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Australian Council of Deans of Agriculture

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The ACDA wishes to make the following comments on the National Agricultural Workforce Strategy.

#### **SUMMARY**

***The ACDA hereby provides advice on aspects of the agricultural workforce. The key points from the submission are:***

- ***Terminology is important in education. 'Tertiary education' means all post-secondary education;***
- ***The graduate employment prospects in agriculture are buoyant with ~2000 jobs in excess of university graduate outputs;***
- ***On-farm management positions and general farm labour positions advertised have increased significantly since 2015;***
- ***Intakes to agriculture and related courses increased from 2012 but have plateaued and decreased slightly since 2017, likely affected by drought and, more recently, fires;***
- ***VET completions in agriculture are increasing with indications of interest in higher level VET courses;***
- ***VET completions in Horticulture are very low suggesting that those industries need to promote career paths and increase wage levels in order to attract new workers. The dependence on visa workers and the impact of COVID-19 will need to be monitored and addressed;;***
- ***Attracting school leavers into university agriculture degrees is compromised by the misleading advice that career advisers receive from the government agency QILT, because environment and agriculture data are confounded in the official employment statistics. It seems the only way forward is to categorise Environment separately from Agriculture;***
- ***Attracting graduates from other relevant degrees into the agriculture sector will be increasingly important;***
- ***Providing students with a challenging, informative and enthusing experience in agriculture at school appears to be a winning formula;***
- ***Agriculture has a very poor record in relation to education, with the sector still way behind in educational credentials. There is a degree of enlightenment in the agriculture sector in relation to qualification requirements and this is important given the demands of the international market place;***
- ***Females have now reached gender balance in university courses. However gender ratios vary depending on the industry considered; there is a trend of increasing qualification levels among females in agriculture at a higher rate than for males;***
- ***Women make up 28% of all managers in the agricultural production system;***
- ***Greater emphasis needs to be given to workplace flexibility to enable females to attain senior management positions;***
- ***Agriculture has an appalling record in the encouragement of Indigenous people into the sector. Indigenous people comprise only 1% of the agricultural workforce and, of those, only 2% have a university education. Universities graduate fewer than 5 Indigenous students nationally per annum;***

- ***Most agricultural industries have a long tail of non-contributors, with the bottom 50% often contributing less than 10% of industry output. Workforce strategies should thus focus on the top 50% of producers. Government should encourage universities to produce graduates who meet the needs of the top 50% of producers, including through extra specialised studies;***
- ***Farms are becoming larger with takeovers and this will increase the range of employment options as technologies and sophisticated equipment are more likely employed;***
- ***Advisory services are largely fee-for service from private providers. These concentrate largely on private good issues and do not address public good needs;***
- ***The intersection of research, education and “extension”, so important for industry productivity gains, could be facilitated though appropriate funding of the network of ‘agricultural’ universities; current university funding is based primarily on student numbers only. The US land grant university system that funds all three components could be relatively easily adapted to Australia, whereby both private and public good issues are addressed;***
- ***Technology is disrupting agriculture as with other sectors of the economy. Business management expertise is increasingly needed;***
- ***Robotics are likely to replace manual labour, such as for harvest, and there will be rapid uptake due to the positive benefit/cost ratio outcomes;***
- ***There are and will be a plethora of apps and gizmos. There needs to be an ‘honest broker’ system to identify the useful ones and their incorporation into the farming businesses. This could be a fee for service part of the “extension” set-up proposed for universities;***
- ***There will be an increasing role for agronomists and other advisers in interpreting and manipulating the extensive data generated by the digital revolution as it is highly unlikely that sensors, drones and other high tech will be able to deliver the management system advice that is provided by the professional adviser. Farmers will not have the time, expertise and facilities to manage such data themselves.***

## **1. Education and jobs**

The ACDA wishes to point out that terminology is important and so the official use of the term *tertiary education* refers to post-secondary education (i.e. vocational education and university education). Reference to university education is officially *Higher Education* while TAFE level courses are referred to as *Vocational Education and Training* or VET.

At the university level we have been monitoring the job market in conjunction with Rimfire Resources, the agricultural graduate employment company, based on job advertisements from the internet. They show the following for 2015-2019 in Figure 1.

