build leadership capability and enhance existing leadership capacity is a key focus for the Australian fishing and seafood industry organisations and businesses. 1 – 2 cohorts of up to 18 participants each year pass through the NSILP, which consists of a nine day course in the development of various leadership skills relevant to fishing and aquaculture in Australia.

The NSILP commenced in 2000 and has more than 250 Graduate Alumni that incorporate representatives of most industry sectors including individuals and organisations from indigenous, recreational, aquaculture and wild-caught sectors of the Australian seafood industry and community.

Wine Australia Future Leaders program

The Future Leaders program is funded by the sector and supported by Australian Vignerons, Wine Australia and Winemakers' Federation of Australia. The program is run every two years and is open to early to mid-career professionals from any section of the grape and wine industry. The course covers leadership skills, innovation, thought leadership, culture and sector impact, with presentations from world class speakers.

Since 2006 more than 100 people have graduated from the program, with 15 participants in the 2019 course.

National Farmers Federation, Diversity in Agriculture Leadership program

This program commenced in 2018 and aims to develop and empower aspiring female leaders to reach their potential. Ten women are taking part in the program in 2019. Each participant undertakes an almost five-month mentoring program with mentors who are already accomplished leaders and includes a two-day retreat in Canberra. The program is supported by a suite of public and private sector investors.

Young Dairy Network Australia

The Young Dairy Network Australia (YDNA) is a project of Dairy Australia that works across the regions to support local networks of young dairy farmers and employees. YDNA aims to support the next generation of young people in dairy to advance within the industry, building capabilities in strategy and innovation.

YDNA also provides support for young people to attend major industry events and assists in the delivery of leadership programs to the industry. Through YDNA, young people can:

- participate in YDNA activities including farm walks, social events, workshops, leadership programs and tours
- get involved in running your network and gain skills in leadership and organisation
- opportunities for support to attend national dairy events
- connect with other young farmers from other regions

Each regional network has local young farmers involved ensuring a regional focus. 2500 young people have taken part in the initiative since it started in 2013.

Source: Wine Australia 2019; Dairy Australia 2019; NFF 2018a; FRDC pers. comm., August 2019.

5 Vocational Education and Training (VET)

Observations

- VET funding is a shared responsibility between Commonwealth, state and territory governments, employers and individuals. The majority of VET activity is privately funded.
- Enrolments in programs under training packages relevant for agriculture, fisheries, forestry and related sectors have fallen since 2015. While all training package program enrolments fell over that period by 15%, program enrolments in agriculture training packages fell at a greater rate at almost 23%.
- The majority of program enrolments in the Agriculture, environmental and related studies FoE are in lower level VET qualifications: Certificate I to III. There has been a fall in enrolments across all levels of education in this field of education. However the fall has been greater for program enrolments in higher level qualifications – Certificate IV enrolments fell by 45% and Diploma or higher enrolments fell by 36%.
- The broad agriculture, environmental and related studies field of education experienced one of the largest drops in government funded program enrolments compared with the twelve other broad fields of education. Only program enrolments in the natural and physical sciences field of education and the engineering and related technologies field of education fell further (26 and 21% respectively from 2015 to 2018).
- The drop in government funded enrolments in agriculture related studies is actually larger than the data for the broad field of education indicates.
- Many issues around VET design and delivery in Australia are common across most industry sectors and have been investigated at length (see Section 5.6). The recent report *Strengthening Skills – Expert Review of Australia’s Vocational Education and Training System* (Joyce Review 2019) identifies many of these common issues. Further to these system-wide issues, authors have identified issues that are of particular importance to the agriculture sector, which result in the under-delivery of VET to the sector, either as a result of diminished incentives for providers to offer courses or for businesses to access training.

5.1 What is VET?

The Vocational Education and Training (VET) sector is the largest education sector, with an estimated 4.1 million students undertaking some form of VET training in 2018. Almost a quarter of the Australian population between 15 and 64 years were estimated as undertaking nationally recognised VET in 2018. Almost 42% of 15 to 19 year olds were estimated as participating in nationally recognised VET in 2018 (NCVER, 2019a).

The VET sector ‘trains people for jobs’ and is underpinned by the concept of work-based vocational learning (Joyce 2019). Vocational Education and Training (VET) covers a wide range of qualifications and training activities, which can include part-day employer-specific training, general-use courses such as first aid, year-long employment-related certificates,

apprenticeships, and post-graduate diplomas (Ey 2018). VET provides entry level qualifications for jobs as well as training to meet regulatory requirements (e.g. Responsible Service of Alcohol). VET also provides courses and qualifications to maintain skills, reskill and upskill – these may be full qualifications, units or units bundled into a skill set (e.g. Agriculture Chemical Skill Set). VET courses at the certificate IV, diploma and advanced diploma level can provide students with a pathway into the higher education sector. In addition to helping students meet job entry requirements, VET courses can also provide credit towards some higher education courses. It is also becoming increasingly common for higher education graduates to complete VET qualifications in order to gain practical, work-oriented skills to assist them to enter the workforce.

The bulk of VET qualifications enrolments fall within the range of AQF Level 2 (Certificate II) through to AQF Level 5 (Diploma).

Table 9 Australian Qualifications Framework (AQF) levels and providers

Level	Qualification	Providers	Volume of learning
1	Certificate I	VET, schools	Typically 0.5 – 1 year
2	Certificate II	VET, schools	Typically 0.5 – 1 year
3	Certificate III	VET, schools	Typically 1 – 2 years Up to 4 years may be required to achieve learning outcomes through a program of indentured training/employment (e.g. apprenticeship)
4	Certificate IV	VET	Typically 0.5 – 2 years Variations between short duration specialist qualifications that build on knowledge and skills already acquired and longer duration qualifications designed as entry level requirements
5	Diploma	VET	Typically 1 – 2 years
6	Advanced Diploma	VET	Typically 1.5 – 2 years
	Associate Degree	Universities	Typically 2 years
7	Bachelor Degree	Universities	Typically 3 – 4 years
8	Bachelor Honours Degree	Universities	Typically 1 year following a Bachelor Degree (may also be embedded in a Bachelor Degree, typically as an additional year)
	Graduate Certificate	Universities, some VET	Typically 0.5 – 1 year
	Graduate Diploma	Universities	Typically 1 – 2 years
9	Masters Degree	Universities	Typically 1 – 2 years
10	Doctoral Degree	Universities	Typically 3 – 4 years

Source: AQFC 2013.

Agriculture related training is available at every AQF level relevant to VET (Table 10).

Table 10 Examples of qualifications relevant to agriculture

Qualification level	Sample qualifications relevant to agriculture
Certificate I	Agrifood Operations Horticulture
Certificate II	Production Horticulture Wool Production Shearing
Certificate III	Agriculture Commercial composting Beekeeping Commercial Seed Processing
Certificate IV	Organic Farming Irrigation Management Pest Management
Diploma	Arboriculture Pork Production
Advanced Diploma	Agribusiness Management

Source: ASQA n.db.

5.2 VET is a national system; responsibility is shared

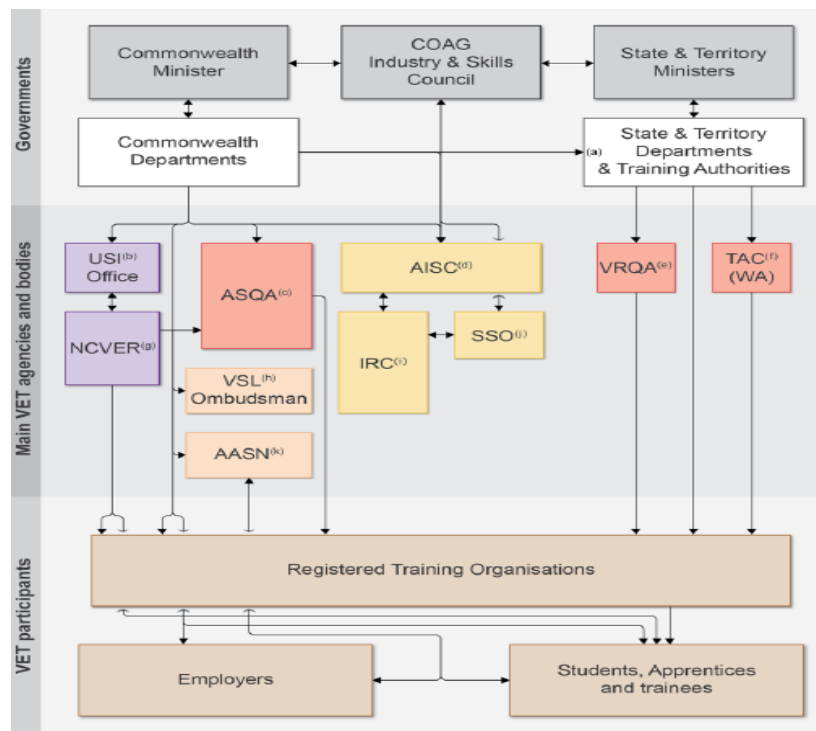
Commonwealth, state and territory governments and the private sector are jointly responsible for the national VET system (Figure 11).

The Council of Australian Governments (COAG) Industry Skills Council (CISC) has responsibility for intergovernmental arrangements governing the sector. The industry-expert based Australian Industry and Skills Committee (AISC) coordinates the development and review of training packages based on the advice of IRCs. The Australian Skills Quality Authority (ASQA) regulates the sector for all states and territories, alongside state-based regulators in Victoria and Western Australia (ASQA n.d.a).

5.2.1 National system of training

Training packages specify the knowledge and skills needed by people to perform jobs effectively. Training packages detail the units of competency (particular skills), skill sets (a combination of skill sets to form a small sub-qualification) and qualifications for an industry.

Industry Reference Committees (IRCs), which are made up of industry experts, oversee the development and review of training packages, supported by the relevant Skills Service Organisation (SSO). To ensure that industry's voice is heard, IRCs gather information from their industry sector – including challenges, opportunities, trends and industry requirements for training.

Figure 11 Governance arrangements for the VET system

(a) Commonwealth funding, (b) Unique Student Identifier, (c) Australian Skills Quality Authority, (d) Australia Industry and Skills Committee, each state and territory nominates an industry representative to the AISC (e) Victorian Registration & Qualifications Authority, (f) Training Accreditation Council (WA), (g) National Centre for Vocational Education Research, a Commonwealth, State and Territory Company (h) VET Student Loans (i) Industry Reference Committee, (j) Skills Service Organisations (K) Australian Apprenticeship Support Network (Joyce 2019).

5.2.2 Funding

VET funding is a shared responsibility between Commonwealth, state and territory governments, employers and individuals. The majority of VET activity is privately funded. In 2018 there were an estimated 4.06 million students enrolled in nationally recognised training. Around half of VET student undertook training in a short course (e.g. first aid) while the remainder were training in an AQF qualification (Joyce 2019). Around 1.2 million students were government funded, with a decrease of 7.3% in government funded student enrolments from 2015 (DESSFB 2019k). In addition, the Australian Government also support students to undertake higher-level VET courses through VET Student Loans which provide income contingent loans to students to help cover tuition fees for approved courses at approved providers.

States and territories are responsible for the delivery and operation of publicly funded VET in their own jurisdictions, including funding public RTOs and targeting training subsidies or grants to local training priorities (Joyce 2019; Ey 2018). Each state and territory has its own arrangements for subsidising training in its jurisdiction, including determining eligibility and subsidy rates, driven by local economic and social needs and differences in VET provider markets and the ways skill needs are assessed (DESSFB 2019k). In recent years, training subsidies and grants have become increasingly targeted to priority skills areas, support for first qualifications, those impacted by structural adjustment and/or people who need assistance to engage in training (Joyce 2019).

The majority of Commonwealth funding for VET is provided to states and territories to support their public training systems (\$1.54 billion in 2019-20; Commonwealth of Australia 2019b). A further \$1.15 billion will be spent in 2019-20 on direct programs (e.g. employer apprenticeship incentives) and system support (for example My Skills Website, National Centre for Vocational Education Research; Commonwealth of Australia 2019b). The other VET outlay for the Commonwealth is VET Student Loans; \$279 million was paid to approved course providers in respect of VET Student Loans in 2018 (Australian Government 2018).

Course eligible for a state/territory subsidy and/or VET Student Loans are presented on MySkills, the national directory of VET organisations and courses. Of the 137 courses classified on MySkills as relevant to the agriculture industry, 132 were eligible for state/territory subsidies and 17 were eligible for VET Student Loans. While all the courses at the Diploma and Advanced Diploma level are eligible for VET Student Loans, eligibility for state or territory subsidies varies considerably as illustrated in Table 11.

5.2.3 Vocational education and training providers

Only RTOs are able to provide nationally recognised training. RTOs are registered by the Australian Skills Quality Authority (ASQA) or the state regulator in Victoria and Western Australia if the provider is only delivering training in those states, to deliver nationally recognised VET (ASQA n.d.a).

Nationally recognised VET courses are offered through both public and private Registered Training Organisations (RTOs) – most commonly through TAFE institutes and private providers. They are also offered through schools, industry and professional associations and adult and community education centres.

As at 22 October 2019, there were a total of 4,121 RTOs. Of these, 75% were private training providers and around 9% were public RTOs (TAFEs, government schools, universities and enterprise RTOs). The remainder were other types of RTOs such as industry or professional associations, non-government schools and universities (DESSFB 2019i). In 2017, more than 60% of all VET students trained at a private RTO, and 16% at TAFEs. However, around 30% of students who were pursuing a VET qualification did so at a TAFE (Joyce 2019).

5.3 VET in schools

In addition to units within state and territory school syllabi, a range of VET initiatives exist for agriculture across Australia. The Expert Review of Australia's Vocational Education and Training System (Joyce 2019) notes that there is considerable debate about the objectives of VET for secondary students. Industry groups emphasise the importance of secondary school VET pathways in attracting people towards VET careers and encouraging them to pursue further training after school. Secondary school students in all states and territories can undertake nationally recognised VET courses (also known as VET in Schools courses) as part of their school program, usually in the senior years of schooling as part of the Senior Secondary Certificate of Education (SSCE) in each jurisdiction.

