

EVOLUTION OF AGRICULTURAL EDUCATION IN AUSTRALIA

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Education in agriculture has evolved in conjunction with the rest of the education system. In some ways it has a special place in the system while in other ways agriculture missed the boat in not taking advantage of opportunities available at particular times. At first settlement from 1788 there was no education system. The upper and middle classes were the only ones who could afford to pay tuition in those early days although there were no teaching standards for those who provided the tuition. McCreadie (2006) indicates that “by the 1830s, the idea that crime was the result of ignorance, ignorance was the result of a lack of education and, therefore, education would decrease crime, was seen as a means of forging the penal colony of Australia into an organised and orderly society. Opponents of this idea, however, felt that the child of a blacksmith did not need any more education than what was necessary for him to become a blacksmith, the child of a farmer only what was necessary for him to be a successful farmer”. The lower class then learned by what was handed down and by experience; this practice perpetuated in farming well into the 20th Century.

The school system for agricultural education

Early formal education was largely through the various churches supported by colonial government. Control was vested in these institutions at the local level. Dissatisfaction with provision by the religions led States to enact legislation, despite religious opposition, to establish public school systems which were defined as ‘free, compulsory and secular’ (Campbell, 2014) and under the control of government ministers. All States implemented this, albeit at different times, Kempsey National School becoming the first school to join the government education system in New South Wales in 1848. The application of the components of ‘free, compulsory and secular’ were put in place progressively but varied across States (Table 1). State aid was removed around that time although it was reinstated much later by the Commonwealth Government from the mid-1960s in order to sustain the religious schools and take the pressure off state schools.

Table 1. Evolution of the public school systems across Australia

States	Education Acts	Establishment of government departments	Abolition of school fees	Compulsory attendance laws proclaimed	Abolition of State aid to church schools	Secular curriculum established
South Australia	1851, 1875	1875	1892	1875	1851	1852
NSW	1866, 1880	1880	1870	1880	1882	1880
Victoria	1872	1873	1872	1872	1873	1872
Queensland	1875	1875	1870	1900	1880	1875
Tasmania	1885	1885	1908	1916	1854	1854
Western Australia	1893	1893	1901	1871	1895	1895

Many forms of schools comprised primary, secondary or combinations of both. Secondary public schools first began in late 1883 with the establishment of separate High Schools for boys and girls in Bathurst, Goulburn, Maitland and Sydney. Fort Street School however had existed, in different locations, from 1849 as did some private schools (e.g. The Kings School from 1830, SCEGS from 1845). From their inception the High Schools offered an academic course designed mainly for students intent on entering university; entrance to High School was through a competitive examination so a large proportion of children in those days did not progress beyond Year 6 – in NSW and Victoria around 1910 for example, fewer than 5% of the school population continued schooling after primary level.

Table 2. Establishment of agricultural high schools in NSW

School	Date established	Coeducational	Selective	Residential
NSW Agricultural High Schools				
Hurlstone	1907 (at Ashfield) 1926 (at Glenfield) 2020 (at Western Sydney University)	1979	1907	Yes
Yanco	1922 (Yanco)	1993	yes	Yes
Farrer Memorial	1939 (Tamworth)	Boys only	no	Yes
James Ruse	1959 (Carlingford)	1977	1969	No
NSW Lighthouse Schools in agriculture				
Colo HS, Junee HS, Kempsey HS, Pittwater HS, Mount View HS, Murrumburrah HS, Tumut HS	Designation from 2015	yes	no	no
South Australian Agricultural High School				
Urrbrae	1913 Agricultural high school from 1932	1972	yes	no
Western Australian College of Agriculture				
Cunderdin (Yrs 10, 11, 12)	1959	yes		yes
Harvey (Yrs 10, 11, 12)	1953	1988		yes
Morawa (Yrs 10, 11, 12)		yes		yes
Denmark (Years 10, 11, 12)	1942	1991		yes
Victorian Agricultural High Schools				
Ballarat, Colac, Leongatha, Mansfield, Sale, Shepparton, Wangaratta, Warragul, Warrnambool, Mildura	Established from 1907 Disestablished 1917		no	no