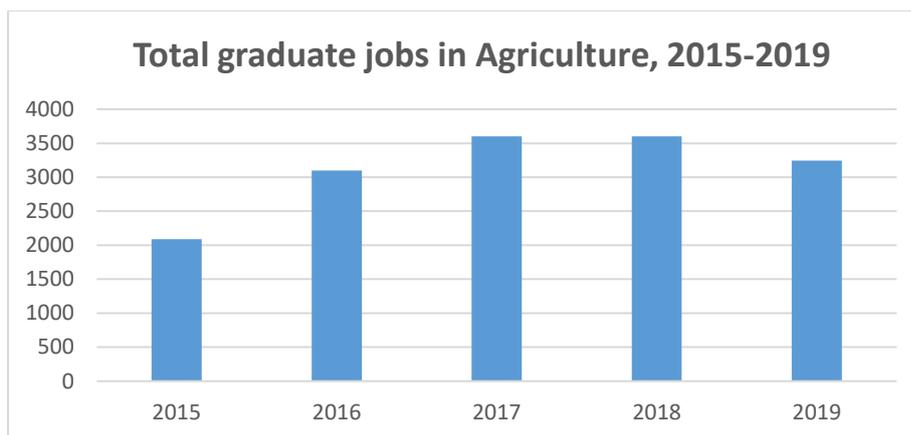


Figure 1

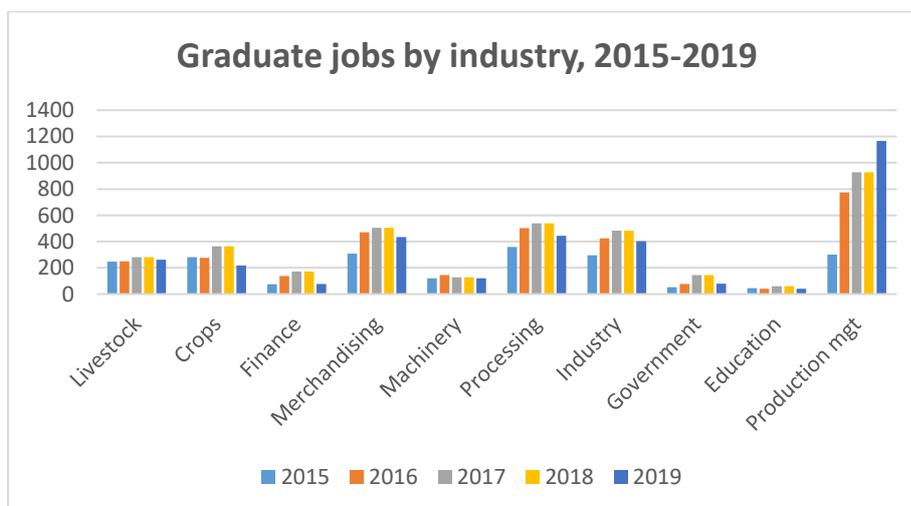


Figure 2

These data show that, notwithstanding severe drought conditions, there were well over 3000 jobs even in 2019. These jobs are spread geographically across various industry sectors with only the finance sector being noticeably impacted (Figure 2).

There has been a substantial increase in employment opportunities on-farm across Australia (Figure 3). While general labour demand has increased there has been nearly a 4-fold increase in management positions from 2015 to 2019. Whether this trend reflects increases in corporate farming, greater corporate-like management of bigger family farms or part of the generational change taking place on Australian farms is unclear. It is likely to be a combination but perhaps needs to be further investigated.

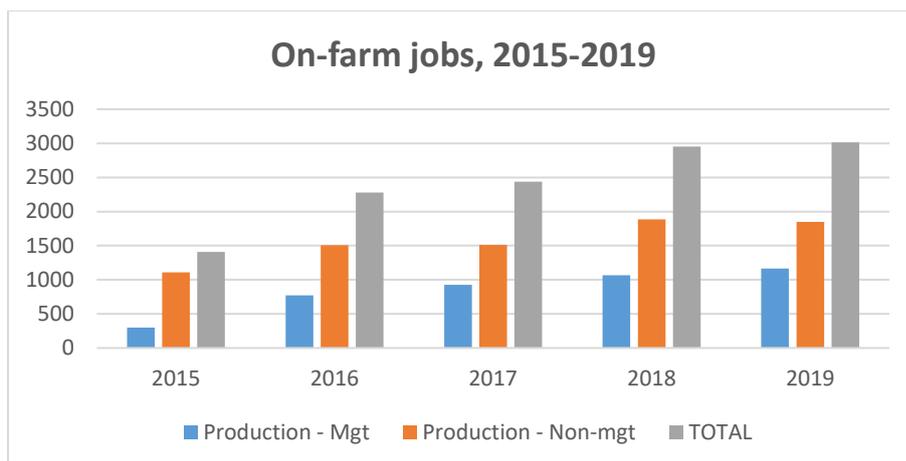


Figure 3

This demonstrated opportunity for employment increases the need to have a commensurate supply of qualified people graduating from higher education and from vocational education. At university level there are many papers showing the decline in intakes from 1990 to 2012. Since 2012 numbers have risen until 2017 since when the numbers have plateaued or declined (Figure 4) reflecting the perturbations of drought and bushfires. From these intakes we can expect perhaps 70% to graduate and so this will leave a shortfall of some 2000 jobs unfilled by qualified people.

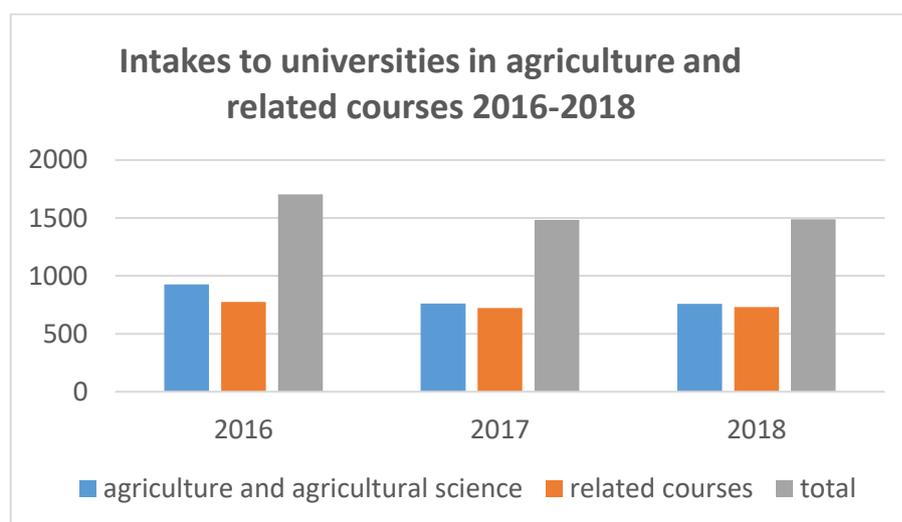


Figure 4

*Related courses refer to animal science, horticulture and viticulture and agribusiness*

At the VET level there is often a short course of study just to pick up a skill required by the employer. This has been standard practice on Australian farms for decades – the benefit is to the employer but as there is no qualification involved there is little benefit to the worker. Such a strategy has been to avoid the need to pay the employee more because of the qualifications. For an extended period in the second half of the 1900s, it was Farmer Organisation policy **not** to embrace the general apprenticeship scheme particularly because it had an associated commitment to on-going employment and increased wages on completion. It then is no surprise that young people shunned the Agriculture sector for employment as wage levels and career prospects were totally inadequate.