Table 11 Sample agriculture industry courses – subsidy and VET Student Loan eligibility

Course	Average course fee (not including subsidies)	States/territories that subsidise courses								Eligible for VET Student Loans
		NSW	VIC	QLD	SA	WA	TAS	ACT	NT	
Cert I in AgriFood Operations	Not available	No	Yes	No	No	No	No	No	No	
Cert I in Aquaculture	Not available	No	Yes	No	No	No	No	No	No	
Cert I in Horticulture	\$200	No	Yes	No	No	No	Yes	No	No	
Cert I in Conservation and Land Management	Not available	No	Yes	Yes	No	No	No	No	No	
Certificate II in Agriculture	\$3,500	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
Certificate II in Arboriculture	\$4,202	Yes	Yes	No	No	Yes	No	No	No	
Certificate II in Irrigation	Not available	No	Yes	No	No	No	No	No	No	
Certificate II in Meat Processing (Abattoirs)	Not available	Yes	No	No	No	No	No	No	No	Not applicable (loans are only available for eligible Diploma and above VET courses)
Certificate III in Agriculture (Dairy Production)	\$2,379	Yes	Yes	No	Yes	No	Yes	No	No	
Certificate III in Beekeeping	Not available	Yes	No	Yes	No	No	No	No	No	
Certificate III in Permaculture	Not available	Yes	Yes	No	No	No	No	No	No	
Certificate IV in Agribusiness	\$6,700	Yes	Yes	Yes	Yes	No	No	No	No	
Certificate IV in Agriculture	\$8,000	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	
Certificate IV in Organic Farming	\$10,318	Yes	Yes	No	Yes	No	No	No	No	
Certificate IV in Production Horticulture	\$4,350	Yes	Yes	No	Yes	No	No	No	No	
Certificate IV in Wool Classing	\$14,239	Yes	Yes	No	Yes	No	Yes	No	No	
Diploma of Agribusiness Management	\$11,000	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes
Diploma of Aquaculture	\$5,518	No	Yes	No	Yes	No	No	No	No	Yes
Diploma of Forest and Forest Products	Not available	Yes	Yes	No	Yes	No	No	No	No	Yes
Diploma of Horticulture	\$11,000	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Diploma of Pork Production	Not available	No	Yes	No	No	No	No	No	No	Yes
Diploma of Viticulture	\$9,708	Yes	Yes	No	No	No	No	No	No	Yes
Advanced Diploma of Horticulture	\$12,000	No	Yes	No	Yes	No	No	No	No	Yes

Source: DESSFB 2019j

Secondary students enrolled in VET include school-based apprentices and trainees. These are students who, as well as undertaking an accredited VET qualification as part of their school studies, have entered into a formal contract of part-time paid employment and training with an employer. Typically, these students undertake part of their traineeship or apprenticeship while at school and complete it once they have left school. On the other hand, schools and educationalists highlight the role VET can play in encouraging more students to stay in school and complete Year 12, possibly building their academic and technical capabilities at the same time.

VET courses inside and outside of secondary schools can provide the opportunity to acquire workplace skills and knowledge through nationally recognised qualifications from industry recognised training packages or accredited courses while still at school. This provides students interested in agriculture with opportunities to complete qualifications in Agriculture, Horticulture and Conservation and Land Management providing them with pathways into further training or university, an apprenticeship or traineeship, or moving

In 2017 (the most recent data publicly available), 413,000 young people aged 15-19 years, successfully completed at least one unit of competency as part of a VET qualification at Certificate II or above. This represents 27.9% of all 15-19 year olds in the Australian population (NCVER 2018).

Table 12 VET Qualifications completed by 15-19 year olds, 2017

Qualification level	Number completed
Certificate I	27,155
Certificate II	106,132
Certificate III	61,255
Certificate IV	11,028
Diploma or higher	12,133
Non-AQF	336
Total	218,039

Source: NCVER 2018.

Number of enrolments and number of qualifications should not be compared. Enrolments include students in their first, second or third year of a VET course and from multiple cohorts, whereas qualifications completed by secondary students are more likely to be issued in the final year of school. In addition, a secondary student may intend to complete only a partial qualification while at school. Students may also commence training between the ages of 15 and 19 and complete the qualification when they are no longer in this age group (NCVER 2018).

Table 13 Number of 15-19 year old students undertaking VET in Schools programs, 2017

Qualification	Number
School-based apprentices and trainees	19,900
Other VET in Schools program students	217,800
Total VET in Schools students	237,700

Source: NCVER 2018.

In the 2017 calendar year, there were 237,745 students aged 15–19 years enrolled in VET in Schools programs. Of these students:

- 53.9% were male and 46.0% were female.
- 14,310 (6.0%) identified as Indigenous.
- The majority (55.7%) were enrolled in Certificate II qualifications and a further 33.4% were enrolled in Certificate III qualifications.

- 8.4% were undertaking a school-based apprenticeship or traineeship.
- 68.6% were from government schools, 18.7% from Catholic schools and 10.4% from independent schools (NVCER 2018; this compares to the shares of school enrolments in Years 11 and 12 of 58.8%, 22.0% and 19.2% respectively).

Based on these data, it is estimated that approximately 45% of senior secondary students undertook one or more VET courses in 2017 as part of their Senior Secondary Certificate.

The most popular courses undertaken by secondary students were from training packages in Tourism, Travel and Hospitality followed by Sport, Fitness and Recreation, and Business Services.

5.4 Participation and outcomes

5.4.1 Enrolments in VET relevant to agriculture

Enrolments in programs under training packages relevant for agriculture, fisheries, forestry and related sectors have fallen since 2015 (Table 14; NCVER 2019e). While all training package program enrolments fell over that period by 15%, program enrolments in agriculture training packages fell at a greater rate at almost 23%.

The largest falls related to the Pulp and Paper Manufacturing Industry Training Package (fall of 100% with no enrolments in programs under the package in 2018) followed by the Forest and Wood Products Training Package (fall of 42% from 2015 to 2018). The smallest fall was for the Animal Care and Management Training Package with program enrolments dropping by 1% from 2015 to 2018.

5.4.2 VET program enrolments in the Agriculture, environmental and related studies FoE

The majority of program enrolments in the Agriculture, environmental and related studies FoE are in lower level VET qualifications: Certificate I to III. There has been a fall in enrolments across all levels of education in this field of education. However the fall has been greater for program enrolments in higher level qualifications – Certificate IV enrolments fell by 45% and Diploma or higher enrolments fell by 36% (NCVER 2019d).

Enrolments in programs in the agriculture, environmental and related studies have experienced a higher drop than over all VET program enrolments (23% compared to 15% from 2015 to 2018). The falls for program enrolments have been greater in the Agriculture, environmental and related studies than for total VET program enrolments by level of education.

However the drop in enrolments for diploma and above courses is reasonably similar (a fall of 34% for all VET program enrolments and a fall of 36% for enrolments at this level in the Agriculture, environmental and related studies FoE; Table 15). The fall in diploma and above enrolments across the board, reflects the closure of the VET-FEE HELP program which provided with no restrictions on the course eligible for such assistance. The replacement program, VET Student Loans, provides loans to students that enroll in an approved course with an approved provider.

Table 14 VET training packages relevant to agriculture

Training package	Training package components	Registered RTOs (a)	Enrolments in qualifications				Change in enrolments (2015 to 2019)	
			2015	2016	2017	2018	#	%
AHC – Agriculture, Horticulture, Conservation and Land Management	97 qualifications, 49 skills sets and 53 units of competency	643	70,793	70,799	69,288	53,480	-17,313	-24.46%
ACM – Animal Care and Management	26 qualifications, 233 units of competency and 10 skills sets		23,538	25,456	24,047	23,306	-232	-0.99%
AMP – Australian Meat Industry	26 qualifications, 60 skills sets, 443 units of competency	121	13,646	11,719	12,362	8,482	-5,164	-37.84%
FBP – Food, Beverage and Pharmaceutical	25 qualifications, 454 units of competency and 38 skills sets	396†	20,117	19,411	14,862	14,490	-5,627	-27.97%
FWP – Forest and Wood Products	25 qualifications, 31 skills sets and 328 units of competency	449	3,882	3,635	2,142	2,246	-1,636	-42.14%
PPM – Pulp and Paper Manufacturing Industry	7 qualifications, 10 skills sets and 80 units of competency	37	47	27	6	0	-47	-100.00%
RGR – Racing and Breeding	2 qualifications, 9 skills sets and 19 units of competency; 21 qualifications, 24 skills sets and 132 units of competency	62	2,148	1,594	1,403	1,415	-733	-34.12%
SFI – Seafood Industry	24 qualifications, 216 units of competency and 14 skills sets		1,421	1,380	1,377	1,072	-349	-24.56%
Total enrolments in agriculture Training Packages programs			135,592	134,021	125,487	104,491	-31,101	-22.94%
Total enrolments in Training Package programs			3,079,974	3,016,959	2,868,456	2,622,520	-457,454	-14.85%
Proportion of total Training Package enrolments in programs in Agriculture Training Packages			4.40%	4.44%	4.37%	3.98%	-	-

(a) not all registered RTOs currently provide training they are registered to deliver

(b) expected based on number delivering the superseded training package.

Source: AQSA n.d.b; NCVER 2019e.

Table 15 Program enrolments by in the agriculture, environmental and related studies broad field of education (FoE), 2015 to 2018

Program enrolments	2015	2016	2017	2018	% change from 2015 to 2018
Total Agriculture, environmental and related studies FoE	80,552	80,678	77,615	61,934	-23%
Non-AQF	347	218	148	113	-67%
Certificate I/II	35,629	33,838	31,867	25,144	-29%
Certificate III	33,372	36,285	36,291	29,973	-10%
Certificate IV	5,382	4,331	3,812	2,955	-45%
Diploma or higher	5,822	6,006	5,497	3,749	-36%
Total VET	3,079,974	3,016,959	2,868,456	2,622,520	-15%
Non-AQF	154,754	210,910	189,883	203,082	31%
Certificate I/II	758,602	735,121	735,307	631,440	-17%
Certificate III	987,743	958,295	983,086	930,079	-6%
Certificate IV	539,299	494,101	454,690	438,096	-19%
Diploma or higher	639,576	618,532	505,490	419,823	-34%

Source: NCVER 2019d.

5.4.3 Government funded VET enrolments

Government funded enrolments in training programs in the Agriculture, environmental and related studies field of education have fallen from 50,000 to just over 40,000 in 2018. This 20% drop in government funded enrolments is not as high as that experienced for all enrolments in the Agriculture, environmental and related studies field of education, regardless of funding source (23%; NCVER 2019b).

However, the broad agriculture, environmental and related studies field of education experienced one of the largest drops in government funded program enrolments compared with the twelve other broad fields of education. Only program enrolments in the natural and physical sciences field of education and the engineering and related technologies field of education fell further (26 and 21% respectively from 2015 to 2018; NCVER 2019b).

Further, the drop in government funded enrolments in agriculture related studies is actually larger than the data for the broad field of education indicates. Enrolments in programs in the environmental studies narrow field of education that forms part of the parent Agriculture, environmental and related studies group grew by just over 25% from 2015 to 2018 nationally. This grow masks a larger drop of almost 26% in enrolments in programs in the narrow fields of education relating to agriculture, as Table 16 outlines.

Table 16 Government funded program enrolments in narrow fields of education within the Agriculture, environmental and related studies broad field of education, 2015 to 2018

Program field of education	2015	2016	2017	2018	Change from 2015 to 2018	% change from 2015 to 2018
0501 - Agriculture	18610	19190	17535	12320	-6290	-33.80%
0503 - Horticulture and viticulture	24070	23635	22650	18920	-5150	-21.40%
0505 - Forestry studies	735	710	410	490	-245	-33.33%
0507 - Fisheries studies	705	695	665	590	-115	-16.31%
0509 - Environmental studies	5860	5880	7615	7355	1495	25.51%
0599 - Other agriculture, environmental and related studies	140	325	585	590	450	321.43%
Total	50120	50435	49460	40265	-9855	-19.66%
Total (except for environmental studies)	44260	44555	41845	32910	-11350	-25.64%

Source: NCVER 2019c, data slicer

There have been large falls in government funded program enrolments in the narrow FoEs relating to agriculture for most states and territories, with enrolments only remaining reasonably stable for NSW. Historical data on subsidy arrangements is not readily available. Current course eligibility for subsidies is available on My Skills.

Table 17 Change in government funded program enrolments in narrow fields of education relevant to agriculture by state, 2015 to 2018.

State	Fall in program enrolments for narrow FoEs relating to agriculture (%)
WA	-44.28
Tas	-43.61
Vic	-34.84
SA	-36.41
NT	-30.39
QLD	-19.29
ACT	-17.57
NSW	-4.03

Note: Narrow fields of education relating to agriculture include: 0501 – Agriculture; 0503 – Horticulture and viticulture; 0505 – Forestry studies; 0507 – Fisheries studies; 0599 – Other agriculture, environmental and related studies.

Source: NCVER 2019c.

5.4.4 VET students outcomes

Median annual income for graduates of VET training in the agriculture, environment and related studies field of education in 2018 were:

- \$52,000 for students employed full-time after training (lowest was \$41,500 for students that did training in the creative arts and highest was \$63,800 for students that did training in engineering and related technologies)

\$44,000 for students employed in first full-time job started after training (lowest was \$38,600 for students that did training in creative arts and highest was \$51,200 for students that did training in the engineering and related technologies field of education) (NCVER 2019f).

Graduates of agriculture, environment and related studies had high employment outcomes when compared with training undertaken in other fields of education.

Table 18 VET graduate outcomes by Field of Education (FoE)

Outcome and satisfaction categories	Agriculture, environment and related studies FoE outcomes (%)	Lowest outcomes (%)	Highest outcomes (%)
Employed after training	83.7	41.1 (Mixed field programs FoE)	88.4 (Architecture and building FoE)
Improved employment status after training	64.1	30.3 (Mixed field programs FoE)	73.9 (Architecture and building FoE)
Employed or in further study	89.0	66.5 (Mixed field programs FoE)	91.7 (Architecture and building FoE)
Achieved their main reason for doing the training	88.2	72 (Information technology FoE)	89.0 (Education FoE)
Satisfied with the overall quality of training	87.3	83 (Information technology FoE)	88.4 (Society and culture FoE)

Source: NCVER 2019f.

5.5 Stakeholder comments on current arrangements

Many issues around VET design and delivery in Australia are common across most industry sectors and have been investigated at length (see Section 5.6). The recent report *Strengthening Skills – Expert Review of Australia’s Vocational Education and Training System* (Joyce Review 2019) identifies many of these common issues. Further to these system-wide issues, authors have identified issues that are of particular importance to the agriculture sector, which result in the under-delivery of VET to the sector, either as a result of diminished incentives for providers to offer courses or for businesses to access training.

The geographically dispersed nature of demand: the market for VET services to the agriculture sector is thin and geographically dispersed. Given the demand-driven nature of government subsidised training, private training providers are reluctant to run courses unless there is sufficient demand to guarantee an economic return. This can result in the mismatch in the delivery of training by RTOs and businesses demand for skills (NFF 2019, Skills Impact 2019; Meat Industry Reference Committee, 2019; Pratley & Archer 2017)

Cost of rural and remote delivery: People living in rural and remote areas are often unable to access and/or have a choice in quality training in the areas of need. Many part and full qualifications are not adequately subsidised when the true costs of remote delivery are considered, which decreases the incentive for service providers to offer these courses. This can leave the government funded TAFE sector to provide difficult or expensive courses (Pratley & Archer 2017).

Support for skills sets: to ensure the required skills for agribusinesses are supported by relevant training, there is an ongoing demand for short courses and just-in-time delivery relevant to singular businesses. Agriculture would benefit by funding policy that supports the delivery of bespoke training programs comprising one or more competencies, provided the competencies are contained in a training package and are relevant to the identified needs of the business (some examples are in Box 11).

Flexible training delivery: demand for traditional institution-based full qualification training is declining and has been impacting upon the viability of traditional providers for some time. At the same time industry is demanding skill sets – with delivery at a location within reasonable access to the place of operation – be it on-site; at a nearby property or in the nearest town centre (Skills Impact 2019). A blended model involving face-to-face, workplace-based and online access to interactive learning and assessment provides the flexibility required by agribusinesses.

Second chance training/training for lateral entry: considerable recruitment into agriculture is of persons 25 year old and over. Many of these workers hold existing qualifications in other areas of expertise (for example trade qualification, science degree). Due to the fact they already hold qualifications at Certificate III or above, they are often not eligible for subsidised training relevant to their new employment in the agriculture sector (NFF 2019). However, from a policy perspective, the issue of subsidies for training for people that are already established in the workforce raises some questions, particularly in relation to the level of subsidy (if any) for this training (Joyce 2019).