Training of farm boys, state wards and migrants also occurred in Catholic-run institutions in Western Australia including Tardun Agricultural School (1928-2008)

BOX 1**DEPARTMENT OF EDUCATION**

00160 11 Jan. 1939

AGRICULTURAL HIGH SCHOOL POLICY

The establishment of the Farrer Memorial Agricultural High School at Tamworth will give to the State the third residential Agricultural high School geographically so placed as to provide effective training for students who wish to qualify for a degree either in Veterinary or Agricultural Science. It appears to me that with the establishment of this third school the time has arrived for the Department to seriously review the existing policy with a view to determining what is best in the interests of this branch of and of the State in the future. Agricultural High Schools, by reason of the fact that they provide residential accommodation for student who enrol, plus provision for practical husbandry, etc., are in the nature of things fairly costly to establish and maintain. It is essential, therefore, that the cost so incurred by the State should be compensated by the maximum advantage in the way of educational results of the highest possible order.

I am of the opinion that for many years to come the Department should not commit itself further to the building of such schools, but should concentrate on completion of schools which are now established, ensuring that they shall have the best possible equipment and accommodation for the maximum number of lads who can be efficiently accommodated there. Further, I am of the opinion that having regard to the fact these schools are so designed and equipped as to prepare for a University Degree, it is not in the interests of the State that boys should be admitted to these schools whose I. Q. is so low as to render it completely doubtful as to whether they will succeed in satisfactorily completing a matriculation course. Boys whose I. Q. falls below this standard should not be admitted to Agricultural High Schools unless there is a surplus of accommodation which cannot be otherwise used.

It will be noted that the real purpose of an Agricultural High School is not to provide a training farm course. Such facilities are only for the better training of the student in the application of science and a better apprehension of its teachings. For those lads of lower standard of intelligence, the obvious place is an Agricultural Farm where courses are designed to meet the requirements of a training school for lads who wish to become practical farmers. The training there is along the lines of practical work, systematic routine and a thorough knowledge of the work and implements of agriculture. This section of the work in an Agricultural High School is largely incidental, though necessary.

To place an Agricultural High School upon the level of a training farm is to incur an expenditure which cannot be justified in the final analysis. There is continuous complaint of the overcrowding of our Agricultural High Schools. And it is probable that even with the establishment of the Farrer Memorial High School at Tamworth, this overcrowding will continue unless a rigid standard of entrance is applied along the lines which will ensure, so I have already indicated, that those who commence the course will be capable of carrying it through successfully.

I desire that this policy be noted for action in the forthcoming and succeeding years.

D.H. DRUMMOND.

It was somewhat revolutionary then when in 1907 a new school called the Hurlstone Agricultural Continuation School was created at Ashfield in Sydney particularly to prepare boys for farm production and for admission to Hawkesbury Agricultural College. The course was only for two years and no other school in the state at the time had subjects about agriculture since "farming was considered to be something you learned at home, not in the classroom" (www.hurlstone.com.au). Hurlstone Agricultural High School, as it developed, was moved to Glenfield in 1926 due to urban encroachment and is scheduled to move again in 2020 as Glenfield has become a residential area of Sydney. It was a boarding school particularly for country students and its success generated three

other schools in NSW to be designated agricultural high schools. Two are located in rural areas at Yanco (Yanco Agricultural High School) and Tamworth (Farrer Memorial Agricultural High School) and were established to train future farmers and provide education for isolated students. The fourth, James Ruse Agricultural High School, was established much later in 1959 on the outskirts of Sydney to provide training for local students from farm industries (see Table 2). With time, three of the four schools have become selective schools with high academic pursuits – James Ruse is the highest selective and highest performing school in Australia. The memorandum from the Minister in 1939 (Box 1) clearly indicates that these schools were to perform at high academic levels.

In some other States agricultural education was also given special status (Table 2). In South Australia the Urrbrae Agricultural High School came into existence in 1932 although the school itself dates from 1913 from a bequest to teach agriculture to boys (Urrbrae AHS website, 2016). It is the only comprehensive special interest agricultural secondary school in South Australia and it is recognised as a centre of excellence in student learning with a focus on agriculture, technology and the environment.