Consideration of the data on VET completion rates (Figure 5)) suggest that there has been an evolution of thinking in terms of the merits of qualification. Across Australia there has been a consistent trend in qualification attainment in agriculture, including at the higher levels, particularly since about 2010.

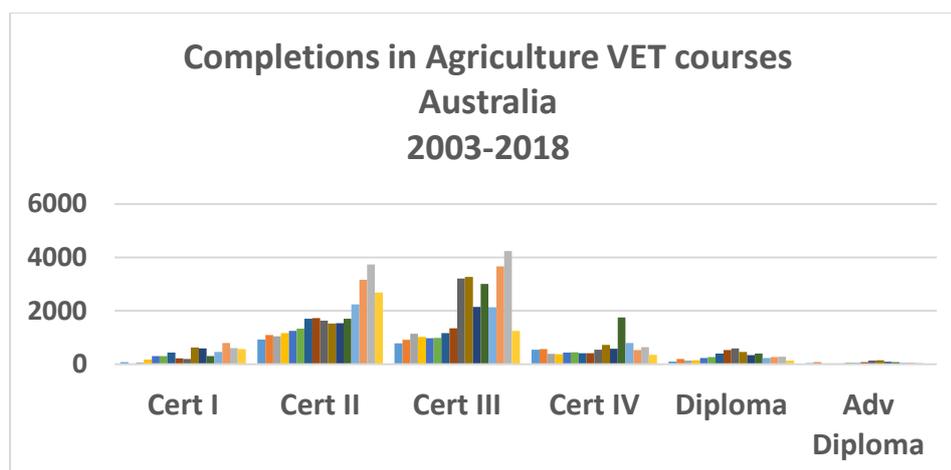


Figure 5

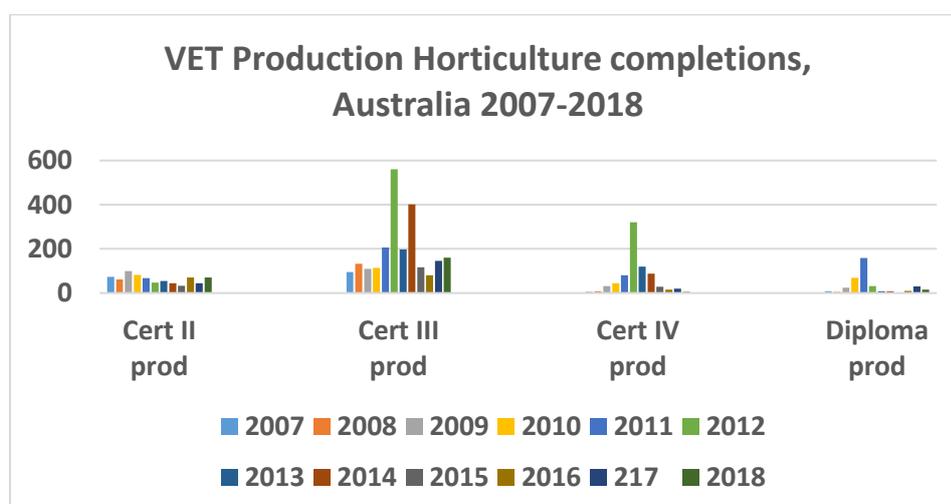
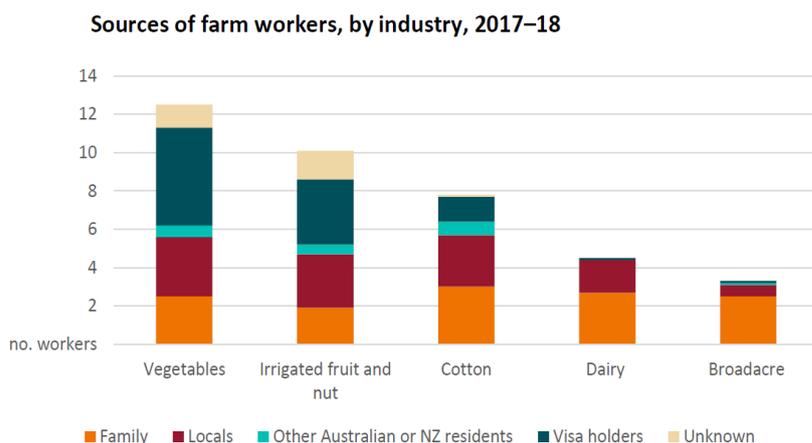


Figure 6

In contrast there has been very modest levels of production horticulture qualification attainment (Figure 6). Whereas in 2018 across Australia there were over 5000 graduates from *agriculture* VET courses, only about 250 nationally attained *production horticulture* VET qualifications. This seems to be inadequate given the very positive projections in international markets for horticulture products. Anecdotal evidence suggests that there is a severe shortage of qualified horticulture people at all levels – professional staff are being sought internationally from South Africa and South America while there is a dearth of technical staff. The influx of corporate farms in horticulture is changing the professional face of the industry and this is long overdue.

The current solution to the shortage of workers particularly in horticultural industries is the dependence on backpackers and other internationals through the 457 and 417 visa arrangements. The current corona virus pandemic, the whims of a minister on the arrangements and the unscrupulous practices of some employment management operations for such schemes **make this unstable**. The requirement in horticulture for such workers is shown in Figure 7 (Source: Demand for farm workers: ABARES farm survey results 2018). Increasingly in these industries, robots will assume the repetitive and heavy roles, opening the way for appropriately qualified staff to manage the technology.



**Figure 7**

### Attracting school leavers into higher education

It is clear that addressing the shortfall in agriculture graduates involves increasing the intakes from school leavers, which in turn means enthusing school students about the opportunities that exist in agriculture. Students can be enthused at school by the advice they receive from teachers and career advisers or from the personal experiences they receive during their studies.