Access to quality trainers: Remote delivery and mobility of quality trainers is difficult in rural and regional areas. If they do exist they generally have a number of better paid options and less compliance requirements than required for accredited training. Employers already question the industry currency and understanding of Registered Training Organisations and their trainers – this perception will be exacerbated as technology and jobs evolve.

Greater workplace and industry participation: in their submissions to the Joyce review, both the NFF (2019) and Skills Impact (2019) expressed the desire for a greater recognition of the importance of workplace-based training in competency assessment. They contended that workplace experience was critical for the development of vocational skills and competencies and current arrangements did not adequately provide for this. Skills Impact (2019) also saw a greater potential role for farm-businesses in providing accredited training and assessing the competence of trainees. As noted by Joyce (2019) employer incentives for existing worker traineeships were removed due to employers claiming training subsidies for skills their employees already had.

5.6 Reviews and reforms to VET arrangements completed or underway

Substantial reviews of the national VET framework have recently been completed.

- The recent report *Strengthening Skills – Expert Review of Australia’s Vocational Education and Training System* (Joyce 2019) identifies many issues with current VET arrangements, including community perceptions of VET, and presents an integrated and broad-reaching set of recommendations for a future VET system.

- The Australian Government review of the AQF, which was completed in September 2019. On 9 December the Government accepted all the recommendations of the review in relation to higher education and accepted the aims of the recommendations of the review in relation to vocational education, contingent on further discussions with state and territory governments.

These reviews have consequences for the broad VET framework, with possible spillover consequences for the agricultural sector.

5.6.1 Joyce review

The Expert Review of Australia's Vocational Education and Training System (the Joyce Review) was commissioned in November 2018 to examine how the system can better deliver for Australian job-seekers and employers now and into the future.

The resulting report, released on 2 April 2019, observed that vocational education remained an effective and efficient way of imparting the skills needed for employment. It also noted that it was likely that work-based learning models will be more important in the future as technology-driven changes will require flexible and applied ways of learning, so people can lay strong foundations for their careers and then build further skills and knowledge in order to participate in new and changing industries (Joyce 2019). The key issues of concern with the VET sector raised with the review were:

- reputational damage resulting from poor provider behaviour, unduly short courses, the variable quality of training, combined with competition from the more prestigious university sector
- continuing variations in quality between providers, and concerns about the relationship between the regulator and providers
- a cumbersome qualifications system that is slow to respond to changes in industry skills needs
- a complicated and inconsistent funding system that is hard to understand and navigate, and which is not well matched to skills needs
- a lack of clear and useful information on vocational careers for prospective new entrants
- unclear secondary school pathways into the VET sector and a strong dominance of university pathways
- access issues for Aboriginal and Torres Strait Islander Peoples and second chance learners seeking skills that will help them obtain and stay in meaningful work.

The review contained 71 recommendations designed to address these key issues by:

- strengthening quality assurance
- speeding up qualification development
- simplifying funding and skills matching
- improving careers information
- clarifying secondary school pathways

- providing greater access for disadvantaged Australians.

The 2019-20 Commonwealth Budget (Australian Government 2019a) included a package of measures to address key recommendations of the review—the \$525.3 million Skills Package — Delivering Skills for Today and Tomorrow which included:

- Supporting up to 80,000 additional apprentices over five years in priority skill shortage areas through a new apprenticeship incentive and streamlining and simplifying incentives for apprenticeships (\$156.3 million over four years from 2019-20 and an additional \$108.0 million in 2023-24)
- \$48.3 million to establish a National Skills Commission to oversee the Australian Government’s investment in VET. The Commission will examine options for a nationally consistent approach to funding VET qualifications
- \$41.7 million to pilot new industry-owned Skills Organisations in the growth areas of human services and digital technologies. The Skills Organisation Pilots will drive innovative ‘end-to-end’ training solutions and enhance the role and leadership of industry in the national training system
- \$42.4 million to establish a National Careers Institute and Careers Ambassador to simplify and strengthen careers development information, including administering a grants program to enhance career education and service gaps, foster innovation and cultivate partnerships between industry, employers, schools and tertiary providers
- \$50.6 million to trial Training Hubs in 10 regions across Australia with high youth unemployment to improve opportunities for young people in these regions by supporting linkages between schools, VET providers and local industry
- \$62.4 million to fund a Foundation Skills for Your Future Program and Remote Community Pilots to support people to identify language, literacy, numeracy and digital skills deficits to access training, including targeted remote and indigenous communities
- \$8.2 million for a Commonwealth Training Scholarships for Young Australians to undertake VET in 10 regional areas experiencing high unemployment.

5.7 State government and industry initiatives

State governments and industry bodies have introduced programs or tailored initiatives to address some of the challenges known to effect the delivery of VET to the agricultural sector (Section 5.5). Some of these initiatives are summarised in Box 8. Key features of these initiatives, which address the challenges observed in Section 5.5, include:

- industry and/or government’s funding or co-funding for the delivery of priority courses for industry, which addresses concerns about courses not being offered due to a lack of guaranteed economic return for training providers and the cost of regional delivery
- funding for people to complete part-qualifications or short-courses, which addresses concerns about the need for support for training in skills sets and to support to assist mature age workers through careers transitions. Along similar lines, the Queensland Government’s Skills for Queensland initiative a three year micro-credentialing pilot will

design and deliver non-accredited, industry-led skills sets that address the immediate need for workforce skills (QDESTB 2019)

- supporting greater industry participation in training delivery, including supportive innovative and flexible delivery models.

Box 11 Agriculture industry VET initiatives

Dairy Learn –Dairy Australia

Dairy Learn was introduced by Dairy Australia in 2018, replacing the previous National Centre for Dairy Education. Its goal is to maximize the opportunity for all dairy learners in Australia to participate in high quality learning experiences, which will allow our people to develop the skills, knowledge and experience they need to support personal growth, career success and industry profitability.

Dairy Learn allows a broader range of education and learning activities to be offered and provides greater access to providers in the vocational, tertiary, and school based sectors of the industry. It provides extension / education providers direct access to the materials and technical support they require via a dedicated portal. This will ensure they have the best opportunity to provide high quality services to the dairy sector

Dairy Learn continues to develop with 14 RTOs participating in the network and delivering a range of extension (non-accredited) and accredited programs to the dairy industry. Dairy Learn has enabled the dairy industry to approach and engage the education sector with clarified offer, creating additional partnerships to be formed through an open network framework. It has also enabled RTOs to collaborate and increase reach/delivery, improved the availability of dairy industry resources to providers and farmers and diversified approaches to capability development within the dairy industry. However, there have been some challenges to bring together a competitive group of organisations in often thin markets, where funding can be insecure.

NSW Government’s AgSkilled program – a training partnership with the cotton and grains industries

AgSkilled is a direct partnership between Cotton Australian, the Grains Research and Development Corporation and the NSW Government which is investing \$14.7 million over three years for vocational training for the cotton and grains industries. This is being administered through NSW Government’s Smart and Skilled initiative and as part of its on-going reform of vocational education and the delivery of skills training. AgSkilled is administered as a specific stream under the existing part qualifications structure which delivered fully funded training to priority groups identified by Government. The project was announced December 2016 and commenced in July 2017.

Funding has been made available to on-farm staff and industry professionals including for:

- Nationally recognised full qualifications (Certificate I – Advanced Diploma Agriculture). These are partially subsidised to the same level as they are under the existing Smart and Skilled system.
- Fee-free part qualifications (from one unit up to half of a full qualification) for short courses that target identified skills gaps.

AgSkilled courses are developed to align with one or more key training pillars; business, safety, production and technology. Current, relevant and flexible, the training is designed to suit business needs and learners with a range of skills and experience. This will increase staff skill levels and help employers attract newcomers.

Available training covers a diverse range of topics, aligned with industry needs, fifteen new courses have been developed for the cotton and grains industries. AgSkilled has delivered over 600 courses across 130 locations, enrolling over 3,000 participants to date.

Box 8 continued.

Victorian Government — Supporting regional workforce training and skills needs

The training and skills needs vary across industries, regions and timeframes. Matching training to the diverse and changing needs of industry prevents lags in productivity associated with skills gaps. Victoria supports the delivery of programs to address these needs through four key funds.

- Regional Skills Fund addresses skills gaps across all rural and regional sectors through industry and community collaboration (closed for new applications; undergoing evaluation). One funding stream of \$34 million total funding.
- Workforce Training Innovation Fund supports partnerships between industry and trainers to deliver innovative training, development and research to improve outcomes and relevance to industry. Two funding rounds each year. Total of \$30 million per year for grant funding and seed funding proposals.
- Regional and Specialist Training Fund addresses training delivery undersupply in specialist and regional courses across the training and TAFE system (accredited training courses). Facilitated and managed fund of \$30 million per year for higher subsidies and grant funding
- Jobs Victoria Employment Network assists Victorians who are disadvantaged in the labour market to gain and retain employment (employment services). \$53 million over four years.

The Office of the Victorian Skills Commissioner (which is informed by industry reference groups), Regional Workforce Plans and Regional Partnership Priorities identify where there are critical skills gaps in regional Victoria.

Sources: Dairy Australia pers. comm., May 2019; Victorian Government 2019; Training Services NSW 2018.

6 Higher education

Observations

- The number of university graduates in agriculture and related courses decreased from around 1,300 in 2001 to 550 in 2014. Enrolments have subsequently increased with student intake data suggesting this is likely to continue in the medium term.
- The agriculture industry, in particular broader supply chain industries, receive value from graduates that come from other disciplines, including accounting, marketing, finance, engineering and computer science. This leads to questions about how important it is that agriculture is a person's primary field of study.
- There is a thin market for higher education in agriculture, especially for specialist degrees. Owing to Australia's size, demand for some specialist courses or for new courses is diffuse and may not be readily apparent to providers. In this context, employers, industry representative bodies or RDCs can play a role in aggregating this demand and working with universities to redesign existing courses or establish new courses required by the market.
- Universities have redesigned their agriculture course offerings to meet student and employer's needs.

6.1 Introduction

The Australian Government is the major funder of higher education contributing 54% of the sector's revenue in 2017 (DET 2018b). Almost all students attending university are required to make some contribution towards the cost of their university education through tuition fees or income-contingent loans (e.g. Higher Education Contribution Scheme or HECS) where the Australian Government covers the student contribution which the student pays back through the income tax system upon reaching the income repayment threshold, contributing a further 30% of the sector's revenue in 2017.

Universities operate in a business-like fashion at arms-length from government, supported by their internal management arrangements.

The Australian higher education system comprises both public and private universities, Australian branches of overseas universities, and other non-university higher education providers (NUHEPs). At present, there are 174 registered higher education providers:

- 40 Australian universities
- 1 Australian University of Specialisation
- 2 overseas universities
- 131 NUHEP (TEQSA 2017).

Currently thirteen Universities, Melbourne Polytechnic and Marcus Oldham College offer a degree course in agriculture or related agricultural areas (Australian Council of Deans of Agriculture, 2019; TEQSA 2017).

6.2 Agriculture graduate numbers have been in long-term decline

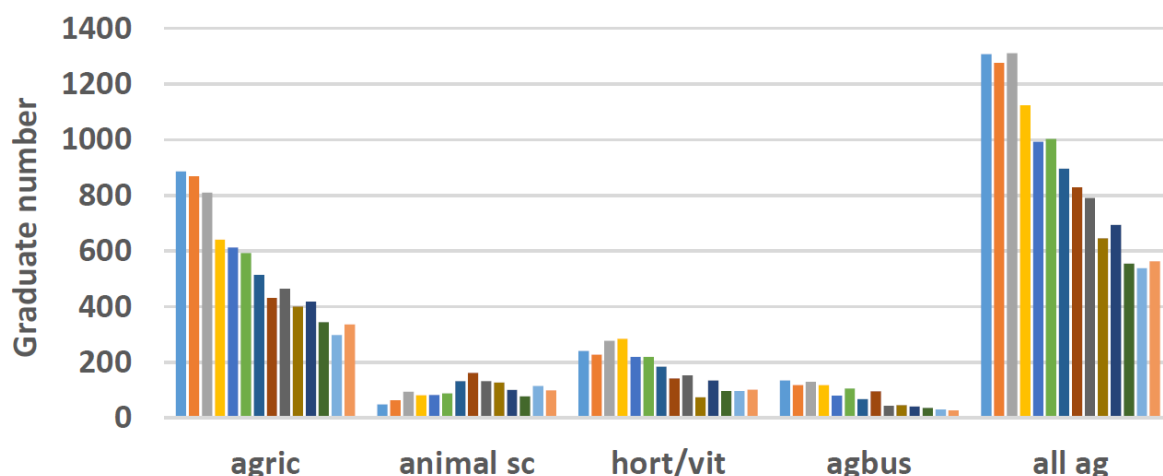
In 2007, the Australian Council of Deans of Agriculture (ACDA) commenced a longitudinal study on the number of graduates produced by Australian universities from undergraduate agriculture and related courses (animal science, horticulture/viticulture and agribusiness). University members of ACDA provided their own records data on course completions, which allowed for agricultural completions to be considered separate to environmental science completions. The results of this work has been reported by Pratley and co-authors between 2008 and 2016.

The results of ACDA's study showed a decline in graduate numbers in agriculture and related courses from around 1,300 in 2001 to around 550 in 2014 (Figure 12). Enrolments (the total number of students across all years studying such courses) declined from 4,300 in 2001 to a low of less than 2,300 in 2012 increasing to 2,500 in 2014, with student intake data suggesting the increase to continue in the medium term (Pratley, 2017a).

Suggested reasons for the decline in the study of agriculture at Australian universities include:

- transitions in Victoria from the former Victorian College of Agriculture to University of Melbourne BAgric degree, which had higher entrance requirements (Pratley & Copeland 2008)
- a decline in the number of university campuses offering agriculture (noting that the cause and effect relationship between the number of campuses offering agriculture and the number of students studying agriculture operates in two directions; Pratley 2012b)
- emerging generations of young people not perceiving rewarding career opportunities in agriculture (Pratley 2012b).

Figure 12 Agricultural and related completions from Australian universities 2001–2014 (columns represent individual years).



Source: Pratley 2017a.

Pratley and co-authors have presented various estimates of the demand for agricultural graduates. These estimates were based on extrapolation of ABS data on the percentage of tertiary in the industry qualified people in the industry and their estimated average working life

(Pratley & Copeland 2008; Pratley 2017a) or analysis of job advertisements (Pratley & Hay 2010) and range from 2,200 to around 4,200 graduates per annum.

The apparent shortfall of appropriately qualified professionals in the industry has led to concerns about the consequences for the industry's ability to innovate and remain competitive, given the increasing need for high level management and technical skills for business owners, the workforce and the advisory system (Pratley 2012b).

However, the agriculture industry, in particular broader supply chain industries, receive value from graduates that come from other disciplines, including accounting, marketing, finance, engineering and computer science. This leads to questions about how important it is that agriculture is a person's primary field of study. As noted by Pratley (2012a) about the horticulture industry, to maintain levels of university trained workforce in the industry, graduates will have to come from other disciplines. Additional industry specific expertise can then be acquired through further post-graduate training or vocational education.

6.3 Thin market for higher education in agriculture, especially for specialist degrees

As noted by Pratley (2012a; 2012b), there was a significant rationalisation in the number of university campuses providing agricultural courses between 1989 and 2011 as a consequence of the Dawkins reforms to higher education (DET 2015). In addition, the introduction of demand driven funding arrangements for higher education, meant that as student intakes for particular courses declined, universities responded by contracting those course offerings (Pratley 2012a; 2012b; 2017). Courses with low enrolments are vulnerable to closure as they are no longer financially viable for universities to provide, threatening the sectors ability to access the education and training required to generate the skilled workforce the industry needs (National Committee for Agriculture, Fisheries and Food 2017; The Allen Consulting Group 2012).