Much later, in the 1940s and 1950s, the government of Western Australia enabled the development of a network of agricultural senior schools. This network, now called Western Australian College of Agriculture, comprises residential campuses at Cunderdin, Harvey, Denmark and Morawa for Years 10, 11 and 12. They are separated from the junior high schools and located on farms where instruction takes place with a focus on vocational studies but provision also exists for higher education entrance programs. A selection process requires students to demonstrate an interest in agriculture or related industries.

Perhaps the most intriguing and informative of attitudes was the foray by the Government of Victoria into agricultural high schools. Agriculture was used politically to establish secondary public schools ('continuation schools') in rural Victoria due to opposition from independent schools in the city. It was supported by the government's wish for closer settlement in the country to encourage people onto the land but this created practitioners without the appropriate knowledge, leading to many failures (Martin 1977). Education into agricultural techniques was seen as 'essential'. The courses were made up of one third culture subjects, one-third science subjects related to agriculture and one third farm work. A deficiency in the agricultural high school system was the difficulty for the students to be qualified to enter higher education. In reality they were continuation schools with agriculture in the name and their establishment in some of the smaller centres resulted in the closure of independent schools in those centres. After the failure of the agriculture courses in these schools (see Box 2) it was regulated in 1916 that agriculture should be retained as a subject. For the newly created Intermediate Certificate, all male candidates going to school in rural areas were required to study agriculture as one of their subjects. Martin (1977) reports much community apathy towards the 'agriculture' in the schools and little financial support. In the end the schools had 'agriculture' removed from their names and they reverted to continuation schools.

BOX 2

"The success of some of these farmers is measured in the amount of wealth accumulated... if the farmer could be convinced that ...a wider education and a scientific knowledge of the principles underlying agriculture would achieve the same end.... And at the same time secure happiness in work and a fuller life because an intelligent interest in the doings of others and in the welfare of the State would be created, then our agricultural high schools become more popular"

Headmaster of Ballarat Agricultural High School 1916 (extract from Martin, 1977)

More importantly, Martin's paper was revealing in the attitudes of farmers to agricultural education – the scepticism from farmers about the needs for such a course since they had learnt by experience and had progressed without training. Further, a 'potent factor' described was that "farmers as a class are sceptical of men who are classed as experts". This view is reflective of a significant proportion of farmers and pastoralists through much of the 20th Century in Australia.

So even in those early days the benefits of an education *per se* were being touted even though the sector tended not to embrace it readily.