**Advice** – We know from a previous study (Barber 2016) that *agriculture teachers* have been highly influential in spreading the message about the availability of jobs in the sector. However we have known for some time that *careers advisers* have been providing contrary advice. Their advice is based on the former Graduate Careers Australia reports, now the Graduate Outcomes Survey known as QILT (Quality Indicators for Learning and Teaching) operated by the Federal Department of Education. Graduates are surveyed about 6 months after graduation and are asked to report, *inter alia*, on employment status and starting salaries. This is reported along the official lines of Fields of Education (FoE).

As shown in the Table below for the most recent survey, Agriculture is in FoE 5 which also includes Environment graduates. However the data for the two groups are not separated and so the total is portrayed as Agriculture and disseminated as such to Careers Advisers. The table below shows that the full-time employment is only 72%. From previous analyses we know that agriculture has full employment (i.e. >90%) whereas Environment has only about 65% full employment.

ACDA has had several interactions with GCA who admitted that they were misleading their audience. ACDA also met with the Federal Department at about the time of the change to QILT and was assured that QILT would not make the same mistake ***but it has***. It would seem that the only solution is the separate categorisation of environment from agriculture.

2 Undergraduate employment outcomes by study area, 2018 and 2019 (%)

Study area	Full-time employment		Total employment		Labour force participation rate	
	2018	2019	2018	2019	2018	2019
Science and mathematics	64.6	63.4	82.9	82.4	81.8	84.1
Computing and Information Systems	73.2	75.9	81.1	82.9	93.3	94.7
Engineering	83.1	84.8	88.2	88.4	94.3	95.3
Architecture and built environment	77.7	74.5	87.9	86.3	94.7	93.9
Agriculture and environmental studies	68.3	72.6	87.1	89.1	92.0	92.7
Health services and support	72.4	70.5	89.5	89.9	93.2	92.9
Medicine	94.9	91.1	94.3	91.9	95.0	88.3
Nursing	78.7	76.3	91.5	90.4	97.8	97.3
Pharmacy	97.2	95.7	97.3	97.5	97.4	98.5
Dentistry	86.8	86.2	94.0	93.7	92.5	94.7
Veterinary science	84.7	81.9	89.2	91.6	90.5	84.9
Rehabilitation	89.3	92.4	95.8	96.2	98.5	98.7
Teacher education	83.3	80.8	93.9	92.7	96.1	95.3
Business and management	77.9	76.6	88.1	88.0	96.5	96.6
Humanities, culture and social sciences	64.3	64.3	83.8	83.9	88.5	90.0
Social work	73.5	70.2	86.5	84.8	94.6	95.3
Psychology	64.5	63.4	85.3	86.3	86.1	88.7
Law and paralegal studies	77.2	77.3	87.9	86.5	94.4	94.8
Creative arts	52.2	52.9	81.3	81.8	91.8	90.7
Communications	60.5	60.1	82.7	82.8	90.4	90.0
Tourism, hospitality, personal services, sport and recreation	59.6	56.4	86.7	83.4	94.2	96.5
All study areas*	72.9	72.2	87.0	86.8	91.9	92.4
Standard deviation (percentage points (pp))	11.9	11.8	4.7	4.6	4.0	4.1

\*Where a graduate completes combined degrees across two study areas, their outcomes are included in both study areas. 'All study areas' figures count each graduate once only.

**Student experience** – Traditionally agriculture in secondary schools has been considered mainly as a subject for the less able or less interested students. As such there is a long-standing stigma attached to the subject and many of its students are not those positioning to attend university. Most students see it as a subject for those who would go farming. Many teachers also have negative views of the subject. This total experience then is counter-productive to enthusing students about careers in agriculture and so most students are never exposed to the range of opportunities that exist for careers in agriculture, particularly the non-farm options. There is an endeavour to transform this situation.

From 2019, in NSW, **all students** in years 7 and 8 are required to undertake a compulsory unit in the technology curriculum in 'Agriculture and Food'. The purpose here is not to make agriculturalists out of the students but rather to give them (and their parents) an understanding of where their food comes from, how it is produced and the opportunities that agriculture presents in careers. It is to be hoped that there is a spill-over into other state education systems.

It is valuable also to report on a program at Barker College in Sydney where the School has changed the Agriculture subjects from a "lifestyle" focus to one where there is significant science rigour. This attitude and focus, backed by quality teaching, has resulted in a three-fold increase in the number of students electing it and there are now double the number of students from that school sitting HSC Agriculture than from any other school in Australia. Some 25-30% of those students move on to study Agriculture and related courses at universities. There are plans to conduct a similar experiment in other schools.

## 2. Professionalising agriculture

Agriculture has long been a sector that has shunned education. There was a strong long-held view that experience was the best teacher – 'learning on the job'. In the mid-1900s this perhaps did not matter because of the protectionist policies particularly of the then Country Party. Until the 1970s women were not admitted to agricultural high schools or to agricultural colleges. However in the recent third

of the 20<sup>th</sup> Century it became evident that the sector was being left behind by the rest of Australian society which was rapidly gaining educational credentials. Figure 8 shows that discrepancy which continues to exist today.