This has consequences for specialist agricultural degree courses, such as horticulture/viticulture, forestry or agricultural economics where the number of enrolments nationally is low (around 100 or less). Full degree courses in these subjects are only offered by between two to five universities nationally (Pratley & Copeland 2008; Pratley, Kanowski & Bull 2012, Pratley 2012a & b), with universities specialising in certain disciplines or not at all, with individual courses available in more generic agriculture degrees (Barr forthcoming).

Owing to Australia's size, demand for some specialist courses or for new courses is diffuse and may not be readily apparent to providers. In this context, employers, industry representative bodies or RDCs can play a role in aggregating this demand and working with universities to redesign existing courses or establish new courses required by the market (Box 12).

Box 12 Collaboration to better articulate demand**Global Masterclass in Horticultural Business – University of Tasmania**

Having the capability and capacity within the horticultural industry is paramount to a sustainable industry. Pratley (2012a) details data and trends that describe a disturbing fall in the number of students studying horticultural science from 1986 to 2012. These data and trends depict the horticultural workforce as having a lower proportion undertaking formal training and education when compared with the broader agricultural sector.

To address this situation the Masterclass in Horticultural Business was developed in partnership with international leaders in horticulture – Hort Innovation, Wageningen Academy and Lincoln University, to ensure it best meets industry needs.

The Global Masterclass is a flexible ten month program of face to face and on-line training for people working in horticulture. The target audience is employers and employees in horticulture that are seeking to enhance their business acumen and understanding of horticultural production. Participants are eligible to be awarded a Diploma in Horticultural Business. The accredited course conforms to the Australian Government's higher education standards framework. There is an opportunity to use credit from this course to articulate into other relevant courses at the University of Tasmania.

Commonwealth Department of Agriculture and Water Resources – biosecurity post-graduate training

The development of the post-graduate curriculum in plant biosecurity was initiated by the Queensland University of Technology in conjunction with the Office of the Chief Plant Protection Officer (OCPPO) at the Commonwealth Department of Agriculture. The curriculum was developed involving five universities (Queensland University of Technology, University of Adelaide, Charles Darwin University, Murdoch University and La Trobe University). The first semester commenced March 2010. The Queensland University of Technology and the University of Adelaide have now withdrawn from the program due to low numbers of enrolments. The University of Queensland is now a party and offers the entomology component that was previously run by the Queensland University of Technology.

The OCPPO was involved in the development of the course material in conjunction with the universities and managed the development of the operating agreement between the universities, the created the website (www.plantbiosecurity.edu.au) and reviewed the program units.

The curriculum offered certificate, diploma and masters courses in plant biosecurity, which included some entomology, pathology, weeds modules, as well as broader foundational modules in risk assessment, community engagement, and biosecurity policy and practices modules. Normally candidates should have had at least a Bachelor degree upon entry, but students without a first degree were able to enter the certificate program based upon appropriate professional experience. Due to low numbers of enrolments both the diploma and masters courses are currently not offered.

The units are delivered electronically either by a university website or on USB this means the course is accessible nationwide (and world-wide). There have been students who have completed the masters program remotely, for example one student completed the masters course from The Seychelles.

Source: Horticulture Innovation, pers comm; Commonwealth Department of Agriculture and Water Resources, unpublished.

6.4 Agricultural courses redesigned to meet demand

In its report for the Business/Higher Education Round Table, The Allen Consulting Group (2012) identified 12 intervention strategies that had been applied to draw more people towards agricultural qualifications and careers (Table 19). The majority of these interventions were

focused on the redesign of courses of study to better support student participation and meet industry needs. The National Committee for Agriculture, Fisheries and Food's decadal plan for Australian Agricultural Science 2017-2026 (2017) reinforced this approach, noting that an innovation culture in the agriculture sector could be encouraged if universities renewed their programs to reflect contemporary agriculture, science and business principles, including industry placement for students to ensure students enter the workforce well prepared.

Table 19 Possible interventions to boost agricultural higher education

Type of intervention	Activities
Next generation	
School outreach and engagement	University scientists working with schools to include agriculture in curriculum
Science teacher professional development	Development of school science teachers to include agriculture knowledge and teaching materials
Agriculture career awareness	Promote agriculture career pathways through agricultural shows and expo type events
Product development	
Rebranding of degree programs	Branding degrees with areas of greatest areas to students, rather than as 'agriculture'
Reorientation of course content	Course redesign and restructuring to better meet market needs and requirements
Flexible delivery	Support for part-time or online course delivery while students remain on the farm or in industry
Fee discounts	Reduce fees for agriculture degrees
Industry focused	
Industry engagement	Substantive engagement with industry regarding degree content and graduate attributes
Industry experience and projects	Industry projects included in degree programs
Scholarships	Offer scholarships for agriculture degrees
Cadetships and mentoring	Offer cadetships and mentoring for school leavers, to combine work with a degree
Pathways to higher education	Rethink the pathway from school to agriculture programs at university, including entry requirements

Source: The Allen Consulting Group 2012.

Since The Allen Consulting Group's 2012 report, universities have continued with their efforts to strengthen intakes to agriculture courses. Some initiatives involving greater collaboration with industry in course design are provided in Box 13. Many of the examples align with initiatives previously identified by an earlier report by The Allen Consulting Group (2012).

Box 13 Examples of program re-design

University of Melbourne

In 2015-16 the University of Melbourne re-designed its agriculture program, following a relatively long-period without review. At its lowest point in 2009, enrolments in the agriculture program reached as low as 20-30 student per annum, creating uncertainty about the future of the university's Dookie campus, near Shepparton. The university attributes the decline in enrolments to a number of factors including the Millennium drought, a lack of jobs, industry structural adjustment and the unattractiveness of agriculture as a study area.

Enrolments have since increased to around 200 per annum, the highest levels ever, with the regional Dookie campus having 150 students based there. This increase has resulted from a concerted effort to make agriculture an attractive study area for students. The relationship between enrolments and investment by the University of Melbourne at its Dookie and Parkville campuses has created a 'virtuous cycle'—increased enrolments has justified increased investment in agriculture teaching infrastructure, which has in turn created an attractive learning environment, further increasing enrolments.

Charles Sturt University

Charles Sturt University extensively redesigned its equine science course in 2016-17, with the first year of the new course starting in 2018. As with all degree courses the course was subject to regular review but this had become delayed. Prior to its redesign, the merit of the curriculum was questioned by industry and graduates. The curriculum was redesigned following extensive consultation with industry, alumni, third year students and drawing on the international experience of staff.

Although the reform is still in its early stages, there was a 150% increase in student numbers in the first year following the launch of the new curriculum. CSU is aware that the rate of change within the equine industry is so fast-paced, that the current material could be out of date in three years, so are continually working hard to ensure that all content is contemporary and that the course is able to produce future-proof graduates.

CSU has taken a similar approach to the redesign of its animal science and agriculture courses, which now include streams/specialisations that allows students to follow their particular interests in fields including agronomy, animal production, mixed farming systems, digital agriculture and horticulture. The need for incorporation of more practical skills was identified and this will be achieved through work place learning experiences in each year of the courses. The new courses are scheduled to commence in 2020 and their commencement will be accompanied by a strong promotional campaign.

Source: University of Melbourne, pers comm., August 2019; Charles Sturt University, pers comm., August 2019.

6.5 Scholarships for students interested in studying agriculture

Scholarships serve to promote agriculture as a study area for students. A wide-range of scholarships are available for under-graduate and post-graduate students in agriculture, with the RDCs supporting a significant number of scholarships. As an example in 2017–18, the Grains Research and Development Corporation funded 13 undergraduate scholarships and 62 PhD scholarships (GRDC 2018).

Recently Agrifutures™ has collaborated with other RDCs to introduce its Horizon Scholarships, which aims to encourage students studying courses outside of agriculture to study in the area (Box 14). This arrangement is noteworthy because attracting students or professionals with a

broader range of backgrounds to work in agriculture is likely to be increasingly important. In addition to a traditional understanding of agriculture, many roles now require skills that have not traditionally been associated with the sector, such as telecommunications, computer sciences, advanced machinery engineering and robotics, and business and people management skills (Heath 2017). These skills needs reflect the high tech nature of many production systems, the growth in corporate farming driving demand for professional farm managers and the emergence of specialist industry advisory and service sectors such as agronomy, finance, product marketing and logistics. It is unclear what barriers, if any, might exist which make lateral career moves into agriculture related roles challenging.

Box 14 AgriFutures™ Horizon scholarships

AgriFutures™ Horizon Scholarships

The AgriFutures™ Horizon Scholarship is awarded to students studying an agriculture-related undergraduate degree or a Science, Technology, Engineering, Maths/Finance (STEM) degree with relevant majors, which align to agriculture. The Scholarship provides:

- a bursary of \$5000 per year for the final two years of your degree
- professional development workshops
- annual industry work placements aligned with the scholar's areas of interest and their sponsor's industry
- opportunities to network and gain knowledge at a range of industry events.

In 2019 AgriFutures is broadening its promotion of the program and working with universities to increase applications from engineering, IT and Finance faculties to create greater diversity in students that are on the Program. The Program is a strong point of collaboration across RDC's with Australian Eggs, CRDC, GRDC, Dairy Australia, AWI, Hort Innovation, MLA being current sponsors and other RDC's such as Wine Australia offering students placements and industry experience.

Source: Agrifutures, pers comm., May 2019.

6.6 New investment in regional, rural and remote higher education

Rural students represent a pool of future workforce for the agriculture sector (OECD 2015). However, the educational performance of students from rural and regional areas has tended to lag the performance of their peers in non-rural areas, which is a common disparity in many other countries (Halsey 2018; OECD 2015).

The Australian Government has supported two substantial reviews of regional, rural and remote education in recent years, which have focused on access to tertiary education (both VET and higher education; Box 15). The Government has invested \$134.8 million over four years as part of its response to the Halsey review into Regional, Rural and Remote Education. The response is likely to produce positive direct benefits for the agriculture industry through increased student participation in agricultural education and training.

Box 15 Reviews of regional, rural and remote education arrangements

Independent Review into Regional, Rural and Remote Education

In 2017, the Australian Government commissioned an independent review into regional, rural and remote education (IRRRRE). The Review was part of the Australian Government's commitment to improve the education of country students so they can reach their full potential and participate in Australia's economy.

Emeritus Professor John Halsey from Flinders University conducted the review, and made eleven recommendations:

- Establish and/or refine processes for ensuring the relevance of the Australian Curriculum and state/territory assessment processes for RRR students and communities.
- Ensure RRR contexts, challenges and opportunities are explicitly included in the selection and pre-service education of teachers, initial appointment processes and their on-going professional support.
- Ensure RRR contexts, challenges and opportunities are explicitly included in the selection, preparation, appointment and on-going professional support of educational leaders.
- Ensure RRR children start school with a strong foundation for learning.
- Expand the availability, affordability and accessibility of high quality work experience placements, VET, dual VET/university options and two-year associate degree programs for RRR students.
- Support RRR students to make successful transitions from school to university, training, employment and combinations of them.
- Encourage the philanthropic sector to play a greater role in raising achievements and improving opportunities for RRR students.
- Improve opportunities for RRR schools to implement entrepreneurship in education through curriculum, teaching, system and cultural changes and building on good practice.
- Improve the availability, accessibility and affordability of ICT for RRR schools, teachers, students, parents and communities.
- Support RRR communities to implement innovative approaches to education delivery designed to improve education access and outcomes for students living in remote communities.
- Establish a national focus for RRR education, training and research to enhance access, outcomes and opportunities in regional Australia.

The Australian Government accepted all 11 recommendations of the IRRRE Review and has committed to ensuring students in regional, rural and remote (RRR) areas are supported to successfully transition through school and onto further education, training and work.

Regional Education Package

On 12 November 2018, the Australian Government announced \$134.8 million over four years to provide students from rural and regional Australia with greater choice in, and access to, higher education. The measures included:

- \$92.5 million over four years to support more students at five regionally focused universities: Federation University Australia (Berwick, Vic); University of the Sunshine Coast (Caboolture and Fraser Coast, Qld); University of Newcastle (Central Coast Medical School and Research Institute, NSW); Central Queensland University (Qld); James Cook University (Qld)

Box 15 continued.

- \$34.1 million over four years to expand the Rural and Regional Enterprise Scholarships. The scholarships provide up to \$18,000 to support students to study STEM (including health and agricultural science) at Certificate IV to PhD level.
- \$7.5 million over four years to expand the Regional Study Hubs. Regional University Centres (formerly known as Regional Study Hubs) provide infrastructure such as study spaces, video conferencing, computing facilities and internet access, as well as academic support and pastoral care for students studying via distance at partner universities.
- develop a national regional, rural and remote education strategy.

Planning for Australia's Future Population

On 20 March 2019 the government announced further support for regional education as part of the Planning for Australia's Future Population policy statement. This included:

- Funding for 4,720 new Destination Australia scholarships over four years. Students can access \$15,000 each per year for studying at a regional campus of a university or vocational education and training provider.
- From 2021, international graduates with a bachelor or higher qualification from a regional campus of a registered institution will be eligible to access an additional one or two years in Australia on a post-study work visa.

National Regional, Rural and Remote Education Strategy

On 12 November 2018, the Australian Government announced the development of a National Regional, Rural and Remote Education Strategy, focused on improving tertiary education participation and outcomes for students from regional, rural and remote areas, as part of a broader regional education package. The Strategy builds on the Government's response to the IRRRRE recommendation 11 which proposed that the government 'establish a national focus for regional, rural and remote education, training and research to enhance access, outcomes and opportunities in regional Australia.'

The Regional Education Expert Advisory Group led this work and provided their final report in June 2019. Although not focussed on training and education for the agriculture sector, the strategy encompasses tertiary students studying agriculture and other related topics. At the core of the Strategy is a vision of a tertiary education system which supports equal opportunity and access for individuals from RRR areas. This vision is underpinned by several core objectives and targets, specifically focused on halving the current disparity between RRR and metropolitan students in relation to tertiary education attainment and participation by 2030. The Strategy includes seven recommendations and a further 33 related actions (not shown):

- Improve access to tertiary study options for students in RRR areas
- Improve access to financial support, to support greater fairness and more equal opportunity
- Improve the quality and range of student support services for RRR students to address the challenges of transition and higher rates of attrition
- Build aspiration, improve career advice and strengthen RRR schools to better prepare RRR students for success
- Improve participation and outcomes for RRR students from equity groups including low SES students, Indigenous students, students with disability and remote students.

Box 15 continued.

- Strengthen the role of tertiary education providers in regional development and grow Australia's regions
- Establish mechanisms to coordinate the implementation effort and support monitoring of the Strategy
- Planning for the implementation of the strategy is underway.

Sources: Napthine et al. 2019; Australian Government 2019b; DET 2018c; Halsey 2018.