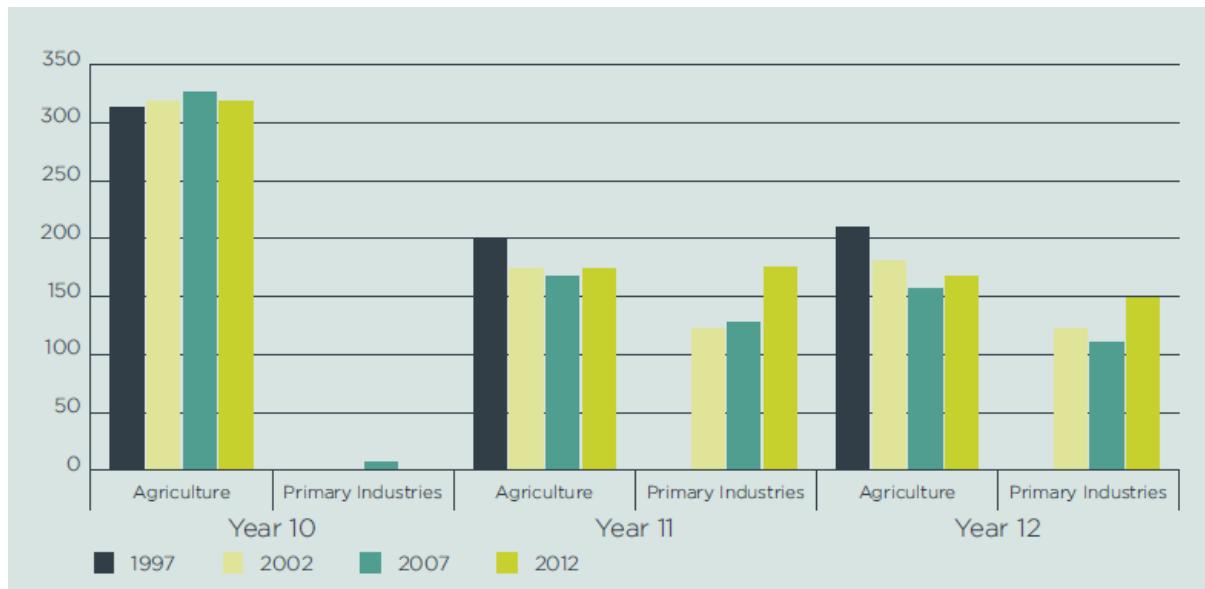


Figure 1 Number of schools in NSW offering agriculture subjects, 1997-2012 (Pratley, 2013)



Figure 2. Distribution of NSW secondary schools offering agriculture at HSC level in 2012

Agriculture became a subject of study at many high schools across Australia including independent and private schools. The number of secondary schools in NSW now offering agriculture is significant

as shown in Figure 1 and their distribution is shown in Figure 2. Over time in some of these schools, however, it became the *de facto* subject for disinterested and less able students. This generated a negative attitude amongst students and teaching staff towards agriculture and so students with ability were avoiding such subjects even though their interests may have been highly compatible. Over time as fewer people were employed in agriculture on-farm and as more of the population moved to the cities a disconnection evolved between agriculture and the majority of the population and its image became tarnished.

Since 2000, there has been a change in attitude towards agriculture as issues such as global food security have gained traction. The realisation regarding the lack of young people coming into agriculture became a driver to reinvigorate agricultural education at all levels and particularly at the school level. A Ministerial Review into agricultural education and training in NSW (Pratley, 2013) led to the designation of 7 Lighthouse Schools in agriculture in 2015. These, together with the Agricultural High Schools, became part of a network of schools with responsibility for providing leadership and support for other schools that were involved to a lesser extent in agriculture. The proposed transfer of Hurlstone Agricultural High School in NSW to the campus of Western Sydney University in 2020 with a focus on STEM (science, technology, engineering and maths) education signifies a strengthening of emphasis in agricultural education for NSW.

Overall, in respect of the school system for agricultural education, there are some strong contradictions. Agriculture is one of the few industry sectors to have specialist high schools in at least three states, despite its unpopularity in the community for the last 30 years of the 1900s. These specialist schools for the most part though are very high performing schools academically whereas agriculture in many other schools is, or has been, considered an inferior study. It is also clear that through the evolution to current offerings the early provision for boys only over a long period has now largely dissipated and agriculture is seen as appropriate for girls as it is for boys.

The wider issue that influences education is that of consumers having knowledge of their food; where it comes from and how it is produced. Because the practices involved in producing agricultural products are now foreign to most people, the danger is that they learn about them from vocal activists and then may reject modern agricultural production methods and set about opposing agriculture. If these views become main stream it will become very difficult for agricultural industries to operate and progress. Although it is important for students to be taught best practice in their agricultural subjects, this ‘preaches to the converted’ and does not address the wider issue. Clearly for best outcomes, all students, and their teachers and advisers, need to be exposed to a holistic insight of food and fibre production and consumption. This can be achieved through agricultural contexts in other subjects.

In 2009, the Australian Curriculum Assessment and Reporting Authority (ACARA) was established to execute a national curriculum in Australian schools. While this change provided an opportunity for populating the curriculum with agriculture, there needed to be a raft of agricultural teaching resources developed together with teacher and adviser professional development. The establishment of the Primary Industries Education Foundation Australia (PIEFA) in 2007 has provided for this process to occur in conjunction with other providers. There are over 3.5 million school students in Australia, 250,000 teachers and 9,500 schools and so the challenge is a major one. At the same time there is the need for industries to continue to work towards a positive image and identify career paths that are attractive to the emerging workforce.