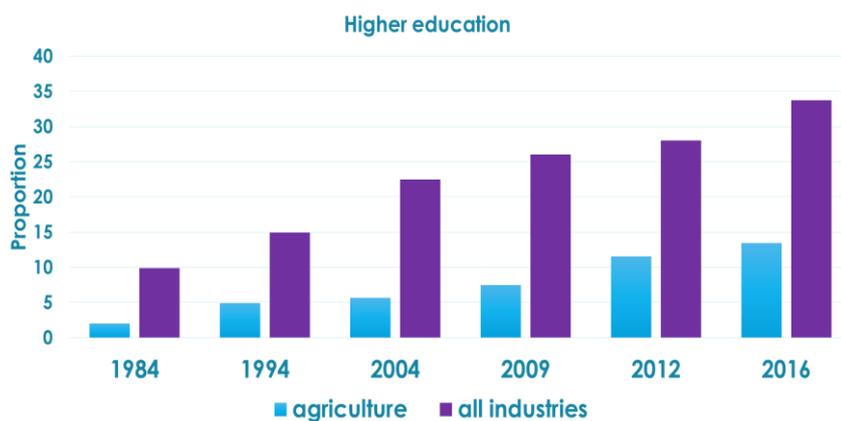


Figure 8

It became evident at the turn of the 21<sup>st</sup> Century that the emerging generation did not see a future in agriculture – the lack of interest in qualifications and career progression were not attractive characteristics, nor was the remuneration. Australian agriculture was in crisis in respect of its workforce. Concurrently, world markets started to consider the environmental and animal welfare aspects of farm production. Traceability and provenance were becoming more important and required quality assurance. All these pressures imposed a greater *professionalism imperative* and education necessarily has become part of the process for modern agriculture. Whereas Figure 8 suggests that agriculture is not well credentialed, Figure 9 shows that there is a greater proportion (compared with the older age groups) with university qualifications in the 25-29 year age groups, confirming that professionalism is increasing at an increasing rate with the new entrants into agricultural employment. While there is a long way to go, the trend is important and pleasing. It is important to note that, pre- and post-farm gate, the workforce positions generally require a degree qualification these days.

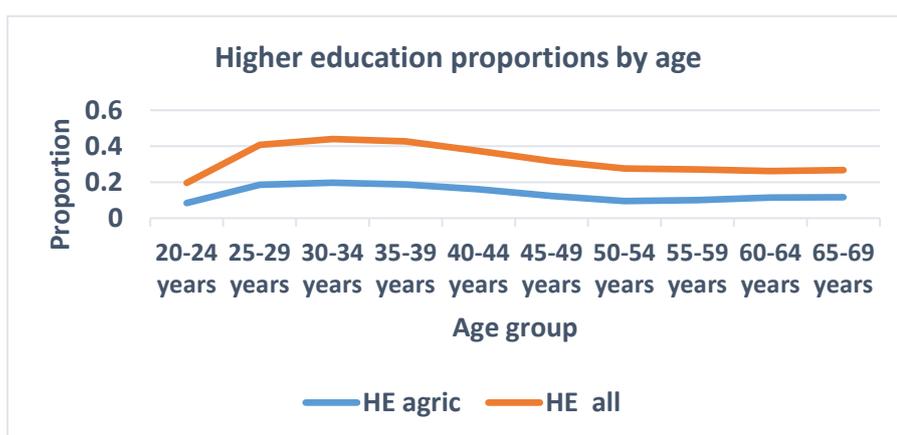


Figure 9

**Females** - What is also pleasing is the recognition that women play an important role in agriculture; this should be encouraged. By 2003, females had reached the majority in undergraduate agriculture courses in Australian universities and have maintained that majority since that time. Figure 10 shows

agriculture to be right on the national average for gender ratio in university studies and well in advance of Information Technology and Engineering in particular.

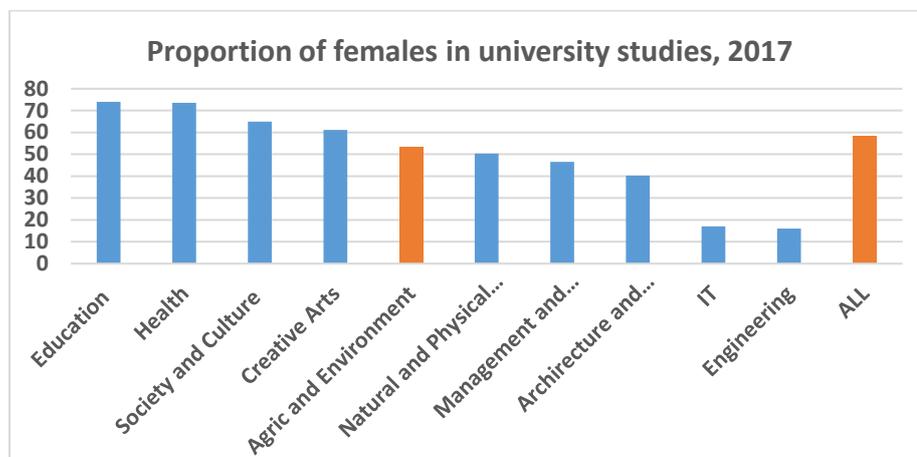


Figure 10

#### Gender ratios in individual agricultural industries

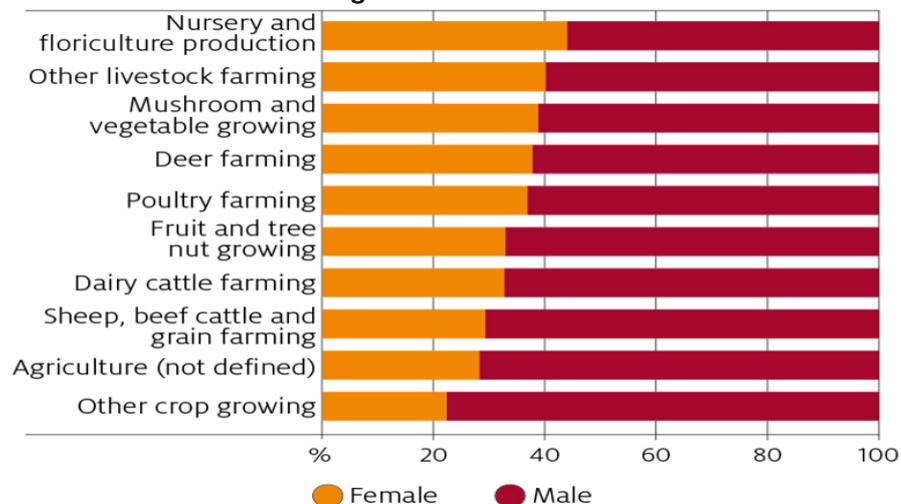


Figure 11

Across the various agricultural industries (Figure 11) the proportion of women varied from around 40% to 20% of the workforce in 2016. Women made up 28 per cent of all managers in the agriculture industry in 2016, with about half the women in agriculture working as managers (Source: Snapshot of Australia's Agricultural Workforce, ABARES 2019). ABARES 2019 reports that women are increasingly achieving qualifications including in agriculture, agricultural science, animal husbandry and wool science (Figure 12). In 2011, there were 22,310 women with a tertiary qualification in agriculture, increasing to 27,384 by 2016, an increase of 23 per cent over 5 years. This compares with an increase of only 8 per cent for men holding tertiary qualifications in agriculture over the same period.

