



Submission to the

**Senate education, Employment and Workplace
Relations Committee**

In relation to its Inquiry into:

**Higher Education and Skills Training to Support
Future demand in Agriculture and Agribusiness
in Australia**

8 November 2011

Who we are

AgriFood Skills Australia (AgriFood) is one of 11 independent, not-for-profit Industry Skills Councils established by the Australian Government.

AgriFood Skills Australia is responsible for skills and workforce development for the agrifood industry, and welcomes the opportunity to make a submission to the Senate Inquiry into Higher Education and Skills Training to Support Future Demand in Agriculture and Agribusiness in Australia. This Inquiry comes at a critical time for Australia's agrifood industry.

Led by industry and funded by Government, AgriFood is charged with driving the skills and workforce development agenda across 43 sectors that include food processing, beverages, meat, seafood, agriculture, horticulture, conservation and land management, , pharmaceutical and racing.

Working in partnership with industry, governments, communities and the tertiary system, AgriFood's strategies and priorities are:

- Building enterprise productivity;
- Supporting high quality delivery and assessment of skills;
- Improving industry image and career pathways; and
- Driving industry leadership and sound policy.

Brief Overview of the Agrifood Industry and Key Workforce Challenges

The agrifood industry affords Australia an exceptional and enviable level of food security. Australia grows and produces over 89% of our domestic food supply and exports 80% of total gross value. Meeting the skill and labour needs of our industry is critical to future national food security, sustainable industry development and ensuring robust and sustainable communities in regional Australia.

Australia's agrifood industry comprises five major sectors: agriculture, horticulture and conservation and land management; food, beverage and pharmaceutical manufacturing; meat processing and retail; seafood processing and the three-racing codes. Within these five major sectors there are 43 sub-sectors, which together cover the entire food supply chain.

The agrifood industry is made up of 180,000 mostly small to medium sized enterprises and a workforce of more than 880,000 people, with 57% based in regional Australia. The industry is a significant contributor to the national economy, generating more than \$200 billion each year and accounting for around 20% of Australia's export earnings (AgriFood Skills Australia, 2011).

A Context for Action

AgriFood Skills Australia's 2011 Environmental Scan highlights:

- The critical role that regional Australia, home to 7.7 million people and the source of two-thirds of the country's export earnings, plays in securing our future;
- Growing recognition, by demographers and governments, of the potential of regional Australia to support a larger and more geographically dispersed population with resilient and highly productive enterprises and communities;
- The need for Australia to build a broader economic base to secure its enduring prosperity;
- The paramount importance of food security. Australia's agrifood sectors provide us with an enviable level of food security, as increasing global food prices reach unprecedented high levels and developing nations struggle to feed themselves;
- The growing responsibility of the agrifood workforce in biodiversity conservation, biosecurity, and preventative health, as frontline custodians of over 60 per cent of the Australian landmass and the world's third largest fishing zone.

Key Workforce Challenges

In a workforce development sense, the industry faces a looming crisis in several sectors due to the ageing of its people, skilled workers existing to the resources sector and poor attraction and retention rates over an extended period¹.

Currently, Australia is facing the dual imperative of ensuring that it can maintain its pre-eminent role as a leading food and fibre producer on global markets while also guaranteeing that the industry remains sustainable and able to meet our domestic food requirements. The agrifood industry is facing significant challenges to secure skilled labour supply due to a rapid ageing of the workforce, low unemployment rates in regional Australia, and a movement of skilled labour to other industries such as mining. Serious labour shortages in the agrifood industry pose fundamental food security challenges to Australia (AgriFood Skills Australia, 2011). There is potential risk that between 2013 and 2018, Australia's regional workforce will become depleted beyond critical mass. The following summarizes these key challenges facing the agrifood industry:

▪ Demographic Crisis and Labor Supply

The age profile of the workforce is a critical labour supply constraint for the rural sector. Demographic projections indicate that by 2018, 38%, (i.e. 116,558 workers of a 2008 workforce of 305,763 in agriculture) will be 65 years or over (Australian Farm Institute (AFI), 2010). It is predicted by AFI (2010) that by 2018, 56.2 percent of the current workforce will be aged over 55.

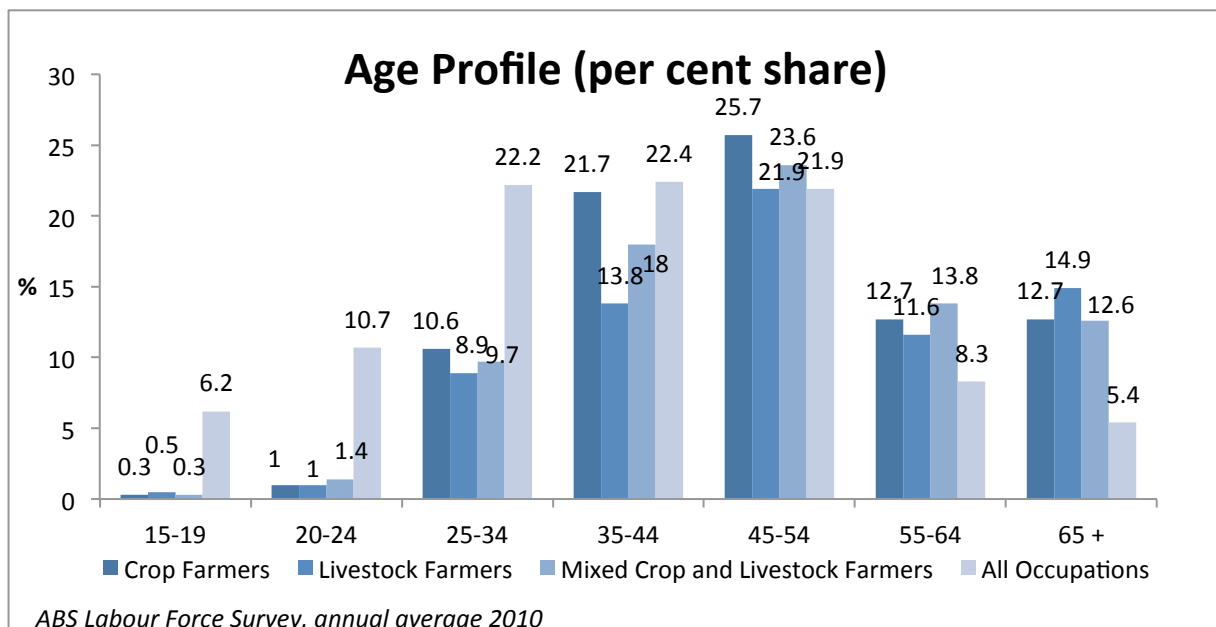
¹ 2011 Environmental Scan of the Agrifood Industry