In order to move from the school system to further education and training, academic attainment requirements needed to be met. From 1867 in NSW, and presumably in other states, these were

met by senior and junior public examinations marked by the University of Sydney. In 1912 the Intermediate Certificate examination in NSW was first held – this was taken at the completion initially of two years of secondary schooling and, after 1919, three years. There followed from 1913 the Leaving Certificate (called Matriculation in some states) examination which comprised a further two years of schooling after the Intermediate Certificate. The Intermediate Certificate became the qualification of admission to tertiary colleges and the Leaving Certificate became the basis for university entrance. In the 1960s, following the Wyndham Report of 1957, which was to reshape school education in NSW and subsequently elsewhere in Australia, an extra year of schooling was included. Thus the School Certificate (replacing the Intermediate Certificate in 1965) was at the end of 4 years secondary schooling and the Higher School Certificate (replacing the Leaving Certificate in 1967) after 6 years of secondary schooling in NSW. Variants of this occur in other states.

BOX 3

How Western Australia is dealing with the problems of agricultural education

by "Martingale"

"PROBABLY never before in the history of the world has there existed a greater need for men of trained intelligence in the ranks of agriculturists. The trend of modern life in a highly-industrialised world has forced agriculture out of the comparatively leisurely tempo at which it has been conducted throughout the centuries, for the farmer himself is not content to adopt the primitive mode of life which contented his ancestors, but wants motor cars, radios, electric light and power and all the other amenities enjoyed by his urban acquaintances.

More and more dependent upon the commercial and industrial world for his tools of trade, his tractors, trucks, artificial fertilisers, and complicated implements, he is forced to boost up production and cut down costs. To do this successfully he must overcome a host of problems of a financial, biological, chemical and mechanical nature. To grow better crops he must use better implements and study the manorial requirements of his land more closely. He must improve his stock by skilled animal husbandry, by paying more and more attention to feeding, breeding and kindred subjects, and whereas the old-time farmer had time to learn by trial and error, the farmer of today is compelled to accept the accelerated pace brought about by changing world conditions.

FARMERS are naturally averse to change. Their calling is an ancient one with its broad outlines, but little has changed throughout the ages, and past experience has taught them the dangers of being swayed by untested innovations. Even today there are practical farmers who regard agricultural education with scepticism and even hostility, despite the fact that they are taking full advantage of new techniques introduced by the agricultural scientist. I think, however that this type is in the minority in these days. Most farmers are fully cognisant of the part played by science in agriculture, and many would like to ensure that their sons commence their careers equipped with a sound foundation of scientific and technical knowledge upon which to base the practical experience of later years. Admittedly comparatively few of them really take the necessary steps to make this possible but I feel it is due partly to financial stringencies and partly to the fact that there has never been an active campaign to "sell" agricultural education to the farmers of our State. Many West Australians are quite unaware of the fact that we possess an agricultural college in this State. Others have a vague idea of its existence, but nothing more."

Extract from Western Maim. Perth WA, 18 Dec 1941

Tertiary agricultural education in Australia

The term ‘tertiary education’, a relatively recent descriptor, refers to all education post-secondary school and is largely split between vocational education and training (VET) and higher education (largely university). The demarcation though is described by West (1998) in the Review of Higher Education and Policy:

“The submissions that our committee received supported the widespread view that VET should continue to teach competencies and maintain the strong focus on skills, and higher education should cultivate attributes. Each sector should have clearly expressed goals. There should be articulation and credit transfer between the sectors and, where possible, facilities should be shared as well in order to effect economies. The curricula, however, should be clearly defined and discrete.”

Over time this demarcation has become blurred as the TAFE sector has sought to offer degrees, (although early history had the technical colleges, such as in Perth, offering degrees where a university wasn’t available) and universities have assumed the education of some professions that were previously the bailiwick of TAFE. This questions, philosophically, the role of universities. Falvey and Bardsley (1995) in discussing the revitalisation of agricultural education in the Australian university system identified the need for distinct and high quality skills-based courses and degree courses with pathways between the two. In arguing for strengthening of vocational education nearly 25 years ago, they referred to Hall (1972) as noting that “pressure on university undergraduate training for graduates to be job-ready, has already vocationalised university education in Australia far more than is admitted”.

A traditional view is summed up by Anderson (2012 – see Box 4). Universities have moved away from the original scholarly function to a business model of qualifications and skills. In agriculture this is the case as the curriculum has little space for reflective considerations. Employers also argue for job-ready graduates. Former Australian Chief Scientist Chubb (e.g. Office of the Chief Scientist, 2012) strongly promoted universities as providing ‘employment-ready’ (prepared for the future) rather than ‘job-ready’ (focused on the present) graduates and this tension remains, particularly with agricultural employers.