#### Educational attainment of women working in the

agriculture industry, 2016

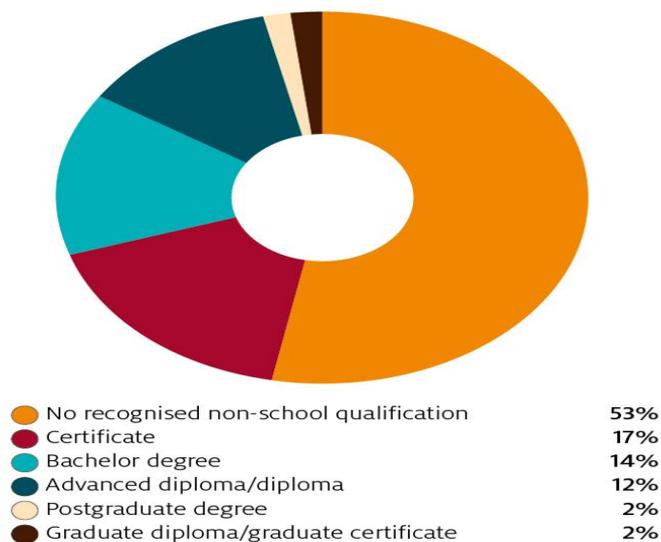


Figure 12

The issue to be addressed though, as with some other industries, is the flexibility of work conditions. It is evident that while starting salaries are similar between male and female, the discrepancy widens as families are established. Creating conditions that allow career progression during these challenging periods of life would facilitate a greater proportion to assume senior positions in the sector. The option of working remotely from an office through internet technology is a critical part of that scenario. It is important to note that currently we have the first female President of the NFF and she is participating in forums and spreading the word where no male would have been invited. There are many examples of women in senior roles in the public service as well.

**Indigenous** - The area of embarrassment that remains is the role of the Indigenous peoples in agriculture. A recent ABARES publication (Snapshot of Australia’s Agricultural Workforce) indicated that only 1% (3,278) of the agricultural workforce self-identified as Indigenous. **Only 2% of those had a university degree** (relative to >30% for the general population) although 29% had a VET qualification. A paper (provided separately) by Pratley (2019) showed that Australian universities as a whole were not attracting Indigenous students and were graduating barely 5 per year nationally (Figure 13).

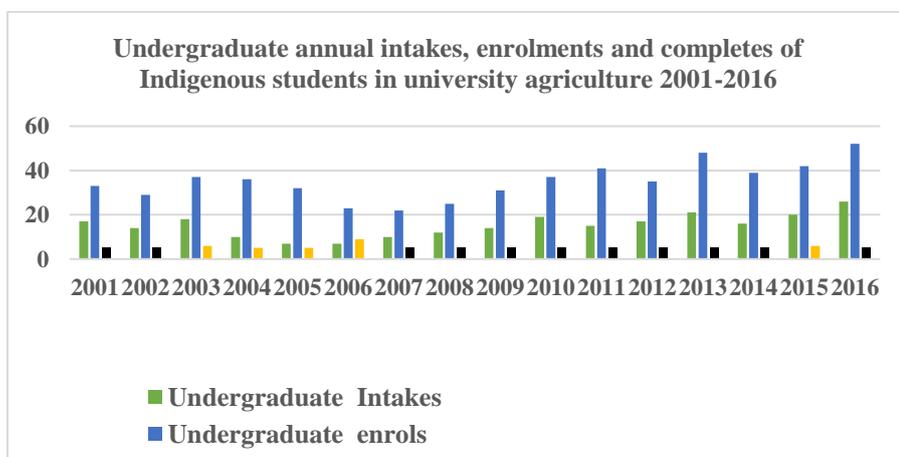
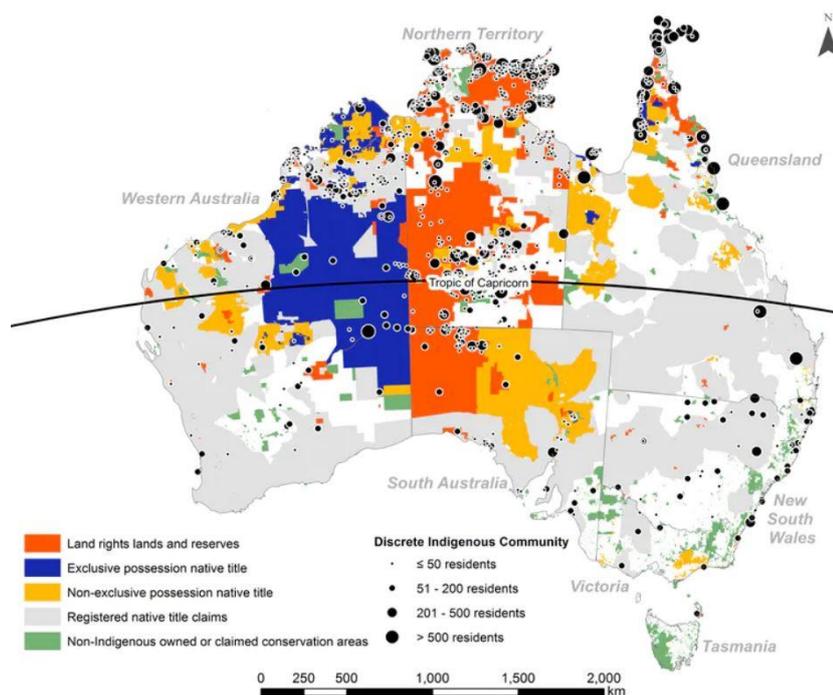