The 2010 AgriFood Environmental Scan states:

The breadth of the workforce ageing crisis and the extent of the up skilling by existing workers goes beyond the resources and scope of any single government, sector or group of VET institutions. It requires a new mind set and unprecedented collaboration between all parties – industry, governments and a re-conceived training system.

Limited data is available on the demographics of industries and professions within the agricultural sector, but the data available provides a glimpse of the emerging challenges and potential chronic employment issues that the sector is facing (NFF 2011). The Labour Supply and Skills Branch in the Research, Analysis and Evaluation Group of Department of Education, Employment and Workplace Relations (DEEWR) has compiled ABS Labour Force Survey statistics for a limited selection of professions within the agricultural sector, which have been published on the Job Outlook website. Figure 1 shows the age profile of crop; livestock; and mixed crop & livestock farmers published by DEEWR and taken from the 2010 ABS Labour Force Survey. In 2010 the total number of crop, livestock and mixed crop & livestock farmers was 47,700, 105,100 and 42,200 respectively. The demographic data in Figure 1 indicates that there are large numbers of farmers over the age of 65 compared with the average age of the Australian workforce, in some cases more than nine per cent higher than the average, as well as relatively high numbers of farmers in the 45-54 and 55-64 age classes compared with the average workforce. The numbers of farmers in age classes 35-44 and younger are much lower than the Australian average.

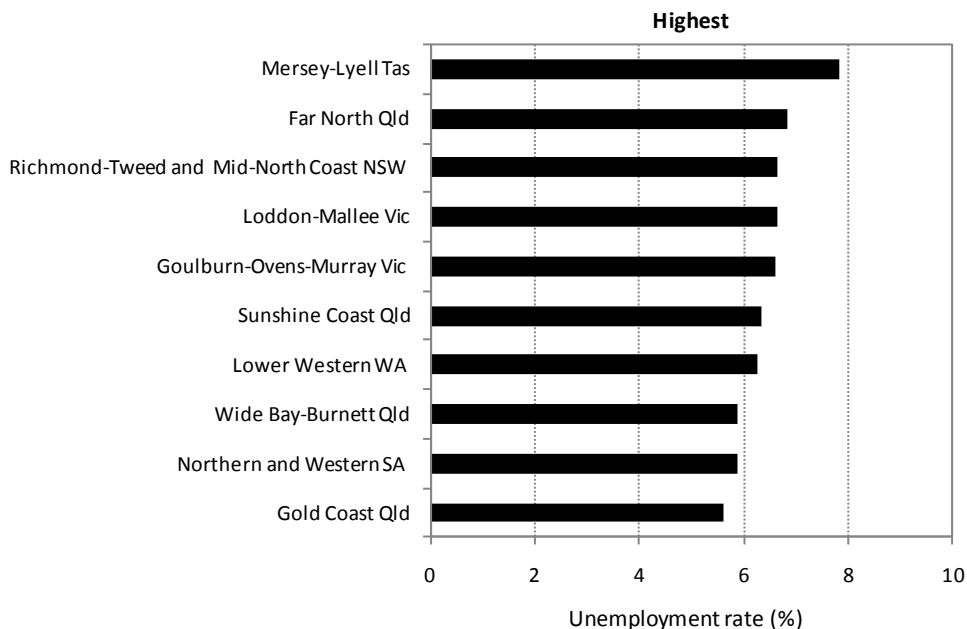
Figure 1. The age profile of crop; livestock; and mixed crop & livestock farmers and the Australian average age profile taken from the 2010 ABS Labour Force Survey.

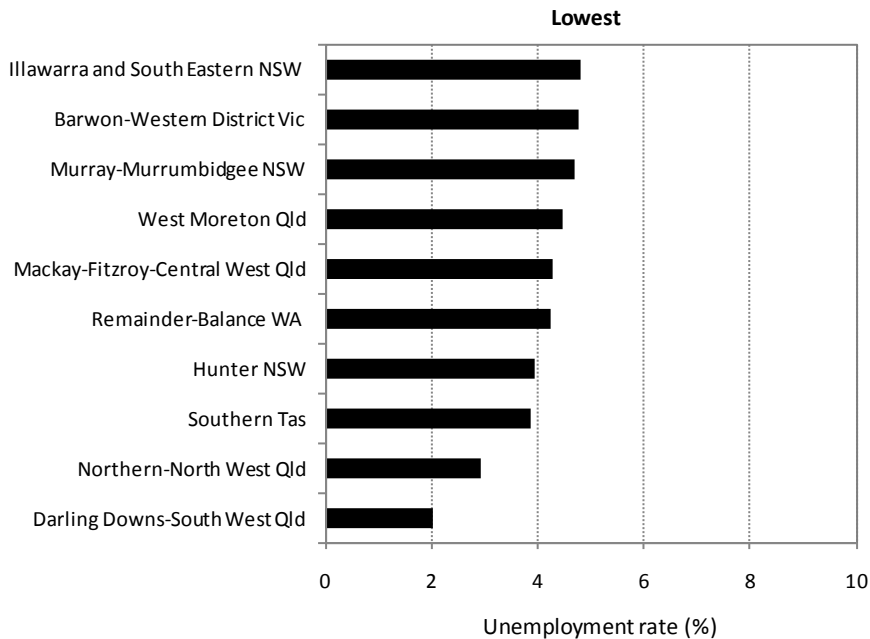


Low rates of unemployment and underemployment in rural and regional Australia demonstrate acute labour shortages exist and will increase in the future. Shortfalls in labour supply due to demographic factors will not be able to be met by pools of surplus labour in many parts of Australia.