7 Workplace conditions and workforce planning

Observations

- Workplace conditions, including wage rates, leave entitlements, opportunities for career progression and other management practices play a critical role in attracting and retaining workers to the agriculture sector.
- Relatively high rates of turnover and exit of staff in the agriculture industry lead to questions about the relative priority of measures to attract people to work in the sector, compared to measures to retain people in the sector.
- Farm employers and employees both report uncompetitive wages as a factor influencing the agriculture industries ability to attract and retain employees. However, the financial position of some farm businesses makes raising wages to attract workers impractical.
- The adoption of progressive human resource management practices, which could ameliorate recruitment difficulties and staff turnover, has been patchy across the agriculture sector. Small agricultural business face additional challenges in this area.
- Some agricultural jobs are inherently low quality. In the medium-term, innovations such as mechanisation could change these occupations, making them more attractive to the domestic workforce. In the near-term, temporary migrant workers will continue to make up the shortfall that exists in the supply of labour from the domestic market.
- Some allied industry support service professions are also unattractive or are perceived to be unattractive.
- New generations of workers are likely to have new expectations on desirable work environments. If the industry does not modernise its human resource management arrangements to accommodate the expectations, it may find itself disadvantaged relative to other industries that do.

7.1 Introduction

Workplace conditions, including wage rates, leave entitlements, opportunities for career progression and other management practices play a critical role in attracting and retaining workers to the agriculture sector (Nettle 2015; TFGA 2015; NRAC 2013). Historically, family farm businesses could depend on family connections to encourage the return of family members to the business, separate from the workplace conditions on offer. This is less so the case with the contemporary corporate agriculture, where businesses need to consider ‘why would anyone come and work on my farm and for me?’ (Nettle, 2015).

Generally, reports suggest the competitive position of agriculture as an industry to attract and retain employees is eroded by:

- poor working conditions, which impact employee living standards or family life

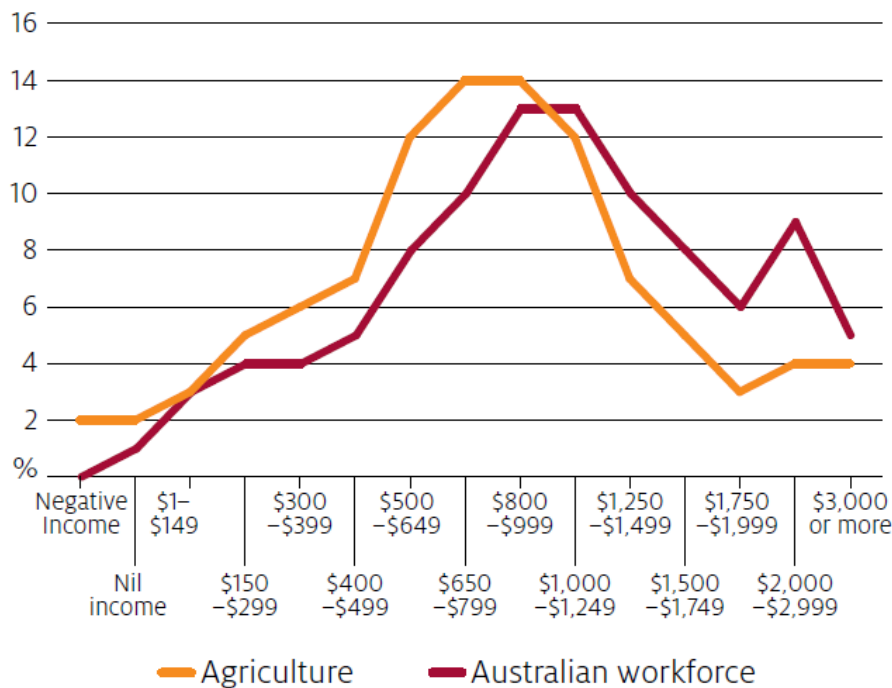
- lack of career development and promotion opportunities, low interest of employers in supporting employee careers or limited understanding of careers available
- concerns for occupational health and safety
- availability of alternative employment with better job and career opportunities (Nettle 2015 and references therein).

Although these observations may generally be true, some agricultural employers are able to offer relatively attractive workplace conditions, which places them at an advantage when it comes to employing people in the competitive labour market. Relatively high rates of turnover and exit of staff from the agriculture industry also lead to questions about the relative priority of measures to attract people to work in the sector, compared to measures to retain people in the sector (Nettle 2015).

7.2 Wage rates effect employee attraction and retention

In her review of studies into workplace conditions in the Australian agriculture sector, Nettle (2015) found that farm employers and employees both reported uncompetitive wages as a factor influencing the agriculture industries ability to attract and retain employees. In 2016, only 23% of agriculture employees earned more than \$1,249 a week, compared to 38% of the Australian workforce (Binks et al. 2018; Figure 13). Barr's (forthcoming) analysis of ABS census data revealed that median wages for low skilled workers in the agriculture, fisheries and forestry industry was middle of range when compared to other sectors of the economy. In contrast, higher skilled workers in the industry had the second lowest median income, suggesting the industry did not remunerate skills.

As noted by Howe (et al. 2019) with respect of the horticulture industry, raising wages to attract workers is not a practical option for all businesses given many operate under tight profit margins or are operating at a loss. For example from 2006–07 to 2016–17 the proportion of vegetable-growing farms recording negative farm business profit averaged 59% a year (Frilay, Weragoda & Ashton 2018). Negative farm business profit means a farm has not covered the costs of unpaid family labour. Top performing vegetable-growing farms that had returns of 10% or more (around 24% of farms) were mostly large farms (by average area planted to vegetables) generated substantially larger farm cash incomes than vegetable-growing farms in general (Frilay, Weragoda & Ashton 2018) and would be better positioned to offer competitive wage rates to their employees.

Figure 13 Distribution of income, 2016

Source: Binks et al. 2018 based on ABS Census of Population and Housing, 2016.

7.3 Human Resource Management effects employee attraction and retention

Research in other industries has found that firms with progressive human resource management strategies, which focused on improving job quality and fostering an engaged workforce, were less likely to experience recruitment problems and to have reduced rates of staff turnover (Howe et al. 2019; Nettle 2015). However, the adoption of progressive human resource management strategies by business across the agricultural sector is patchy.

- Howe's (et al. 2019) review of the horticulture workforce found relatively few growers appeared to have implemented strategies aimed at engendering long-term commitment of their workers, with 'low road' management strategies dominating the industry.
- Nettle's (2015) review of human resource management in Australian agriculture (based on studies of the cotton, dairy, red meat and wine industries) identified excessive working hours, low provision of training and development opportunities and low adoption of formal human resource management practices (written position descriptions, performance reviews and training and career plans) across the industry.
- TFGA (2015) observed that in its experience in Tasmania, employers who have sound employment practices have little trouble attracting a workforce through positive reputation. It also observed that low participation in workforce development and training and a lack of people management skills in the industry were challenges in attracting and retaining a suitably skilled workforce.

Surveys of employers in the cotton, red meat and dairy sectors indicated that the most common inclusions used to increase the attractiveness of employment packages included:

- above award pay
- access to full accommodation
- provision of vehicle and fuel, farm produce
- education and training.

In the same studies, employers noted the management practices they used or found most effective to retain staff included:

- flexibility in work hours
- rostered time off
- training and development (including mentoring, career planning)
- recognition of a job well done (Nettle 2015 and references therein).

7.3.1 Small agriculture businesses face additional challenges

Employers with larger permanent workforces have a number of advantages with regard to creating progressive human resource management strategies. These include:

- the ability to create an internal labour market through promotion and career development
- greater ability to invest in training
- increased likelihood of more formal procedures for human resources management (Nettle 2015; NRAC 2013).

NRAC (2013) found that agricultural employers with five or less employees were unlikely to formalise workforce planning processes even if they recognised the importance of workforce planning or human resource activities. Most employers with five or less employees did not have the structure, resources or skills to support formal workforce planning. In contrast NRAC observed that larger businesses had more structured approaches to workforce management, including employing dedicated human resource personnel and mitigating compliance risks through documented induction and WHS procedures.

The tendency of large businesses to invest more in training than small businesses appears common across industry sectors within the economy (Waddoups 2011). Specific agriculture industry examples include:

- in the horticulture sector, training pathways to support career pathways between lower-skilled and higher-skilled roles in the industry are relatively rare. This appeared to be the case particularly for smaller farmers with very few high skilled positions, which limited opportunities for promotion (Howe et al. 2019)
- in the pork industry, large producers have addressed the lack of Registered Training Organisations (RTOs) in their regions by becoming RTO's themselves. This enables them to deliver Certificate III in Pork Production, Certificate IV in Agriculture, and Diploma in Agriculture training directly to their employees (APL 2017). Smaller producer are unable to substantiate such an investment

- in the wine industry large wine companies make their own investments in attracting and developing their workforces (AWITC 2019; Box 16). These investments generate positive spill-over benefits to the rest of the industry as workers move between employers, taking skills and experience learned from previous employers to their new employers.

Box 16 Investments by large wine companies in workforce development

Pernod-Ricard

Pernod-Ricard offers a range of programs across both the operational and corporate workforce. One focus is on leadership and management capability, targeting senior managers. The 'Pernod-Ricard University' provides nominated senior leaders with an opportunity to travel to Paris for intensive leadership training. It also has a program for emerging leaders, to build a talented population at supervisory and new to management levels, along with a supervisor development program. This is allied to a mentoring program for high-potential leaders.

Treasury Wine Estates

Treasury Wine Estates (TWE) takes a broad approach to capability development and leadership. Investments in this area have increased substantially over the last few years. They continually refine and target their leadership training around growth behaviours, for example: lead self-authenticity, self-awareness and resilience; managing others and communicating; business acumen and branding; strategic thinking: vision and innovation; delivering results, and problem solving.

All staff are considered as leaders, whether they have responsibility for people or not. It is taking an active approach to diversity and inclusion, with specific investments in women to help realise their potential.

Casella Family Brands

Every year Casella Family Brands offers five students from Charles Sturt University in Wagga Wagga, NSW, a scholarship to help them with their studies. The scholarships are designed to alleviate some of the financial pressures that come when studying so that students can focus on getting great results.

Casella Family Brands participates in the *Grow Our Own* regional initiative in Western Riverina area. Supported by Regional development Australia the initiative was developed to provide information to potential students and on-the-job trainees, and to business people in this region. It aims to encourage people to build a career while living locally, and to encourage local business to invest in local people through employment, training, mentoring and motivation.

Source: AWITC 2019.

7.3.2 Some agriculture jobs are inherently 'low quality'

As noted by Nettle (2015), the quality of jobs and the availability of real careers is essential for building the sector's reputation and attracting people into agriculture. However, some jobs in the agriculture industry are 'low quality'. According to the OECD (Cazes, Hijzen & Saint Martin, 2016) low quality jobs share the following characteristics:

- low earnings (level of individual earnings and distribution of earnings)
- low job security (short duration of employment)
- low quality of the working environment (long working hours, high intensity or hard work, lack of learning opportunities, poor relations among colleagues)

Examples in the agriculture industry include seasonal horticulture harvest roles. Increasing the quality of these types of jobs is a long-term aspiration, which requires innovation to allow for a

greater role for mechanisation in the completion of these tasks, which would increase worker productivity and job quality (Howe et al. 2019). However, until these innovations are developed and adopted by industry, temporary migrant workers make up the shortfall that exists in the supply of labour from the domestic market (see Chapter 8).

7.4 Some allied support service professions are perceived to be unattractive

Issues regarding the relative attractiveness of agricultural careers also apply to agricultural supply chain and support services industries and professions. For example, the National Committee for Agriculture, Fisheries and Food (2017) expressed concern about the future of the Australian agricultural research workforce due to the relatively unattractive nature of the employment conditions for young career scientists. Relatively unattractive remuneration, lack of long-term job security and the availability of more attractive graduate employment options make it difficult to attract young career scientists into research positions or to retain them in those positions. Reflecting on findings that most doctorate recipients in the USA worked outside of academia, and that this was likely even more so in Australia, Kingwell (2016) asked if it was worth examining what changes in post-graduate training, career advice and reporting of employment statistics were needed to facilitate innovation, particularly local agricultural innovation, in Australia.

Similarly, PriceWaterhouseCoopers (2018) and the Transport and Logistics Industry Reference Committee (2019) reported that poor perceptions about the nature of work in the automotive and the transport and logistics industries discouraged young people from considering careers in these industries. Joyce (2019) noted that the relatively low training wages for up to four years for apprentices was one reason why young people were less attracted to the traditional apprenticeship model, contributing to long-standing skills shortages in many trade related occupations.

Beyond agriculture, concerns about the perceived attractiveness of careers are broadly held across other industry sectors, including the aged care sector (Aged Care Workforce Strategy Taskforce 2018).

7.5 Emerging generations have different expectations about work

The OECD (2015) concluded that competition for scarce labour with more attractive and dynamic sectors is a challenge beyond the education system alone and that the industry itself has a role to play to make agricultural careers more attractive. Younger generations entering the workforce have new expectations on desirable work environments. They are connected, technologically advanced, creative and entrepreneurial and have new perspectives on ethical issues and communication styles (Hajkowics et al. 2016).

The Australian agriculture industry is world leading in many respects and offers a range of rewarding career possibilities. It is an internationally competitive industry that has transformed itself through the adoption of innovative technology. The further adoption of high-tech agricultural equipment and methods and entrepreneurial business opportunities could further expand the range of career options in the industry and make the industry attractive to a younger generation of tech-savvy workers (Wu et al. 2019). Conversely, if the industry does not

modernise its human resource management arrangements to accommodate the expectations of new generations of workers, it may find itself disadvantaged relative to other industries that do.

7.6 Government and industry initiatives

Government and industry representative bodies have implemented measures to assist agricultural businesses adopt more progressive human resource management strategies. Some of the initiatives are case studied in Box 17 and are generally extension or advisory type activities. As noted earlier, the adoption of progressive human resource management strategies by business across the agricultural sector is patchy, suggesting further scope for the broader adoption of best-practice.

Box 17 Supporting the adoption of more progressive human resource management strategies

Beef industry on-station quality workforce handbook

Developed by the Queensland Department of Agriculture and Fisheries (2016) in collaboration with the beef industry. The handbook developed career pathway models, agreed position descriptions and salary packaging models in a bid to attract and retain workers to the sector. It is the foundation—a first step—in enabling the on-station beef production sector to achieve a consistent approach to its workforce management and development. This will allow the beef industry to create and market an exciting employment and career pathway story that will attract and retain a skilled and committed workforce.

People in Agriculture (led by Dairy Australia, plus other partner RDCs)

People in Agriculture is an online portal of practical employment information for growers/producers and employees across Australian agriculture to attract and retain the calibre of people required to address the barriers to adoption of technical developments, and ensure ongoing and improved business efficiency and profitability.

The online portal breaks down the most commonly asked questions around employment law and staff management, allowing producers to find what they need, when they need it. Employees can access information on employment opportunities, entitlements and managing their career in agriculture.

The project aims to:

- attract and retain skilled people in Agriculture
- enable improved employer compliance to increase profitability and productivity
- improve perception of agriculture as a workplace and a career option
- promote an independent, collaborative platform for RDCs to communicate
- practical employment information available to producers / growers

The portal attracts an average of 6,400 page views monthly, with 70% of users accessing the site via a mobile/smart device access, with split of 50% employers / 50% potential employees accessing the site. Promotion of the project to key stakeholders has been challenging with limited funds available.

Fair Farms Initiative

Managed nationally by Growcom, the Queensland horticulture industry representative body, Fair Farms is an industry-led initiative aimed at fostering fair and responsible employment practices in Australian horticulture. The program provides support and training of farm employers and a pathway to independent certification of fair employment practices. Fair Farms enables horticulture businesses to demonstrate their commitment to good employment to their customers, workers and the community.

Box 17 continued.