Figure 13



Aboriginal communities cover vast and remote areas of Australia in need of environmental management. Altman and Markham 2014

Figure 14

This would seem to be a priority in any Workforce Strategy in Agriculture to engage with the Indigenous communities and provide them with the educational opportunities enjoyed by their non-Indigenous counterparts. It is perhaps an imperative given that Indigenous peoples now control and manage around 40% of the national landscape (Figure 14).

### 3. Farming businesses

A study by ABARES of the contribution made by farms to overall production by (Source: Disaggregating farm performance statistics by size 2018-19) shows the disparity between the top producers and the lowest contributors:

#### *Broadacre farms -*

The bottom 50% of producers contribute 10.6%; the top 30% contribute 76.5%.

#### *Beef industry –*

The bottom 50% contribute 9.5% of output; the top 30% of farms contribute 80%.

#### *Sheep industry -*

The bottom 50% contribute 18% of output; the top 40% of farms contribute 75%.

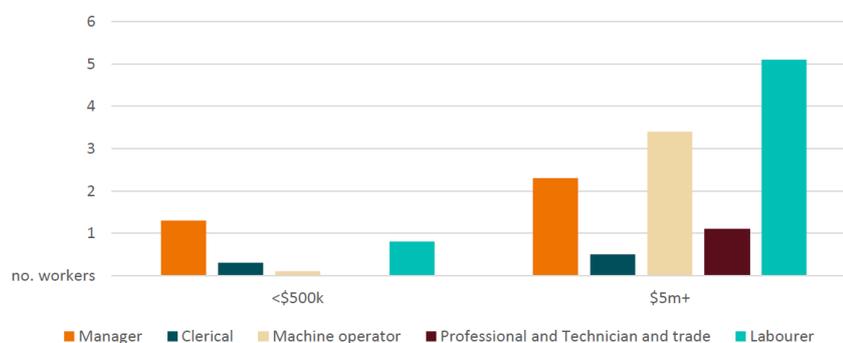
#### *Vegetable industry –*

The bottom 50% contribute 6.2% of output; the top 20% of farms contribute 80%.

It raises the question as to why the bottom 10-20% of “producers” are included in production statistics for the agriculture sector. Most have negative rates of return and negative profits but high equity ratios suggesting agriculture is not their priority relative to lifestyle. They contribute little to national

prosperity as farmers although many receive farm taxation benefits; nevertheless they represent a biosecurity risk and many do not pay land services rates as they sit below the designated threshold. They therefore do not fit into any agricultural workforce strategy and so any such strategy outcomes should concentrate on the top producers and their contributions and needs.

**Figure 12 Average number of workers, by occupation and farm size, 2017–18, broadacre farms**



**Figure 15**

The discrepancy between top and bottom performers is likely to increase. Farm size is increasing as takeovers occur either by corporates or the corporate-managed family farms. These farms have the resources and expertise to employ the relevant technologies and staff (Figure 15 – Source: Demand for farm workers: ABARES farm survey results 2018) and to seek professional and trade (e.g. fencing contractors) inputs as required. This trend is likely to increase demand for on-farm labour and management expertise as seen in Figure 3.

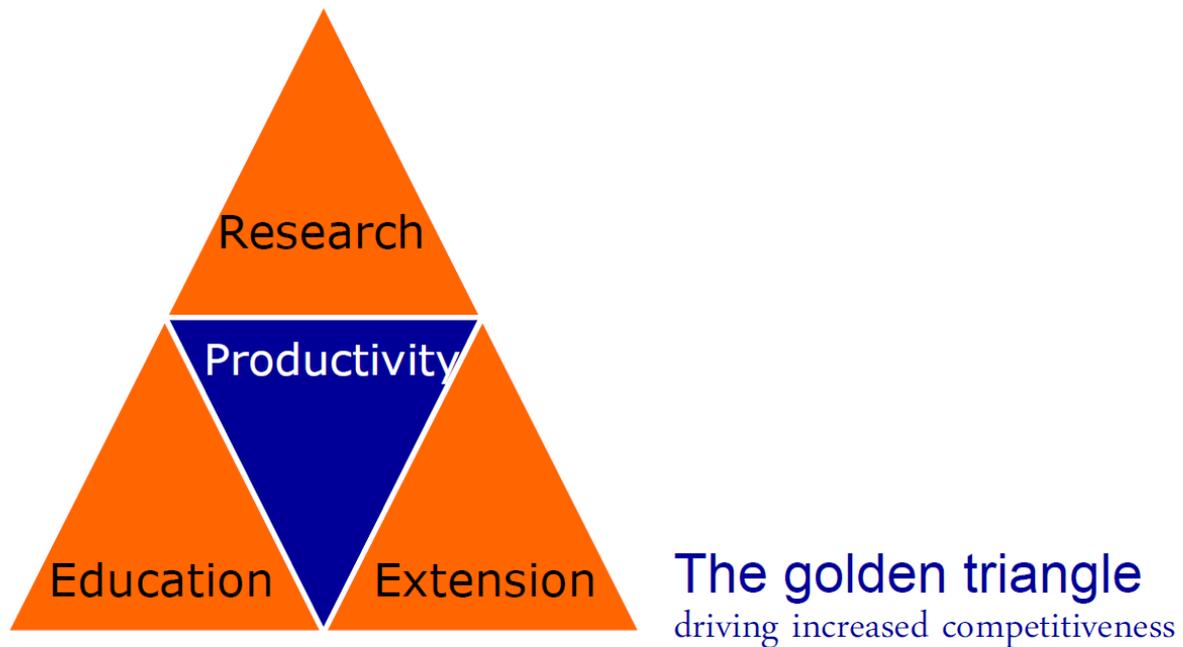
#### **4. Advisory services**

Traditionally advisory services were the domain of, and funded by, the State agencies. The particular characteristic of that provision was the intensive training of these advisory officers in all matters relating to that profession. From the 1990s, these services were progressively wound back. Governments argued that such advice would be taken up by the private sector on a fee for service basis; that has happened and is reasonably successful. There are two main deficiencies that arise:

- there is no longer the intensive training in extension that used to occur; and
- the advice nowadays is largely related to private good, with public good issues largely overlooked.