There is a widespread perception that unemployment rates are higher in regional areas. However, this is not confirmed by ABS figures (Figure 2), which reveal very considerable diversity across regions in both labour force participation and unemployment rates. For example, in NSW unemployment is much higher in the north-coast region (6.7%) than in the Hunter region (3.9%), which has a considerably more diverse economic base (it includes mining, dairying, livestock, grain crops, market gardening, wine production, horse breeding, transport and shipping, and metals and engineering); the participation rate for the two regions shows the opposite pattern (56.5% in contrast to 63.3%). Similarly, in WA the regional areas in the south-west have lower unemployment and higher participation rates than elsewhere in the state. In many rural and regional areas the participation and unemployment rates are much the same as the overall rates. Recent ABS labour market statistics (cat. no. 6105.1, January 2011) do not show any strong perceptions of underemployment—that is, employed persons wanting and available for more hours of work—in the agriculture, forestry and fisheries sector (4.0%, in contrast to 7.0% for all employed persons, although this picture could change if unemployed persons were included). This suggests that many of the skills shortages reported for agrifood industries in rural and regional areas are a combined consequence of population outflows particularly among young people, and an the rapidly ageing nature of the population.

Figure 2 Rural and regional areas with the highest and lowest unemployment rates, November 2010





Source: Labour Force, Australia, Detailed - Electronic Delivery, Nov 2010, cat. no. 6291.0.55.001.

The massive increase in demand for Australia’s mineral and energy resources from China and India is driving an unprecedented demand for suitably skilled labor. As well, the significantly higher salaries available in the resources sector are seriously eroding the available supply of workers for the agrifood industry. The impact of the resources boom is a very serious issue for the agrifood industry, which is compounding the significant rate of demographic attrition discussed above.

- **The scale of high skilled para-professionals and professionals, and lower skilled labour shortages will accelerate in severity.**

AgriFood Skills Australia’s 2011 Environmental Scan demonstrates the agrifood industry is a rapidly transforming industry. The shortage of labour throughout the industry is impacting on a range of structural and workforce adjustments, such as a greater uptake of innovation, an aggregation of land holdings and the demand for increasingly skilled workers in new para-professional and technician-oriented occupations. Due to chronic skills shortages, there is also a move to using contractors who bring reliable and specialist skills to enterprises. As well, in order to compete successfully in today’s more complex operating environment, many small enterprises increasingly require employees with highly developed ICT, business and enterprise skills.

- **Agrifood students training in the VET system is relatively low to other industries and will not meet future industry needs.**

In 2006, only 46.7% of the agrifood workforce held a post-school qualification, in contrast to 58.8% for other industries. However, the post-school qualification rate in agrifood did increase substantially in the decade from 1996 to 2006, from 38.2% to 46.7%. The rate also increased for the rest of the workforce, from 49.6% to 58.8%, with the gap between agrifood and other industries widening slightly (NCVER, 2011).

Low training rates, combined with high rates of labour departure from the sector due to portable skills, indicates we can anticipate that the current national training system output of students in the agrifood industry will compound the demographic profile noted above, and will be clearly insufficient to meet the challenge of future industry skill and labour demand. Of the just over 80,000 enrolments each year in AgriFood Training Packages, there are only just over 20,000 full completions (NCVER, 2011)

The learning culture of the majority of agrifood sectors is developmental, socially embedded and occurs as needed over one's working life. Their preference is the acquisition of skill sets over time as a way of obtaining a full qualification. There is however, a serious disconnect between how regional Australia learns and how training is offered, planned and funded by the National Training System with few jurisdictions funding delivery of skill sets.

The VET system needs to change to address the industry's prevailing culture of incremental learning (building block approach). Furthermore, there are inadequate incentives for RTOs to operate effectively in the thin training markets of rural, regional and remote markets.

There is an urgent need to up-skill existing workers and the need to attract more skilled workers, both nationally and internationally especially young people, to seek employment in Australia's agrifood industry. Significant resources will need to be committed to help build a stronger culture of lifelong learning, and the attraction and retention of young people to agrifood careers.

- **Shortages of university trained agricultural scientists**

The 2011 AgriFood Skills Australia Environmental Scan revealed that it is estimated that half of the industry's agricultural scientists are approaching retirement. In 2009, the Australian university system produced 270 Agricultural Science graduates (Table 1). Industry is concerned that without intervention, there will be insufficient graduates from the vocational and higher education sectors to meet future industry skill and labour demand. A related concern to atrophying numbers of agricultural science graduates is the impact this is having on dissemination of research findings from research institutions. This is expected to have adverse effects on agrifood research extension into existing and new areas of research and regulatory challenges, e.g. the sector's capacity to adapt to climate change and undertake sustainable practice.