Separately, Growcom also provides its members with advice on people management in the workplace. This includes workforce planning, performance management and workplace induction. Generic advice is available free to members and tailored advice is available to businesses on a fee-for-service basis.

A guide to farm labour: How to find and retain on-farm staff

Developed by the Grains Research and Development Corporation, this booklet provides a basis for stepping through the different stages of the employment lifecycle. It provides information on key practices to support positive outcomes for employers and employees through the steps of planning, recruiting and inducting, development, retention and termination. The case studies and checklist in the booklet also provide practical tips and tools to help grain farmers understanding and address the specific labour needs of their businesses.

Complementing this resource, expert presentations on human resource management are included in the GRDC's grower and advisor national update workshop series, which is well attended by grains industry stakeholders.

Sources: QDAF 2016; Dairy Australia pers. comm., May 2019; Growcom 2019; GRDC 2015.

8 Migration and visa programs

8.1 Observations

- A suite of visa arrangements and programs exist that allow for overseas workers to work in agriculture and related industries, filling a range of vacancies from short term, low-skilled labour to long term and higher-skilled positions, where local workers are not available to fill these positions.
- Overseas workers contribute significantly to the workforce of some agricultural industries, including horticulture, intensive livestock and meat processing industries.
- Current visa policy settings seek to strike a balance among a suite of competing objectives and stakeholder perspectives.
- Visa arrangements are dynamic and continue to adapt to industry needs. It will take some time for the effect of recent changes to visa programs and the introduction of new skilled regional visas to be known.

8.2 Introduction

As noted in Chapter 2, temporary and permanent migrants are an important part of the Australian agricultural workforce, particularly in the horticulture, intensive livestock and meat processing industries (Dufty, Martin & Zhao 2019; Barr forthcoming).

There are a range of visa arrangements and programs that allow for overseas workers to work in Australian agriculture and related industries filling a range of vacancies from short term, low-skilled labour to long term and higher-skilled positions where local workers are not available to fill these positions (Table 20). These arrangements are dynamic and continue to evolve to meet the demands of Australia's labour market needs and are administered by a range of Australian Government departments.

Current migration settings and programs are described throughout this chapter, supported by relevant case studies, and both program benefits and limitations are discussed.

8.3 Global context

Sourcing labour from overseas countries is not an arrangement unique to Australia. The International Labour Organization (ILO) estimated that in 2017 there were 164 million migrant workers worldwide. Of these migrant workers, approximately 70% were employed in high income foreign countries, such as Australia. The majority of migrant workers, nearly 60%, were employed in Western/Northern Europe, North America and the Arab Emirates (ILO, 2018). Australia employed approximately 7% of the global migrant worker estimate.

There are specific industry sectors that seek to attract and engage migrant workers. There can be a range of factors that determine why these industries source migrant workers, including out of preference or necessity. Australian agricultural industries appear to seek foreign workers out of the need to fill vacant positions that are otherwise not filled by the local labour force.

Table 20 Migration and visa programs of particular relevance to agriculture

Name & lead agency	Key parameters	Workforce contribution	Employer obligations
Working Holiday Makers ('backpacker') Department of Home Affairs	A range of skill levels; up to 12 months with one agricultural employer, can apply for a second and a third year visa after completing a period of specified work in certain occupations in regional locations; a wide range of partner countries.	Approx. 30,000 to 35,000 and steady	Nil beyond minimum wage and condition requirements.
Seasonal Worker Programme Department of Foreign Affairs and Department of Education, Skills and Employment	Low skilled; up to nine months per annum; can be renewed multiple times; selected Pacific Island countries	Approx. 12,200 and growing	Need to go through a process to become an approved employer, provide a minimum amount of work, pastoral care and accommodation.
Pacific Labour Scheme Department of Foreign Affairs	Low to semi-skilled; up to three years; can be renewed multiple times selected Pacific Island countries.	Approx. 100 and growing (introduced 1 July 2018)	Need to go through a process to become an approved employer.
Temporary Skilled Shortage visas Department of Home Affairs	Skilled; possible permanent residency.	Under 100 per annum and steady	Need to fulfil necessary sponsorship obligations
Industry labour agreements Department of Home Affairs	Semi-skilled to skilled; possible permanent residency.	Unknown	As specified in the labour agreement.
Skilled Employer Sponsored Regional (Provisional) visa Subclass 494 Department of Home Affairs.	Skilled; possible permanent residency.	Unknown (commenced on 16 Nov 2019)	Need to fulfil necessary sponsorship obligations
Skilled Work Regional (Provisional) visa Subclass 491 Department of Home Affairs.	Skilled; possible permanent residency.	Unknown (commenced on 16 Nov 2019)	Nil beyond minimum wage and condition requirements.
Designated Area Migration Agreements (DAMAs) Department of Home Affairs.	Semi-skilled to skilled; possible permanent residency	Unknown	As specified in the DAMA

Source: Dufty, Martin & Zhao 2019; Department of Home Affairs, pers. comm., February 2020.

This appears to be consistent with the international experience. For example, with reference to the horticulture industry, Howe (et al. 2019) noted that studies in Germany, the United States, the United Kingdom, Canada, Sweden, Italy, Greece and Spain have documented the declining

presence of local workers and growers' increased reliance on temporary migrant workers to meet their needs.

Local citizens in high income countries may be deterred from high risk, seasonal, transient and lower income occupations. However, migrant workers may be motivated to seek employment in these positions. Motivating factors can include more career opportunities and better remuneration compared to their country of origin (Alemandral 2018).

8.4 Working Holiday Maker visas

In Australia, working holiday makers, known commonly as 'backpackers', are the most commonly employed visa holders in the agricultural sector (Dufty, Martin & Zhao 2019). The working holiday maker visa (WHM) program provides the opportunity for backpackers from specific countries to hold a 12-month visa in Australia. These visas allow backpackers to undertake work to support their travels.

There are two working holiday visa programs, the Working Holiday visa (subclass 417) and Work and Holiday visa (subclass 462). The main differences between the two subclasses is the overseas countries they cover and the 462 visa generally has caps on the number of visas granted annually and additional eligibility requirements. In 2018-19 there were a total of 209,036 working holiday maker visas granted (Department of Home Affairs 2019a). The programs incentivise backpackers to seek employment in agriculture and other specified industries if they wish to extend their visa. Visa holders can extend their visas for a second year if they work for three months (88 days) in agricultural or specified primary industries in designated regional areas. In 2018-19, 36,125 visa applicants gained eligibility for a second year visa by working in the agricultural, forestry or fishing industry (Department of Home Affairs 2019a). Second-year visa holders may be eligible for a third-year visa if they complete six months of specified work in a regional area after 1 July 2019.

The government has made a suite of changes to Working Holiday Maker visa arrangements in recent times, which potentially increases the agriculture industries access to this workforce cohort (Box 18 Changes to Working Holiday Maker visa arrangements).

Box 18 Changes to Working Holiday Maker visa arrangements

In November 2018 the government announced a suite of changes to the Working Holiday Maker visa program, including:

- expanding the regional areas where subclass 462-visa holders can work in agriculture (plant and animal cultivation) to qualify for a second year of stay in Australia. Currently only those who work in Northern Australia are eligible.
- increasing the period in which subclass 417 and 462 visa holders can stay with the same agricultural (plant and animal cultivation) employer, from 6 to 12 months.
- introducing the option of a third-year for subclass 417 and 462 visa holders who, after 1 July 2019, undertake 6-months of specified work in a specified regional area during their second year.
- increasing the eligible age for subclass 417 visa applicants from Canada and Ireland to 35 years

Box 18 continued.

Since December 2018 the government has expanded the number of places available in the 462 visa program:

- increasing in the number of places available for travellers from, Spain (1,500 up to 3,400), Israel (500 up to 2,500), Peru (100 up to 1,500), Chile (2,000 up to 3,400), Argentina (from 1,500 up to 2,450), Malaysia (100 up to 1,100), Singapore (from 500 up to 2,500), Portugal (200 up to 500), Poland (from 500 to 1,500), Vietnam (from 200 to 1,500) and Thailand (from 500 to 2,000 with the date of the increase to be announced)
- adding Greece (500 places) and Ecuador (100 new places) to WHM visa program on 1 July 2019, taking the total number of eligible countries to 44
- increasing the eligible age for French applicants to 35 years.

The Indonesia-Australia Comprehensive Economic Partnership Agreement will expand the number of 462 visa placed from the current 1,000 places to 4,100 places on entry into force and the number of places will be stepped up each year to 5,000 by the 6th year.

Source: Department of Home Affairs 2019c.

The Working Holiday Maker visa arrangements have a series of advantages and disadvantages for employers and visa holders (Box 19). As noted by Howe et al. (2018), working holiday makers make a structural contribution to the seasonal horticultural workforce that is not readily replaced from other sources. In particular, working holiday makers tend to be an accessible workforce available at short-notice, which is important during peak harvest periods (Zhao et al. 2018). However, incentive structures created by the second-year visa arrangements can increase the risk of visa holders being exploited (Howe et al. 2018).

Box 19 Reported advantages and disadvantages of Working Holiday Maker arrangements**Advantages**

- Significant structural contribution to the agricultural workforce, particularly in seasonal horticulture
- Flexible workforce arrangements.
- No visa or other administrative costs for employers.
- Supports longer-term tourist stays, including in regional areas

Disadvantages

- High turn-over rates of employees increases training requirements and contributes to lower average productivity compared to some other workforce cohorts
- Creates incentive structures which can increase the risk of worker exploitation
- The number and distribution of workers is driven by backpacker supply, rather than employers demand
- The high levels of reliance on the WHM program, especially in horticulture, holds the potential for future instability
- Some significant horticultural production regions in peri-urban areas do not qualify as regional for the purposes of a second year visa extension.

Source: (Howe et al. 2019; Zhao et al. 2018).

8.4.1 Government initiatives to address the risk of migrant worker exploitation

Migrant Workers Taskforce

Reports of the exploitation of migrant worker by agricultural employers or labour hire service providers are not uncommon. The Migrant Workers Taskforce was established in 2016 as part of the Australian Government's commitment to protect vulnerable workers. It was asked to identify further proposals for improvements in law, law enforcement and investigation, and other practical measures to more quickly identify and rectify any cases of migrant worker exploitation.

The report of the Migrant Workers' Taskforce was released on the 7 March 2019. The Taskforce was chaired by Professor Allan Fels AO and Dr David Cousins AM and made 22 recommendations aimed at improving workplace protections for vulnerable migrant workers (Migrant Workers' Taskforce 2019). The Government has accepted in-principle all 22 recommendations (AGD 2019). The Australian Government further announced measures in the 2019-20 Budget responding to recommendations with additional funding to be provided to the Fair Work Ombudsman to bolster enforcement action and to enhance resources to ensure vulnerable workers are aware of their workplace rights.

The Fair Work Ombudsman's Harvest Trail Inquiry

Initiatives being progressed as part of the Australian Government's response to the Migrant Workers' Taskforce report build on the work already being done by the work place regulator, the Fair Work Ombudsman (FWO). The FWO initiated its Harvest Trail Inquiry, which began in 2013 and reporting in late 2018, in response to complaints that it received from migrant workers that follows the seasonal harvesting of horticultural produce. The Inquiry investigated workplaces along Australia's Harvest Trail. The Inquiry found widespread non-compliance, with over half of the horticultural businesses not complying with workplace laws, and inspectors recovering more than \$1 million in unpaid wages for over 2,500 workers (FWO 2018).

8.5 Seasonal Worker Programme

The Seasonal Worker Programme (SWP) provides citizens from nine Pacific countries and Timor Leste access to work in Australia's agriculture and accommodation sectors. The SWP, administered by the Australian Government Department of Education, Skills and Employment, aims to provide labour to these sectors in regional locations. The SWP also intends to build and strengthen Australia's relationship with the Pacific countries and contribute towards their economic development.

The countries currently participating in the SWP are Fiji, Kiribati, Nauru, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Timor-Leste. The SWP is uncapped and the number of SWP participants has increased annually from 1,473 in 2012-13 to 8,459 in 2017-18 and 12,200 in 2018-19 (Dufty, Martin & Zhao 2019). In 2017-18, over 97% of approved seasonal worker placements were in horticulture and another 1% was in broader agriculture. Although Howe (et al. 2019) was critical of the SWP in comparison to New Zealand's equivalent program, the Recognised Seasonal Employer scheme, such comparisons are premature as the number of Pacific workers participating SWP is continuing to increase rapidly.

Box 20 Reported advantages and disadvantages of the Seasonal Worker Programme.

Advantages

- Allows workers to return in successive years, increasing workforce productivity.
- Program specific safeguards to protect against worker exploitation.
- The number of workers is uncapped.
- Responsive to farmer or labour hire contractor demand.

Disadvantages

- Smaller farms without sufficient continuity of work find the program difficult to access.
- The costs of the program and administration involved has been considered burdensome by some employers.
- A restricted range of source countries.

Source: Zhao et al. 2018.

To access workers through the program, employers either need to be approved by the Department of Education, Skills and Employment or to contact an approved employer, such as a labour hire contractor, who manages the recruitment and takes care of all the administrative arrangements. Approved employers are responsible for:

- testing the labour market, and trying to recruit local Australian workers before seeking access to seasonal workers
- employing seasonal workers in accordance with Australian workplace legislation
- providing briefings to seasonal workers on-arrival into Australia and before departing for home
- providing seasonal workers a minimum average of 30 hours per week
- paying for the full cost of each seasonal worker's return international airfare and domestic transfer arrangements up front, and recouping from the combined cost any amount over \$300 from a seasonal worker's pay over time
- organising and providing access to council approved accommodation and transport to and from work for each seasonal worker (at the seasonal worker's expense)
- providing access to pastoral care for workers, including opportunities for recreation and religious observance, a 24 hour contact number, and assisting workers to access services in the local community (DESSFB 2019I).

Zhao (et al. 2018) explored the quantitative productivity benefits of the SWP workers in comparison to working holiday maker visa holders, combined with qualitative interviews with farmers that used the program. The study found that the productivity of seasonal workers was, on average, 20% higher than that of working holiday makers for the farm businesses based on fruit picking tasks. In addition, farmers that used the program appreciated the predictability and reliability of the SWP workforce and the greater control it gave them over the recruitments process. However, the non-wage labour costs related to seasonal workers was 2.3 times higher per hour worked than for working holiday makers. This estimate includes costs associated with

the recruitment process, some transport, training and administration. However, these costs were estimated to be only a small part of total farm cost so is likely to have a limited impact on farm profitability.

One of the concerns raised by the agriculture industry about the SWP has been difficulty that smaller farm enterprises have with accessing the scheme. This is because smaller farm enterprises find it difficult to provide a sufficient continuity of work or a minimum of 30 hours work a week as required by the program. In addition, labour hire firms have been reluctant to take on the risk of hiring workers without having sufficient demand from a single farm business for the workers. To address the workforce needs of smaller agricultural enterprises, a 12 month pilot commenced on the 1 May 2019 that streamlines arrangements for approved employers to move seasonal workers between farm placements. The pilot is underway in the Goulburn/Murray (Vic), Riverina (NSW) and Sunraysia (NSW/Vic) regions, and has been extended to the Wimmera/Mallee (Vic) with effect from 1 January 2020. The pilot has been extended to 30 June 2020 and will then be evaluated.

The agriculture industry has also raised concerns about the administrative burden associated with the program. However, successive governments have streamlined the administrative arrangements for the program to make it easier for employers to access it (Box 21 **Error! Reference source not found.**) and the number of seasonal workers participating in the program continues to grow strongly. In addition, some of the administrative arrangements of concern to industry are designed to safeguard workers from exploitation and ensure their welfare or to ensure that the local workers are given preference in the recruitment processes (Box 20).