It raises the question regarding the innovation of conservation agriculture and whether it could have been achieved without the State agencies being involved. Agriculture may well be different today if it had been left solely to the private good agenda. It is unlikely that governments will get back into this space and so that gap is left open.

It is noted that there is a lag between research and broad-scale adoption in agriculture being commonly 10-20 years. It took about 30 years for 80%+ adoption of conservation agriculture in Australia and we lead the world in that development. The low level of productivity growth in the last decade is a reflection of the reduction in RD&E investment 2-3 decades previously and that looks likely to continue unless there is intervention. Adoption of research requires persistent effort by champions of the technology, often closely linked to researchers, to demonstrate benefits against years of entrenched experience. Delays in the adoption of new practices represent a substantial lost opportunity cost to the efficiency and competitiveness of our agriculture.



Since universities undertake the education and training of the sector's professional workforce and perform about 30% of agricultural research in Australia it follows that continued links with the implementers of that research is an imperative as demonstrated by the Golden Triangle (with acknowledgement to Rabobank). With the demise of much of the public extension system in Australia and the incomplete extension delivery of the private providers, there is a strong argument for ensuring the agricultural universities are involved in, and contribute to, the implementation phase of the process. This however should not be in isolation but rather through the development of strong public/private partnerships.

The US do this well through their "Land-Grant universities" where they are funded to provide "Golden Triangle" services. In Australia we could implement a similar model as there is now a strong complement of rural-based agricultural campuses in the network of universities that do agriculture teaching and research. There would need to be a change in the funding model as universities are funded primarily for teaching based on student numbers. A business case could be developed for such investment, perhaps as a first call on the co-contribution to levies by the government. In return there would be an obligation on that "extension network" to provide appropriate education to undergraduates, provide training courses to advisers of primary producers, undertake research into change management practices, train the next generation of "extension specialists" and contribute with their academic colleagues to advisory services for the sector. One other feature is that such staff do have access in their institutions to a range of other expertise that can be consulted or brought into the fray.

This is an important workforce issue going forward as there will be a substantial need for advisory services for a range of new issues such as digital disruptions, the handling of big data, the management of information and the social media, as well as the modern public good imperatives of water, soils, biodiversity, biosecurity and other environmental imperatives.

## 5. Technology

Agriculture, as with other sectors of the economy is experiencing the digital disruption era and at the same time has the prospects of labour replacement with robotic technologies. There is a plethora of

options available and some concerns exist about the workforce needs going forward. There are probably four components worth consideration.

- a. **Sophisticated business management** – increasingly agricultural businesses require business skills and acumen, involving using all the relevant internet and software applications in order to manage the business, This is an increasing need which will continue to build as there are more corporate takeovers and larger family businesses.
- b. **Manual labour replacements** – Already robots have replaced labour in many packing sheds and processing chains. This will continue where there is a high input of manual labour on repetitive activities such as at harvest. Some vegetable and fruit crops (e.g. potatoes and carrots, wine grapes) already are mechanically harvested and it is only time before most other horticulture crops are likewise harvested. Given the benefit/cost ratio of such a transition there will be rapid adoption of such technology. That means labour replacement, which will largely target the backpackers and fly-in internationals currently dominating these activities. However it will also require technical expertise to run the machines to a standard either as a farm employee or as a contractor.
- c. **Technologies and apps** – Already there are many such technologies available but few have been adopted on farm. Too often they address a small part of the system but do not integrate with the whole system such that there is an efficiency or profit outcome. Many go nowhere. Most farmers do not have the time nor resources to evaluate whether the app or gizmo is worth the investment of cash and time. There does need to be an ‘honest broker’ available to sort the ‘wheat from the chaff’. Universities are well placed to do that and maybe the advisory role indicated in section 4 could assume some responsibility with appropriate funding.
- d. **Useful technologies and their application** - Already farmers have adopted a range of technologies including GPS, remote sensing, yield mapping and the like. However the technologies are only as good as their applications. Some of these technologies have been around for a considerable time (over two decades) and in that time have collected considerable data. The question is to what use all those data are put. GPS of course has enabled the introduction of auto steer in tractors and that has been a useful; and also mapping capability for weeds, crop yields and variable rate technologies. Crop yield maps have been collected for around 25 years but they largely remain a collection of maps rather than a management tool.

Advisory specialists such as agronomists therefore need to be trained in evaluating and integrating all the data into management advice. This has been addressed in Chapter 26 of “Australian Agriculture in 2020 – from conservation to automation”. So rather than replace labour, these technologies increase the need for specialists to interpret and provide advice on management changes based on the data. Whether private advisory services can, want to, and have the capabilities to do the evaluations and analyses is an open question. It is unlikely that drones and other sensors will be able to deliver such advice – they may contribute to knowledge but not replace the interpreter of the range of advice provided by all the technologies. It is clear that individual farmers do not have the time to handle these aspects themselves and will need to look for external advice. Universities also could fill this void on a fee-for service basis to either farm or consultant, via their advisory services outlined above.