Table 1: Higher education agrifood course completions by field of education, 2006-09

	2006	2007	2008	2009
010709 - Soil science	2	0	1	1
010711 - Hydrology	37	17	36	34
010713 - Oceanography	0	0	0	1
010901 - Biochemistry and cell biology	370	407	369	372
010903 - Botany	30	38	36	34
010905 - Ecology and evolution	134	123	136	127
010907 - Marine science	224	180	199	225
010909 - Genetics	28	25	32	45
010911 - Microbiology	128	148	132	126
010915 - Zoology	76	86	83	73
010999 - Biological sciences, nec	1,830	1,759	1,912	1,908
019905 - Food science and biotechnology	815	769	719	674
019907 - Pharmacology	211	217	223	197
030307 - Food processing technology	27	55	52	52
040105 - Landscape architecture	244	285	272	206
050101 - Agricultural science	237	256	213	270
050103 - Wool science	0	1	0	0
050105 - Animal husbandry	85	137	173	142
050199 - Agriculture, nec	99	80	63	67
050301 - Horticulture	107	100	70	90
050303 - Viticulture	145	131	94	95
050701 - Aquaculture	67	64	34	23
050799 - Fisheries studies, nec	17	21	25	10
050901 - Land, parks and wildlife management	417	402	379	340
050999 - Environmental studies, nec	671	649	725	829
059901 - Pest and weed control	1	0	1	2
059999 - Agriculture, environmental and related studies, nec	202	192	324	345
061101 - Veterinary science	459	464	515	534
061103 - Veterinary assisting	0	2	1	2
061199 - Veterinary studies, nec	24	15	23	27
080321 - Farm Management and agribusiness	119	87	111	69
Total	6,806	6,710	6,953	6,920

Source: Higher Education Collection, 2006-09.

To a significant degree, the shortage in agricultural science professionals is a reflection of a rapidly evolving industry and that job roles, in particular those in the science area, are becoming more varied as the industry places a greater value on specific knowledge of the environment, technology and business practices. This is not to say that agricultural science is no longer a desired requirement, but graduates entering into the industry are now choosing more contemporary qualifications to reflect changing needs of industry. Rapid growth in the following areas is now reflective of where skills formation is occurring:

- Soil science - carbon capture, storage and accounting;
- Animal pathology - biosecurity, emergency pest and disease response;
- Genetics - animal behaviour, health and welfare;
- Natural resource management – sustainable management of land, water and vegetation;
- Water harvesting, filtration systems and water cycle management;
- Supply chain management; and Human resource management, marketing and business practice.

Skills Formation Involving Higher Education

The adequate supply of skilled and professional workers is a critical challenge facing the Australian AgriFood industry. In a recent report (2010), the AFI wrote:

The increasing difficulty many in agriculture are experiencing in securing educated personnel to participate in the sector is a reflection of short-term labour supply constraints are a consequence of a decade of strong economic growth, but also seems to be a consequence of some long-term factors. These include declining rural populations, a reduction in numbers of new entrants to the sector due to the increasing capital costs associated with owning a farm business, and the expansion of highly paid employment opportunities in the services and mining sectors.

The following discussion contributes to the discussion around graduate supply to the agrifood industry at the time where the significant demographic challenges facing the industry are partly resulting in increased agglomeration of land holdings and use of technology. Adding to these challenges, agrifood enterprises are facing the need to:

1. Reduce emissions ahead of a price on carbon;
2. Manage rising energy charges and water costs,
3. Use resources more efficiently;
4. Ensure animal welfare;
5. Adopt and diffuse new research findings, innovative practice and technology; and
6. Commit to ethical operations and social responsibility.

The Demand Side

These additional challenges make the imperative for a highly skilled workforce even more pronounced. The Australian Council of Deans of Agriculture (ACDA) has examined the demand for skilled individuals with tertiary qualifications in rural and regional Australia. The ACDA published a study in 2010 examining the job market in agriculture in Australia (Pratley and Hay 2010). It reviewed 50,600 vacancies advertised in the metropolitan and regional print media as well as the internet for a 3 year period from 2007 to 2009. A consistent demand for 15,000 agricultural employees was identified over the study period, with a ratio of 3:2 for agricultural production related jobs to positions in agribusiness. The ACDA has also published reports and submissions on the gap in graduate numbers. It estimates there may be as much as a six-fold gap between demand and graduate numbers and that graduate numbers are in decline (ACDA 2009). Importantly, the ACDA studies have highlighted that the way jobs were advertised was different between regional and urban Australia, with a particular emphasis on advertisements for agricultural employees in regional print media. This has implications for the way job data related to agricultural employment is collected and analysed, and the strategies required to understand the employment outlook for the sector. Pratley and Hay (2010) conclude that the job market in agriculture has been underestimated, and previous estimates for the demand for graduates have been “exceedingly low.”

As part of their analysis of skills and labor demand in agriculture, Pratley and Hay (2010) have provided estimates of the demand for university graduates. Their derivation of demand is as follows:

Based on the data in this study this would represent a potential of around 4200 (or 70% of agribusiness jobs) where tertiary qualifications might be encouraged. To this would be added the proportion of production jobs, which require managerial expertise. If these were 20% of the advertisements then a further 1800 might be advantaged by having a degree making a potential demand of around 6000 graduates per year. The study by the Australian Council of Deans of Agriculture (ACDA) in 2008 indicated that at best the Australian universities were graduating fewer than 800 per year in agriculture and related courses for an estimated job market of more than 2200 per year (Pratley and Copeland, 2008). This was based on 7% of the workforce having a degree, a situation way below the rest of the population at 22%. The estimate of 6000 in this study is nearly thrice that of the ACDA and would bring the graduate percentage much closer to the community standard but still significantly below it.

Thus, Pratley and Hay's (2010) estimates of the annual demand for university graduates in agriculture are approximately 6,000. The ACDA figures indicate that this demand is not being met.

The Supply Side: The Production of Graduates in Agrifood Related Degree Programs in Australian Universities

In 2010, AgriFood Skills Australia commissioned the NCVET to undertake an analysis of the VET, Higher Education training profile of the agrifood industry. The analysis of the Higher Education data available from DEEWR between 2006-2009 indicate that Australian universities produced just less than 7,000 graduates annually for agrifood related degree programs. We note that in the following analysis, that agrifood related degree programs are more broadly defined than agriculture, as discussed by Pratley and Hay (2010).