Box 21 Seasonal Worker Programme (SWP) Reforms

Phase one 2008-2012

- Opening up the pilot to allow direct employment of Seasonal Workers, rather than through labour hire firms.
- Removing geographical constraints so employers in a wider range of areas could access workers under the pilot.
- Changing employer contributions to visa holders' airfares depending on their country of origin.
- Modifying the minimum period of work requirement.
- Reducing employers' responsibility for domestic travel costs.
- Reducing the tax rate for Seasonal Workers from 29% to 15% for their first \$37,000 of taxable income.

Phase two 2012

- Expanding the number of source countries to nine Pacific states and Timor-Leste.
- Increasing the SWP's reach beyond horticulture through a trial to three additional sectors (aquaculture, cotton and cane).
- Lifting the cap on the number of workers to 12,000.

Phase three 2015

- Removing annual limits on the number of visas issued.

Box 21 continued.

- Reducing employer contribution to covering workers' domestic and international transportation costs.
- Removing the requirement that each visa holder be given a guaranteed minimum period of 14 weeks' work. This was replaced with a new requirement that Seasonal Workers 'will benefit financially from their participation in the program'.
- Expanding the SWP into other occupations in the agriculture industry, including cattle, sheep, grain and mixed enterprises.

Phase four 2017-2018

- Introducing multi-entry visas.
- Streamlining the application process to become an Approved Employer through fewer forms and simpler processes.
- Investigating ways to help employers lodge information online.
- Piloting ways to lower upfront costs for employers.
- Removing the requirement for employers to organise the Add-on Skills Training component.
- Piloting a 24/7 information line for workers to complement the pastoral care provided by Approved Employers.
- Increasing promotion to employers in eligible industries and their Industry Associations.
- Introducing a new condition allowing Seasonal Workers to change employers in exceptional circumstances.
- Piloting ways to help Seasonal Workers access their superannuation once they have left Australia.
- Reducing employer contribution to travel costs to \$300 (from \$500).
- Increasing the period in which labour market testing is valid from 3 to 6 months.
- Increasing the period of work for all SWP partner countries to 9 months.

Source: Howe et al. 2019.

8.6 Pacific Labour Scheme

The Pacific Labour Scheme (PLS) aims to complement the SWP and is administered by the Department of Foreign Affairs and Trade (DFAT). It officially began in July 2018. Like the SWP, the PLS allows citizens from Pacific partner countries to fill shortages in low to semi-skilled positions in regional and rural Australia. However, workers in the PLS stay in Australia for longer periods of time—a minimum of 12 months and up to a maximum of three years and can fill an expanded range of job roles (not just unskilled). The PLS has no annual cap on the number of workers that can enter Australia under the scheme (DFAT 2019). The PLS commenced on 1 July 2018 and the advantages and disadvantages of the scheme have not been fully assessed at this early stage.

Similar to the SWP, there is a strong focus on ensuring PLS workers are safeguarded from exploitation. Any business seeking to engage in the PLS must be accredited by DFAT as an approved employer. The recruitment of workers under the PLS is facilitated by the Pacific

Labour Facility (PLF). The PLF works on behalf of DFAT and guide employers through the processes of securing workers and ensuring pastoral care and support services are adequate, which is a requirement as a part of the PLS and aims to negate worker exploitation.

The processes and costs involved in the PLS can be viewed as a deterrent to employers especially when compared to the WHM programs. However, the costs and processes are required to ensure the workers are not exploited and that work is ensured over longer periods. Exploitation could subsequently undermine the purpose of the program and have the opposite effect by damaging participating countries development and also relationship with Australia.

8.7 Skilled visa arrangements

8.7.1 Temporary Skill Shortage and Regional Skilled Visas

Temporary Skills Shortage (TSS) visa arrangements allow employers to employ overseas workers to fill skilled vacancies (generally ANZSCO level 4 or 5; Table 3) when the local labour market cannot meet this demand. In contrast to the number of overseas workers employed through the working holiday maker and SWP arrangements, the number of workers on skilled visas is relatively small—there were 912 workers on skilled visas in agriculture, forestry and fishing in 2017 (Dufty, Martin & Zhao 2019).

The small number of people granted TSS and the previous Regional Sponsored Migration Scheme (RSMS) visas, compared to working holiday maker and SWP arrangements, should not diminish the importance and value add of these visas holders to the industry. These visa holders can be of significant value to the agricultural industry, but this value is not necessarily reflected in the number of visas granted. Individuals with correct skills sets can be limited even upon a global scale creating a highly competitive market for talent for some (Dairy Australia et al. 2019). It is likely that as technology continues to advance, management skills increase and enterprise scale continues to grow the demand for these workers will increase. Box 22 explores the benefits that the pork industry has experienced using skilled visa arrangements.

Box 22 Pork industry

Skilled migration programs have provided benefits to some agricultural industries that require specific skills that are not available in the local labour market. Australian Pork Limited conducted a survey of 54 pork producers in 2017 (APL 2017). The survey results found that 68% of respondents had staff vacancies and 81% employed workers from overseas. 95% of these workers had the relevant skillsets or formal qualifications necessary to fulfil roles. All respondents to the survey reported that the Temporary Skills Shortage (TSS) Work (Skilled) (subclass 457) visa program, was a successful means in addressing labour shortages. The 457 visa has since been replaced by the 482TSS visa.

The following visas are available to individuals who are qualified to work or train in an eligible skilled occupation in Australia:

- Employer Nomination Scheme (subclass 186)
- Regional Sponsored Migration Scheme (subclass 187)
- Skilled Independent visa (subclass 189)

- Skilled Nominated visa (subclass 190)
- Training visa (subclass 407)
- Temporary Skill Shortage visa (subclass 482)
- Temporary Graduate - visa (subclass 485)
- Skilled Regional (Provisional) visa (Family sponsored) (subclass 489)
- Skilled Regional (Provisional) State or Territory nominated visa (subclass 489)
- Skilled Work Regional (Provisional) (subclass 491)
- Skilled Employer Sponsored Regional (Provisional) (subclass 494; Department of Home Affairs 2019b).

The Skilled Regional (Provisional) (subclass 489) visa closed to new applicants on 15 November 2019 and was replaced by the new Skilled Work Regional (Provisional) (subclass 491) visa. The Direct Entry stream of the Regional Sponsored Migration Scheme (RSMS) (subclass 187) visa also closed to new applications on 15 November 2019.

To date, the two main visa categories that allow farm businesses to access skilled visas have been the TSS visa (subclass 482) and the previous RSMS (subclass 187; Dufty, Martin & Zhao 2019).

The Temporary Skills Shortage visa (subclass 482), started in March 2018 (replacing the Temporary Skills Shortage (TSS) 457 visa). This visa has two streams; a short-term stream (up to two years) and a medium-term stream (up to four years). Both short and medium term visas can be renewed. However, only people granted a medium-term TSS visa may have a pathway to permanent residency. Eligible skilled occupations are listed on the Short-term Skilled Occupation List (STSOL); Medium and Long-term Strategic Skills List (MLTSSL) and the Regional Occupation List (ROL). These lists are agreed by the Minister for Immigration, Citizenship, Migrant Services and Multicultural Affairs based on advice from the Minister for Employment, Skills, Small and Family Business. The Department of Education, Skills and Employment conducts labour market analysis and stakeholder engagement to inform the lists' updates.

The ROL provides regional employers and skilled migrants applying for regional access to more occupations than are available in metropolitan areas. There are 77 additional regional occupations available on the ROL. This additional list applies to the Temporary Skill Shortage visa (subclass 482 medium-term stream), the Skilled – Regional (Provisional) visa (subclasses 489, 491 and 494) and the Training visa (subclass 407). In addition, there are 650 eligible occupations available under the Skilled Employer Sponsored Regional (Provisional) visa (subclass 494; Department of Home Affairs 2019b), which also provides for permanent residency. However, the costs and processing times for Skilled Employer Sponsored Regional (Provisional) visas are greater than other visa options (Table 21).

Businesses sponsoring skilled visa applicants need to meet certain obligations including demonstrating they are experiencing a genuine skilled workforce shortage, payment of travel, processing and training costs. For the Temporary Skill Shortage visa, the employer must pay at or above a minimum salary requirement established by the Temporary Skilled Migration Income Threshold (currently \$53,900). This salary requirement also applies to the 186, 187 and 494 visas.

On 11 March 2019, the government announced changes to the skilled migration occupation lists (Short-term Skilled Occupation List (STSOL), Medium and Long-term Strategic Skills List (MLTSSL) and the Regional Occupation List (ROL). A suite of agricultural occupations were moved from the STSOL to the ROL, which enables access to a four-year visa that can be renewed multiple times. Formerly, these occupations could only access the short-term stream of the TSS visa, which enables access to a two-year visa which can be renewed once. The agriculture related occupations included on the three skilled occupation lists are listed in Box 23.

Box 23 Agricultural roles listed on occupation lists

Regional Occupation List

- Agricultural technician
- Aquaculture farmer
- Deer farmer
- Horse breeder
- Mixed livestock farmer
- Ship's engineer
- Turf grower
- Beef cattle farmer
- Fruit or nut grower
- Livestock farmers (other)
- Pig farmer
- Ship's master
- Wine maker
- Cotton grower
- Goat farmer
- Master fisher (494 ROL)
- Poultry farmer
- Ship's officer
- Wool buyer
- Crop farmers (other)
- Grain, oilseed or pasture grower
- Mixed crop or livestock farmer
- Shearer (494 ROL)
- Stock and station agent (494 ROL)
- Wool Classer (494 ROL)
- Dairy cattle farmer

Box 24 continued.

- Grape grower
- Mixed crop farmer
- Sheep farmer
- Sugar cane grower

Medium and Long-term Strategic Skills List

- Agricultural consultant
- Agricultural engineer
- Agricultural scientist
- Diesel motor mechanic
- Forester
- Horse trainer
- Veterinarian

Short-term Skilled Occupations List

- Apiarist
- Arborist
- Butcher and smallgoods maker
- Flower grower
- Meat inspector
- Primary products inspector (other)
- Production manager (forestry)
- Vegetable grower
- Veterinary nurse

Source: Department of Home Affairs 2019d.

8.7.2 Industry Labour Agreements

Industry labour agreements enable approved businesses to sponsor skilled overseas workers when there is a demonstrated need that cannot be met in the Australian labour market and standard temporary or permanent visa programs are not available. For example, industry labour agreements allow for the employment of migrant workers in industry specific semi-skilled positions that are not currently on the approved skilled occupation lists (Box 24). There are presently nine labour industry agreements, five of which cover agricultural industries:

- dairy
- fishing
- meat
- horticulture

- pork
- minister of religion
- on-hire
- restaurant (fine dining)
- advertising (Department of Home Affairs 2019d).

Industry labour agreements are developed between the Australian Government (represented by the Department of Home Affairs) and a representative of employers. The agreements usually cover a period of five years and use one or both of the following visa programs:

- Temporary Skill Shortage (TSS) visa (subclass 482)
- Skilled Employer Sponsored Regional (Provisional) visa (subclass 494)
- Employer Nomination Scheme visa (subclass 186).

Industry labour agreements are demand driven by approved businesses sponsoring the visas for skilled overseas workers. The agreements can offer employment for periods of up to four years and then can open a pathway for permanent residence. Box 24 provides an example in describing the Dairy Industry Labour Agreement.

Box 24 Dairy Industry Labour Agreement

Employers can nominate to sponsor migrant workers for the occupation of 'senior dairy cattle farm worker'. Presently, there is no ANZSCO code for this occupation and employers must use a different code to nominate. Despite senior dairy cattle farm worker not on the list of occupations, it requires the execution of a range of complex skilled tasks including:

- coordinate and implement reproductive programs, including artificial insemination and herd fertility management, detection of oestrous and pregnancy
- implement calving procedures, including the ability to physically conduct unsupervised internal assessments to minimise the incidence of still births or injuries to cow or calf
- supervise animal health programs, handle sick or injured animals and maintain an optimal environment for the wellbeing of livestock consistent with the Australian Animal Welfare Standards and Guidelines – Cattle
- supervise work routines and performance of less experienced employees
- operate a dairy recycling system and farm and dairy shed-related vehicles, plant and equipment
- transport, handle and store chemicals; prepare and apply chemicals
- where appropriately qualified, perform maintenance works on sheds, fixtures and fittings, fences and surrounds and install new or replacement equipment or fittings
- ensure food safety regulatory requirements are met
- operate computer equipment and software packages
- coordinate the response to emergencies for both occupational health and safety emergencies and animal welfare emergencies

Source: Department of Home Affairs 2019d.

8.8 Regional arrangements

8.8.1 DAMAs

Designated Area Migration Agreements (DAMAs) are agreements between Designated Area Representatives (DARs) and the Minister of Immigration, Citizenship, Migrant Service and Multicultural Affairs. DAMAs are an employer-sponsored visa program and individual workers cannot apply for a visa independently. DAMAs typically last for five years (with an annual review process in place to assess and potentially vary the terms, concessions, approved occupations and nomination ceilings) and are demand driven.

DAMAs provide the flexibility for states, territories or regions to respond to their unique economic and labour market conditions through an agreement-based framework.

From an agriculture perspective, DAMAs allow sponsoring businesses to access semi-skilled migrant workers, which could be otherwise ineligible for migration under the Skilled Occupation Lists. The cause of ineligibility is usually due the relevant positions not being considered skilled under current policies and the occupation lists.

DAMAs generally utilise the Temporary Skill Shortage (subclass 482) visa and Employer Nomination Scheme (subclass 186) visa that require employer sponsorship. In addition, the new Skilled Employer Sponsored (provisional) Regional (subclass 494) visa is available for use in DAMAs since its introduction on 16 November 2019. A DAMA may include various negotiable concessions to these visa programs, however legislative requirements including demonstrating a genuine labour market need for the defined occupations, as well as sponsor obligations, health, character and other visa requirements, must be met. There are currently seven DAMAs in effect, these include:

- Northern Territory (the second DAMA for the territory)
- Adelaide city, South Australia
- Regional South Australia
- Kalgoorlie-Boulder (Goldfields), Western Australia
- Great South Coast, Victoria
- Orana, New South Wales
- Far North Queensland (Department of Home Affairs 2019e).

DAMAs are designed to ensure employers recruit Australian citizens and permanent residents as a first priority and prioritise initiatives and strategies to facilitate the recruitment and retention of such workers. After this, DAMAs provide the option to bring in a broader range of workers than the standard skilled migration program, where there is a demonstrated need in a defined geographical location. DAMAs can allow for agricultural businesses in these regions to employ migrant workers. Interest in DAMAs is continuing to develop nationwide, The introduction of a comprehensive regional engagement strategy, including Home Affairs Regional Outreach Officers conducting both a national roadshow and targeted engagement with regional employers and industry, is increasing awareness of DAMAs and other regionally specific migration

pathways.. Information on the Northern Territory DAMA from the Department of Trade, Business and Innovation (2019) is below in Box 25.

8.8.2 Skilled Regional Provisional Visas

As part of the Government's Plan for Australia's Future Population, 25,000 places within the Migration Program were allocated to regional skilled migrants, and two new regional skilled visas were introduced on 16 November 2019.