Table 2 Agrifoods commencing students and course completions 2006 to 2009: University Degrees

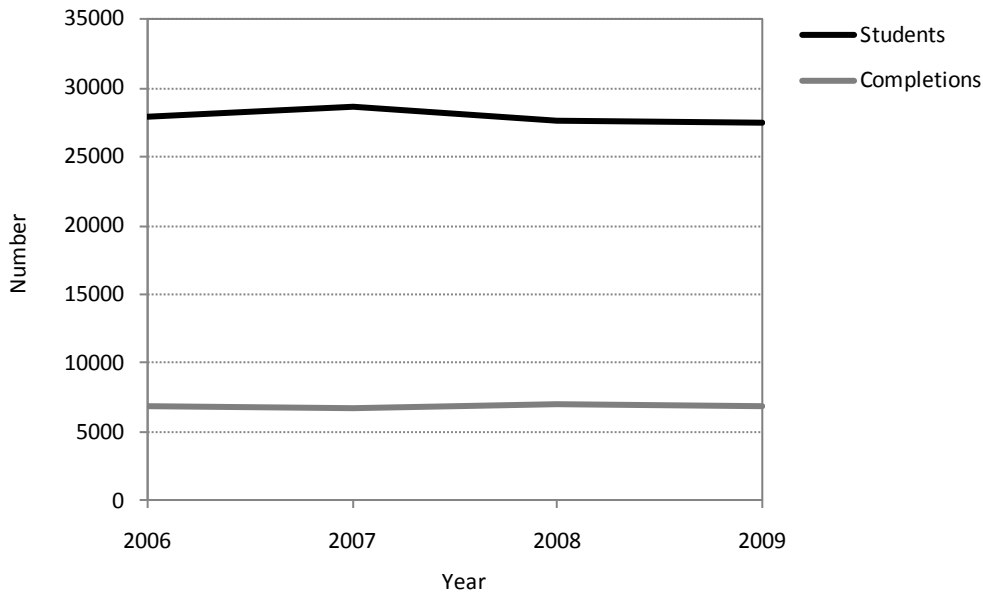
	Agrifood			
	2006	2007	2008	2009
Students				
Commencing	9351	9829	8737	9260
Not commencing	18612	18861	18911	18276
Total students	27963	28690	27648	27536
Completions	6,806	6,710	6,953	6,920

Source: DEEWR, Higher Education statistics 2006-2009.

Tables 1, 2, 3 and Figures 3 and 4 show students commencing agrifood students and course completions for the period 2006-2009. It is not possible to calculate completions rates from this data as it is point in

time data and does not show student flows. While we cannot calculate a completion rate from this data, we can look at the ratio of students completing in a given year as compared to students commencing three years earlier (assuming that this is the average length of the course). So for example, in 2008, 6,953 students completed and in 2006 9,351 students commenced giving a ratio of 74.3%. Similarly if we look at the numbers completing in 2009 and commencing in 2007 we get a ratio of 70.4%. However the interpretation of these figures must be treated with some caution.

Figure 3 Higher education agrifood students and course completions, 2006–09



Source: DEEWR, Higher education collection, 2006-09.

The majority of enrolments in agrifood skills programs are at bachelor-degree level (about 67%), with 2-3% in associate degrees, enabling programs and other undergraduate programs. The remaining 30% or so are in postgraduate programs. It is important to note that over a quarter of enrolments in agrifood related degree programs are from international students (27.8%), which is a surprising statistic.

Also revealing are the main fields of education of agrifood related degree enrolments (Table 2). The most popular is biological sciences (19.0% in 2009), followed by environmental studies (14.7%), veterinary science (12.5%), and food science and biotechnology (9.2%). Some of the fields that might normally be associated with the agrifood sector are well down the list: agricultural science (5.2%); marine science (3.9%); agriculture, environmental and related studies (3.1%); animal husbandry (2.7%); and farm management and agribusiness (1.2%).

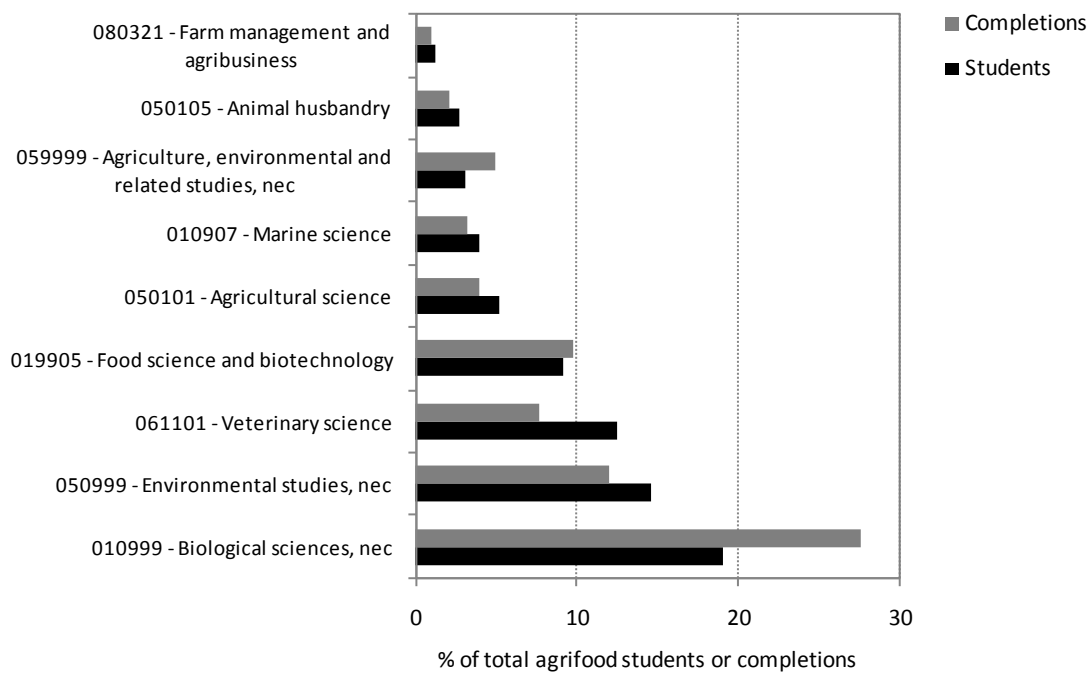
Table 3: Higher education agrifood students by field of education, 2006-09

	2006	2007	2008	2009
010709 - Soil science	5	4	2	2
010711 - Hydrology	83	91	79	56
010713 - Oceanography	1	3	7	10
010901 - Biochemistry and cell biology	1,509	1,609	1,538	1,639
010903 - Botany	195	182	169	174
010905 - Ecology and evolution	640	552	500	479
010907 - Marine science	934	903	951	1,085
010909 - Genetics	144	133	169	172
010911 - Microbiology	486	458	438	465
010915 - Zoology	326	450	363	414
010999 - Biological sciences, nec	5,718	6,113	5,576	5,243
019905 - Food science and biotechnology	3,031	2,818	2,731	2,532
019907 - Pharmacology	687	692	729	710
030307 - Food processing technology	125	214	140	126
040105 - Landscape architecture	1,154	1,218	1,148	1,074
050101 - Agricultural science	1,378	1,745	1,509	1,423
050103 - Wool science	0	0	0	0
050105 - Animal husbandry	794	855	808	738
050199 - Agriculture, nec	440	412	415	431
050301 - Horticulture	493	424	298	287
050303 - Viticulture	794	646	577	528
050701 - Aquaculture	222	174	134	84
050799 - Fisheries studies, nec	75	76	65	41
050901 - Land, parks and wildlife management	1,676	1,592	1,250	1,078
050999 - Environmental studies, nec	2,966	3,125	3,571	4,038
059901 - Pest and weed control	0	1	4	2
059999 - Agriculture, environmental and related studies, nec	786	773	827	854
061101 - Veterinary science	2,753	3,013	3,231	3,430
061103 - Veterinary assisting	0	0	2	2
061199 - Veterinary studies, nec	66	29	111	94
080321 - Farm Management and agribusiness	482	385	306	325
Total	27,963	28,690	27,648	27,536

Source: Higher Education Collection, 2006-09.

Qualification completions (Table 1) data provide some indication of graduate supply to the agrifood industry. The lowest numbers completing or absent completions are for: Soil science, Oceanography, Wool science, Fisheries studies, Weed and pest control, and Veterinary assisting. Other degree/course programs where completions have substantially decreased between the years 2006 and 2009 are in the areas of: Food science and biotechnology (-17%); Agriculture (-13%); Horticulture (-16%); Viticulture (-34%); Aquaculture (-66%); Fisheries Studies (-41%); Land, parks, and wildlife management (-18%); Farm management and agribusiness (-42%). The large percentage drops in completions over a four year period for the above courses, combined with non-completions is a concerning trend for these industry subsectors.

Figure 4 Higher education student and course completions in selected fields of education, 2009



Source: DEEWR, Higher education collection, 2009.

Conclusion

It is clear from the previous discussion the research undertaken by Pratley and Hay (2010) and our analysis of the supply side, that there is much we do not know about the changing dynamics of the agrifood labour market and how well this is being met. An important area for further research is to understand the extent to which demand for professional workers is being met by supply in the agrifood industry.

It is unclear from these course completion statistics the extent to which graduates in agrifood qualifications work in the agrifood industries post-graduation, and this is an important area to understand for both domestic and international students undertaking agrifood related degrees. Without systematic research on the relationship between degree completion and employment pathways and outcomes, we do not know whether the Higher Education sector in Australia is meeting the labour demands for the agrifood industry, and how well this demand is likely to be met in the future. Such research is essential to enable strategic planning for both industry and tertiary education institutions. AgriFood is now scoping such a research project.

Recommendations

“The breadth of the workforce ageing crisis and the extent of the upskilling by existing workers goes beyond the resources and scope of any single government, sector or group of VET institutions. It requires a new mind set and unprecedented collaboration between all parties – industry, governments and a re-conceived training system”²

The complex challenges facing this key national industry needs to be urgently addressed in order to ensure the long-term sustainability of the agrifood industry. The following are our recommendations to help address these challenges.

- Revision of Funding System to Increase Flexibility: Overall funding for VET and Higher Education has remained relatively static, but according to AgriFood Skills Australia’s Skills Providers Reference Group, funding allocation for agricultural education and training within this, has suffered relative to training for other industries, e.g. mining. There is increased demand for non-accredited training to provide businesses in the primary industries just-in-time training to meet industry information needs (e.g. trends in grain marketing). There is a need to assist the VET system and RDCs to disseminate key findings to primary producers using just-in-time training and knowledge provision systems. There is need for greater flexibility in funding to ensure that such training is funded and also accredited.

We recommend the allocation and distribution of Commonwealth and State funding be more flexible and demand driven, to enable greater flexibility in training delivery to meet future changes in demand for training. In particular, funding systems must allow for:

- The funded delivery of skills sets and recognize the complexities and additional costs associated with delivery in regional and remote areas and within thin markets.
 - Training funding needs to be based on the recognition of, and accommodate, the agrifood industry’s incremental building block approach to the acquisition of skills sets over a lifetime.
 - The funding of skill sets at all levels of qualifications as part of a building block approach to acquiring a full qualification over time.
- A Revision of Skill Set Funding for Qualifications Below Certificate III, Rather Than Above Certificate III, as Currently Funded.
 - Addressing the Stereotypical and Poor Image of the Agrifood Industry. This will require increased Commonwealth and industry funding for marketing of agrifood careers, and for building employer awareness of the importance of being an employer of choice in an increasing and highly competitive labour market. We recommend increased and targeted funding to:

² 2011 *Environmental Scan of the Agrifood Industry*

- Assist in overcoming out-dated stereotypical images of regional Australia and agrifood sectors by promoting an industry image that highlights contemporary and emerging job roles and their associated employment pathways;
 - Attract significant numbers of new entrants from the school, VET and university sectors, as well as new entrants from other industries;
 - Publicise contemporary case studies demonstrating the jobs and career opportunities for young people, presented through the eyes of employees pursuing exciting and successful careers in agrifood enterprises.
- Improve articulation arrangements between the VET and Higher Education Systems. Currently, there are piecemeal and inconsistent national articulation arrangements and pathways between the VET and Higher Education sectors. This is an inhibitor to both training and to developing a vocationally oriented higher education post-graduation workforce. Greater articulation between these two education sectors would also facilitate the development of clear career pathways for students in the Australian Higher Education system. AgriFood is working with a number of universities to assess current arrangements between the various institutions, as well as to seek to develop a set of standard arrangements for broader adoption.
 - We recommend that the Commonwealth increase funding to enable the development of clear articulation pathways between VET and Higher Education providers.
 - Addressing research gaps: There is limited research that examines how adequately the Higher Education and VET sectors are meeting current and future industry workforce needs, or what the projected skills demand actually is. This is also partly derived from patchy indications of what labour and skills shortages exist now, and what these are projected to be in the short, medium and longer term. We do not have an accurate perspective on how well the supply of agrifood graduates is meeting industry demand. These major knowledge gaps need to be urgently addressed in order to meet future skilled labour demand for the agrifood industry.

It is recommended that the following research areas be funded as a matter of urgency.

- A profiling of the labour and skills needs and the future dimensions of professional skills shortages in terms of industry subsector, occupational category, and by major regions. This research needs to urgently occur in order to inform government, higher education and industry investment in training in the agrifood sector.
- Comprehensive analysis of what degree programs exist, the size of current and projected enrolments, and university planning around meeting future industry labour force needs.
- Analysis of post-graduation employment destination of students having completed agrifood relevant degrees in the Higher Education System. Such research is urgently needed to inform government, university and industry investment in workforce skill training capacity development.

References

- Agrifood Skills Australia Ltd, 2010 Environmental scan of the agrifood industry. *A Perfect Storm of Shortage: Are We Ready?* Agrifood Skills Australia Ltd, Canberra, ACT, Australia.
- Agrifood Skills Australia Ltd, 2011 Environmental scan of the agrifood industry. *Australia's Regions: Australia's Future Agrifood Skills Australia Ltd, Canberra, ACT, Australia.*
- Australian Bureau of Statistics (2010) Labour Force, Australia, Detailed - Electronic Delivery, Nov 2010, cat. no. 6291.0.55.001.
- Australian Council of Deans of Agriculture, 2009. Capacity in Agriculture – A matter of National Concern. Submission to PMSEIC from the Australian Council of Deans of Agriculture
- Australian Farm Institute (2010), Towards a better understanding of current and future human resource needs of Australian agriculture, Research Report, Australian Farm Institute, Surry Hills, NSW, Australia.
- Department of Employment, Education and Workplace Relations (2010) Higher Education Collection, 2006-09.
- Department of Employment, Education and Workplace Relations (2010) Job Outlook: Employment Outlook for Science Professionals and Veterinarians.
<http://joboutlook.gov.au/Documents/Employment%20Outlook%20for%20Science%20Professionals%20and%20Veterinarians.pdf> [Accessed October 2011].
- National Farmers Federation (2011) Submission to the Senate Education, Employment and Workplace Relations Committee in relation to its Inquiry into “Higher Education and Skills Training to Support Future Demand in Agriculture and Agribusiness in Australia.” 8 November, 2011.
- NCVER (2011) “An Analysis of Training and Demographic Characteristics Across the AgriFood Industry.” Unpublished Report for AgriFood Skills Australia.
- Pratley JE and Hay M, 2010. *The job market in agriculture in Australia*, Research report Australian Council of Deans of Agriculture.
<http://www.csu.edu.au/special/acda/docs/papers/0510/The%20Job%20Market%20in%20Agriculturefinal%202010.pdf> [Accessed October 2011].
- Prime Minister's Science Engineering Innovation Council Expert Working Group (2010) *Australia and Food Security in a Changing World*. The Prime Minister's Science Engineering Innovation Council, Canberra, Australia.

Rabobank 2011 “Scarcity and price fluctuations pose threat to food supply” Media Release
https://www.pressroomrabobank.com/publications/food__agri/scarcity_and_price_fluctuations_pose_threat_to_food_supply.html. [Accessed October 2011].

Rural Research and Development Council (2011), *National Strategic Rural Research and Development Investment Plan*, Department of Agriculture, Fisheries and Forestry, Canberra.