- The Skilled Work Regional (Provisional) (subclass 491) visa is for applicants who are nominated by a State or Territory Government or sponsored by an eligible family member who is resident in regional Australia.
- The Skilled Employer Sponsored Regional (Provisional) (subclass 494) visa is for applicants sponsored by an Australian business in regional Australia.

A key feature of the visas is a requirement for skilled regional migrants to live and work in a regional area for at least three years. In addition, to be eligible for the new Permanent Residence (Skilled Regional) (subclass 191) visa from 2022, skilled regional provisional visa holders will need to demonstrate they have lived and worked in regional Australia as holders of a regional provisional visa.

25,000 places within the Migration Program have been allocated for regional skilled migrants, and providing priority visa processing for all regional visa applications.

8.8.3 Regional definition

The definition of 'regional Australia' for skilled migration purposes changed on 16 November 2019, comprised of the following three categories:

- Category 1 – 'Major Cities' of Sydney, Melbourne and Brisbane do not receive regional incentives.
- Category 2 – 'Cities and Major Regional Centres' of Perth, Adelaide, the Gold Coast, the Sunshine Coast, Canberra, Newcastle/Lake Macquarie, Wollongong/Illawarra, Geelong and Hobart have access to the following regional incentives:
 - access to the dedicated 25,000 regional places;
 - priority processing of regional visas;
 - access to the Regional Occupations List – more jobs compared to non-regional lists; and
 - international graduates with a bachelor or higher qualification from a regional campus of a registered institution will be eligible to access an additional year in Australia on a post-study work visa.
- Category 3 – 'Regional Centres and Other Regional Areas' will also have access to the dedicated 25,000 regional places, priority processing of regional visas, and the Regional Occupations List. Additional incentives include:
 - international graduates with a bachelor or higher qualification from a regional campus of a registered institution will be eligible to access additional two years in Australia on a post-study work visa.
 - priority in negotiating region-specific Designated Area Migration Agreements.

Refinement of the definition of ‘regional Australia’ for skilled migration purposes will add to incentives for skilled migrants to settle into Australia’s regions, and at the same time, help ease growing infrastructure and congestion pressures in Australia’s major cities.

8.9 Other visa programs

Holders of visas with attached work rights may choose to work in the agriculture industry. This includes student visa and refugee visas. It is not known how important a contribution these other visa programs make to the agriculture workforce, but it is thought to be locally significant in some instances.

Box 25 The Northern Territory DAMA

The new Northern Territory (NT) DAMA is the second version of the NT DAMA and applies to the whole of the NT. The DAMA is tailored to address current and emerging labour market shortages.

The key elements of the NT DAMA are:

- pathways to permanent residency for NT DAMA visa holders (including transitional arrangements for existing visa holders)
- a broad range of occupations that reflect NT skilled and semi-skilled shortages, with no caveats to apply
- English language concessions for some occupations
- salary concessions that reflect NT market rates, ensuring that worker terms and conditions of employment are not eroded, and NT businesses and consumers are not subjected to inflationary costs
- a range of risk and integrity actions to ensure that the rights of both employees and employers are protected
- a five-year agreement to reduce red tape.

Businesses can access the NT DAMA if:

- they are actively operating in the NT and:
- are viable and have been operating for at least 12 months
- have no history of not meeting its obligations to employees
- are looking to employ overseas workers to fill full-time positions with duties that align with one of the occupations on the NT DAMA list
- can demonstrate they cannot fill the position locally with Australian citizens or permanent residents
- can provide terms and conditions of employment to overseas workers that are in accordance with those offered to Australian workers employed in the region.

Source: Northern Territory Department of Trade, Business and Innovation 2019.

8.9.1 Student visas (Subclass 500)

International students can study in Australia on the student visa (subclass 500). These students are able to work while they complete their studies. These visa holders have limitations on their working hours (no more than 40 hours per fortnight during semester). This is because the purpose of their time in Australia is to complete tertiary education, not to work. International students can work in agriculture and this trend would be more apparent in regional universities closely situated to agricultural businesses. Presently, there is no way to validate the number of international students that are employed in agriculture. Howe (et al. 2019) reported that the limitations on working hours associated with the student visa may encourage these visa holders to work in breach of these conditions.

8.9.2 Refugee visas

Australia's refugee and humanitarian visas allow for migrants who are subject to persecution in their home countries to move to Australia permanently. While there are types of refugee and humanitarian visas and subclasses, these are not designed or intended to provide workforce into regional Australia or for agricultural industries. However, there have been studies demonstrating the positive contribution that refugees have made to regional Australia and agriculture.

What is more, as part of Australia's regional migration scheme there are organisations that seek to aid refugees to settle in regional areas. There has also been some positive media attention on the social and economic benefits which can include revitalising and re populating rural areas (Collins et al. 2016; Box 26). One example of facilitating refugee migrants is the National Farmers Federation and the Migration Council Australia. These bodies collaborated and signed a memorandum of understanding on the Friendly Nation Initiative. The Friendly Nation Initiative seeks to enhance the refugee employment strategy in Australia and encourages Australian businesses to provide employment, mentoring, internship and work experience opportunities to refugees.

Box 26 Karen refugee settlement in western Victoria

Karen people are from Myanmar (formerly Burma) and have experienced persecution making them eligible for refugee status and acceptance into Australia. Over 200 Karen refugees have relocated to Nhill in Western Victoria from Melbourne. This was facilitated by the agricultural company Luv-a-duck. Luv-a-duck was looking to expand operations but lacked the necessary workforce. By collaborating with resettlement agency AMES Australia, Luv-a-duck worked to facilitate and support the relocation of the Karen refugees to Nhill in Victoria.

Approximately 54 refugees are directly employed by Luv-a-duck and others are engaged across other local businesses (Australian Government, 2019). The resettlement brought in the needed workforce, and helped to 'revitalise' the township. The economic benefit of the Karen settlement in Nhill was estimated to produce an approximate \$41.5 million boost to the local economy (Deloitte and AMES 2015).

8.10 Visa costs

The costs of visa sub classes commonly used by the seasonal and skilled agricultural migrant workers are shown in Table 21. The costs and administrative burden of accessing the skilled visa arrangements are substantial and may act as a barrier to sourcing labour via these pathways (Dufty, Martin & Zhao 2019). The government's skilled migration reforms (effective August 2018) required employers who sponsor a foreign worker to pay a levy under certain visa types, including:

- Temporary Skill Shortage (TSS) (subclass 482) visa
- Employer Nomination Scheme (ENS) (subclass 186) visa
- Regional Sponsored Migration Scheme (RSMS) (subclass 187) visa.

The levy also applies to the Skilled Employer Sponsored Regional (Provisional) (subclass 494) visa that commenced on 16 November 2019.

The purpose of the levy is to require employers seeking to access skilled overseas workers to contribute to the skills development of Australians. The levy payments are tax deductible.

The purpose of the levy is to require employers seeking to access skilled overseas workers to contribute to the skills development of Australians.

Table 21 Costs of visa classes commonly used by migrant agriculture workers

Visa sub-class	Employer/sponsor costs		Visa holder costs
	Application and sponsorship charges	Other costs	Application costs
Working Holiday Maker (417)	0	0	\$485
Work and Holiday Maker (462)	0	0	\$485
Temporary Work (international Relations) visa (403) <i>Seasonal Worker Program stream</i>	\$420 sponsorship	All return travel costs (up front), with all except \$300 being repaid via pay deduction. Costs associated with providing pastoral care responsibilities.	\$310 Travel costs (repaid to the employer/sponsor except for the first \$300).
Temporary Work (International Relations) visa (403) <i>Pacific Labour Scheme stream</i>	\$420 sponsorship	Costs associated with providing pastoral care responsibilities.	\$310
Temporary Skills Shortage Visa (482) <i>Short Term stream</i>	\$330 application; \$420 sponsorship	Skilling Australia fund levy. \$1200 (small business) or \$1800 (other business) per year per worker.	From \$1,265
Temporary Skills Shortage Visa (482) <i>Medium-Long Term stream and Regional Occupation List</i>	\$330 application; \$420 sponsorship	Skilling Australia fund levy. \$1200 (small business) or \$1800 (other business) per year per worker.	From \$2,645
Skilled Employer Sponsored Regional (Provisional) Visa (494)	\$0 application; \$420 sponsorship	Skilling Australia fund levy. \$3,000 (small business) or \$5,000 (other business) one-off payment.	From \$4,045

Source: Department of Home Affairs 2019g.

8.11 Industry and employee representative concerns and policy tensions

Work migration arrangements seek to strike a balance between the needs of employers for workers, the needs of domestic workers for work and employment conditions and the broader national interest. Recent submissions to the Senate Standing Committee on Legal and Constitutional Affairs inquiry into the effectiveness of the current temporary skilled visa system in targeting genuine skills shortages provide an insight into the different views stakeholders have on the aspects of the current policy balance that has been struck by government.

8.11.1 The definition of ‘skilled’ occupations

The skills level of occupations is determined by the ANZSCO classification (Table 3), ranging from 1 (high skilled) to 5 (unskilled). Agriculture industry representatives have raised concerns that the ANZSCO classifications have not kept up with the changing nature of job roles (and titles), in particular that it does not identify mid-manager level roles in agricultural industries or the increased skills requirements of historically unskilled on roles (APL 2019; NFF 2018b). As noted by APL (2019), Industry Labour Agreements, provide a mechanism to identify tailored, industry specific occupation categories, which largely addresses concerns about the ANZSCO classification system.

8.11.2 Labour market testing requirements

As part of the process to hire workers through some visa programs, employers must demonstrate they have tested the local labour market and found they cannot source the workers they require. This ensures that employers favour local workers before migrant workers and that visa programs are only used where a genuine local labour or skills shortage exists.

Agriculture industry representatives contest that these arrangements are generally onerous for farmers, provide little benefit to the community and should be abandoned, particularly for occupations or regions with demonstrated labour shortage (AMIC 2018; NFF 2018b; APL 2019; Growcom 2015). Conversely, employee representatives were critical of the application of labour market testing requirements of industry labour agreements, questioning if some employers acted in good faith when testing the market, suggesting that the testing was conducted in such a way as to deter local people applying for the roles (AWU 2018; AMIEU 2018; ACTU 2015).

8.11.3 Short Term Skilled lists

Skilled occupations that qualify to access skilled visas are listed on either the Medium and Long-term Strategic Skills List (MLTSSL), the Short-term Skilled Occupation List (STSOL) or the Regional Occupation List (ROL). Agriculture industry representatives have concerns that agricultural occupations have tended to be list of the STSOL, which enables access to a two years visa, which can be renewed once. The STSOL does not provide visa holders with a pathway to permanent residency. The NFF (2018b) considered that without a pathway to permanence, fewer skilled workers may be attracted to the position, in turn impacting the sustainability and integrity of the industry. In March 2019 the government moved many of the agriculture roles listed on the STSOL to the ROL, which enables visa holders to access a four year visa that can be renewed multiple times, at lower costs and shorter visa processing times than available under the RSMS.

8.11.4 Costs

Accessing migrant workers through visa programs imposes costs of employers. These costs include those associated with hiring professional services, such as migration agents or lawyers, the Skilling Australia Fund Levy and the minimum wage rates set for migrant workers by the Temporary Skilled Migration Income Threshold (TSMIT).

- The purpose of the Skilling Australia Fund levy is to require employers seeking to access skilled overseas workers to contribute to the skills development of Australians.

- The TSMIT has been used as an entry level salary threshold to protect lower paid Australian jobs, and to ensure that temporary visa holders have reasonable means of support while in Australia.

Agriculture industry representatives have raised concerns with the costs associated with accessing migrant workers through some visa programs (NFF 2018b, AMIC 2018). Conversely, employee representatives argued that the TSMIT for migrant workers in Industry Labour Agreements was inadequate and that better terms and conditions of employment would result in more locals seeking to take up these positions (AWU 2018; AMIEU 2018).

8.11.5 Worker protections

Reports of migrant worker exploitation in some sectors of the agriculture industry, in particular the horticulture industry and the meat processing sector are not uncommon. In recognition of this risk, Australian Government department's that administer work visa programs have instituted measures to safeguard workers from exploitation. Although agriculture industry representatives recognise that such safeguards are necessary (Growcom 2015), they also contend that these safeguards reduce the flexibility and increase the administrative costs of the programs, such as the Seasonal Worker Program. However, as noted by the ACTU (2015) the regulation of the Seasonal Worker Program has ensured that some of the problems with exploitation that have been experienced with the working holiday maker visa arrangements have been avoided.

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Appendix A

National Agricultural Labour Advisory Committee-Terms of reference

Purpose

The purpose of the National Agricultural Labour Advisory Committee (the committee) is to help progress the National Agricultural Workforce Strategy (the strategy) and to advise the Government on farm labour and agricultural sector workforce challenges. The strategy provides the opportunity to comprehensively assess the workforce needs of the agriculture industry.

Scope

The committee will:

- prepare the strategy, including considering and examining:
 - the current and expected future agriculture industry workforce and skill needs
 - the current and expected demand and supply of labour for the agricultural supply chain to meet future agriculture industry workforce and skill needs
 - the effectiveness of current education and training arrangements, including programs designed to promote agricultural careers to students, at meeting the agriculture industry's workforce and skills needs
 - best practice examples and case studies of agricultural workforce development and potential innovative approaches aiming to deliver better outcomes
 - the outcomes from any other relevant reviews, consultation to date and inputs made by industry groups.
- as requested by government, provide specialist advice on farm labour and agricultural sector workforce challenges.

Note: 'agriculture industry' includes the agriculture, fisheries and forestry industries and their closely allied service and supply chain industry sectors.

Background

The Australian agriculture industry is changing, including through:

- the adoption of technologically advanced equipment and techniques
- the emergence of internationally competitive industry and business structures
- production changing to favour regions or products that are competitively advantaged
- a trend towards supplying premium food and fibre products.

At the same time as these changes are occurring, research suggests there is a lack of understanding about career prospects in the industry. There are also concerns about the ability of current education and training initiatives to upskill the industry workforce in response to the changes listed above.

The situation is dynamic. Responsibility for developing the agricultural workforce is shared between a suite of Commonwealth and State and Territory Government agencies, industry representative and private sector stakeholders. Workforce development initiatives undertaken by these groups confront opposing forces from environmental, economic and social factors, such as drought or poor commodity prices.

The strategy will recommend potential actions to address the agriculture industry's future workforce needs. These actions will target school education, vocational education and training and higher education to attract, retain and upskill the domestic workforce and identify where access to a migrant workforce will be necessary to meet the industry's workforce needs.

Membership

The committee will be chaired by an independent chair and up to 12 other members with relevant skills and experience in agriculture, fisheries or forestry industries, related agricultural supply chain industries, education and training and/or the future of work.

Other external experts and participants may be invited by the chair to discuss particular agenda items.

Consultation

National consultation will be undertaken to inform the development of the strategy. The committee will decide on the details of the consultation required to develop the Strategy.

Operation

Unless otherwise arranged, the committee will meet at least three times to support the development of the strategy, which is expected to take nine months to complete. There will be flexibility in whether meetings are conducted in person or by other means such as teleconferencing.

The committee will develop a work-plan to address the Terms of Reference. This could include commissioning expert advice or other assistance, if required.

Reporting

The committee will report the outcomes and advice from the meetings to the Minister for Agriculture. Once completed, the strategy will be submitted to the Minister for Agriculture and then published.

Secretariat

The Department of Agriculture will provide secretariat and administrative support for the committee.

Funding

The activities of the committee and the secretariat will be funded by the Department of Agriculture.

Term

The committee is expected to operate for up to two years.