Appendix 1

Table 1: Higher education students by selected characteristics, 2006-09

	Agri-food				Non-agri-food		
	2006	2007	2008	2009	2006	2007	2008
Female	12,091	12,455	11,860	11,846	432,820	450,997	465,392
Male	15,872	16,235	15,788	15,690	523,278	550,159	573,055
18 years and under	18,508	19,018	17,994	17,631	581,924	620,226	649,285
19 to 24 years	8,391	8,573	8,554	8,778	313,644	318,329	325,010
25 years and above	1,064	1,099	1,100	1,127	60,521	62,589	64,068
Nationality status							
Australian	23,511	23,797	22,575	22,043	709,756	732,950	749,357
Non-Australian	4,452	4,893	5,073	5,493	246,342	268,206	289,090
Disability status							
With a disability	908	945	969	1,012	30,047	31,895	32,546
Without a disability	27,055	27,745	26,679	26,524	926,051	969,261	1,005,901
Language spoken at home							
English	138	153	145	138	8,716	9,217	9,384
Non-English	27,825	28,537	27,503	27,398	947,382	991,939	1,029,063
Country of birth							
Australia	8,643	9,009	9,086	9,421	393,358	421,812	444,134
Overseas	19,320	19,681	18,562	18,115	562,740	579,344	594,313
Mode of study							
Full-time	20,887	21,623	20,823	20,836	637,559	678,384	712,356
Part-time	7,076	7,067	6,825	6,700	318,539	322,772	326,091
State/territory							
New South Wales	6,890	7,223	7,326	7,301	295,905	314,351	325,151
Victoria	9,185	9,465	8,719	8,356	242,509	257,377	270,064
Queensland	5,368	5,427	5,365	5,586	184,668	186,835	187,980
South Australia	2,007	1,878	1,717	1,825	67,394	71,071	74,282
Western Australia	2,781	2,877	2,825	2,752	98,103	103,290	108,936
Northern Territory	891	973	801	745	17,868	18,558	19,390
ACT	165	178	189	211	5,903	6,421	6,807
NT	593	602	634	668	27,301	25,536	27,155
Other	83	67	72	92	16,447	17,717	18,682
Level of study							
Undergraduate	7,268	7,622	8,035	8,558	263,181	270,635	281,223
Postgraduate							
Doctorate by research	3,296	3,399	3,613	3,677	37,215	38,028	38,753
Doctorate by coursework	21	17	9	12	1,785	1,609	1,511
Master's by research	489	467	464	419	8,467	8,246	7,874
Master's by coursework	2,172	2,390	2,655	3,193	146,533	150,376	160,496
Other postgraduate	1,290	1,349	1,294	1,257	69,181	72,376	72,589
Total	20,504	20,820	19,492	18,945	663,084	699,183	724,228
Agri-food	19,958	20,244	19,035	18,379	649,774	670,149	689,348

Associate Degree	85	165	217	262	4,837	6,244	8,176
Other Undergraduate	461	411	240	304	8,473	22,790	26,704
Other	191	248	121	33	29,833	31,338	32,996
Enabling courses	191	248	121	33	7,118	8,523	10,586
Non-award Courses	0	0	0	0	22,715	22,815	22,410
Total	27,963	28,690	27,648	27,536	956,098	1,001,156	1,038,447
Proportion of total	2.8%	2.8%	2.6%	2.4%	97.2%	97.2%	97.4%

	Agri-food				Non-agri-food		
	2006 %	2007 %	2008 %	2009 %	2006 %	2007 %	2008 %
Gender							
Female	43.2	43.4	42.9	43.0	45.3	45.0	44.8
Male	56.8	56.6	57.1	57.0	54.7	55.0	55.2
Age							
18 years and under	66.2	66.3	65.1	64.0	60.9	62.0	62.5
19 to 44 years	30.0	29.9	30.9	31.9	32.8	31.8	31.3
45 years and above	3.8	3.8	4.0	4.1	6.3	6.3	6.2
Nationality							
Australian	84.1	82.9	81.7	80.1	74.2	73.2	72.2
Non-Australian	15.9	17.1	18.3	19.9	25.8	26.8	27.8
Disability							
With a disability	3.2	3.3	3.5	3.7	3.1	3.2	3.1
Without a disability	96.8	96.7	96.5	96.3	96.9	96.8	96.9
Language spoken at home							
English	99.5	99.5	99.5	99.5	99.1	99.1	99.1
Non-English	0.5	0.5	0.5	0.5	0.9	0.9	0.9
Country of birth							
Overseas	99.5	99.5	99.5	99.5	99.1	99.1	99.1
Within Australia	0.5	0.5	0.5	0.5	0.9	0.9	0.9
Mode of birth							
Full-time	74.7	75.4	75.3	75.7	66.7	67.8	68.6
Part-time	25.3	24.6	24.7	24.3	33.3	32.2	31.4
State							
New South Wales	24.6	25.2	26.5	26.5	30.9	31.4	31.3
Victoria	32.8	33.0	31.5	30.3	25.4	25.7	26.0
Queensland	19.2	18.9	19.4	20.3	19.3	18.7	18.1
South Australia	7.2	6.5	6.2	6.6	7.0	7.1	7.2
Western Australia	9.9	10.0	10.2	10.0	10.3	10.3	10.5
Tasmania	3.2	3.4	2.9	2.7	1.9	1.9	1.9
Northern Territory	0.6	0.6	0.7	0.8	0.6	0.6	0.7
Australian Capital Territory	2.1	2.1	2.3	2.4	2.9	2.6	2.6
Multi-state	0.3	0.2	0.3	0.3	1.7	1.8	1.8
Postgraduate level							
Postgraduate	26.0	26.6	29.1	31.1	27.5	27.0	27.1
Doctorate by research	11.8	11.8	13.1	13.4	3.9	3.8	3.7
Doctorate by coursework	0.1	0.1	0.0	0.0	0.2	0.2	0.1
Master's by research	1.7	1.6	1.7	1.5	0.9	0.8	0.8
Master's by coursework	7.8	8.3	9.6	11.6	15.3	15.0	15.5
Other postgraduate	4.6	4.7	4.7	4.6	7.2	7.2	7.0
Undergraduate level							
Undergraduate	73.3	72.6	70.5	68.8	69.4	69.8	69.7
Bachelor	71.4	70.6	68.8	66.7	68.0	66.9	66.4
Associate Degree	0.3	0.6	0.8	1.0	0.5	0.6	0.8
Other Undergraduate	1.6	1.4	0.9	1.1	0.9	2.3	2.6

her	0.7	0.9	0.4	0.1	3.1	3.1	3.2
Enabling courses	0.7	0.9	0.4	0.1	0.7	0.9	1.0
Non-award Courses	0.0	0.0	0.0	0.0	2.4	2.3	2.2
(%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
('000)	28.0	28.7	27.6	27.5	956.1	1,001.2	1,038.4

ce: Higher Education Collection, 2006-09.

cludes not known.

food definition based on list of 6-digit fields of education supplied by the industry skills council. Students undertaking secondary course in an agri-food field of educa