BOX 4 – What is a university?

“If we seek guidance from the past, it is better to see the ‘idea of a university’ not as a fixed set of characteristics, but as a set of tensions, permanently present, but resolved differently according to time and place. Tensions exist between:

- Teaching and research
- Autonomy and accountability
- Universities’ membership of an international scholarly community and their role in shaping national cultures and forming national identity
- The transmission of established knowledge and search for original truth
- The inevitable connection of universities with the state and the centres of economic and social power and the need to maintain critical distance
- Reproducing the existing occupational structure and renewing it from below by promoting social mobility
- Between serving the economy and providing space free from utilitarian pressures
- Teaching as the encouragement of open and critical attitudes and society’s expectations that universities will impart qualifications and skills

To come down too heavily on one side of these balances will usually mean that the aims of the university are being simplified and distorted.”

Adapted from Anderson 2010

Table 3 shows the chronological relationships between components of the Australian education system as they relate to agricultural education. To some extent, there are clear blocks of activity suggesting there were political imperatives at work.

Table 3 Chronological establishment of institutions related to agricultural education by decade

Decade	Public school Acts	Agricultural high schools	Vocational agricultural (certificate) colleges	Agricultural colleges*	Universities
1850	SA				U Sydney U Melbourne
1860	NSW				
1870	Vic Qld				U Adelaide
1880	Tas			Roseworthy SA* Dookie Vic* Longerenong Vic* Queensland*	
1890	WA			Burnley Vic* Hawkesbury NSW* Wagga NSW*	U Tasmania
1900		Hurlstone NSW			
1910		Urrbrae SA Narrogin WA			U Queensland U Western Australia
1920		Yanco NSW		Muresk WA*	
1930		Farrer NSW		Dairy Research (Gilbert Chandler 1966) Vic	
1940		Denmark WA Narrogin WA			
1950		James Ruse NSW Harvey WA Cunderdin WA			U New England
1960			Yanco NSW Tocal NSW Longreach Qld Emerald Qld	Glenormiston Vic* Marcus Oldham Vic	Qld Institute of Technology (→ Central Queensland U) La Trobe U
1970		Morawa WA	TAFE Dalby Qld Burdekin Qld	McMillan Vic Orange NSW*	James Cook U Murdoch U
1980					WA Institute of Technology → Curtin U of Technology (→ Curtin U) Charles Sturt U Western Sydney U
1990					Southern Cross U
2000					
2010		Lighthouse schools NSW			

*Agricultural colleges tended in most cases to become Colleges of Advanced Education in the early 1970s

While Australian universities *per se* were established progressively from the 1850s, agricultural colleges predated faculties of agriculture in the universities. South Australia, Victoria, New South Wales and Queensland all had agricultural colleges established by their respective colonial governments in the late 1800s (Table 4) whereas the teaching of agriculture in universities did not start until early in the 1900s. Agricultural colleges are unique educational institutions and date back to the 19th Century when they were established in Europe. The first agricultural college in

the English-speaking world was Cirencester (1845), now known as the Royal Agricultural College. The establishment of such institutions in Australia were heavily influenced by similar developments in the UK. These agricultural colleges were particularly for the training of farm boys to certificate or diploma level, providing also the opportunity to articulate to university entrance. Their establishment coincided with the closer settlement movement and graduates of the colleges worked both for government and on farms. The initial thrust to establish agricultural colleges in each colony was driven more by city interests than country interests. Large landholders or graziers, the descendants of the squatters, by then landed gentry, did not readily support the new colleges. Their interest in education was in sending their sons and daughters to private boarding schools in the capital cities and then anything that needed to be learnt about agriculture (more specifically grazing) could be learnt on the job.

Table 4 Establishment and evolution of agricultural colleges in Australia

Agricultural College	Established	Coeducational	Evolution
Queensland	1897 (High School until 1962 and College)		1990 to UQ
Hawkesbury	1891	1974	1989 to WSU
Wagga	1896	1974	1989 to CSU
Orange	1973	1973	1990 to UNE →1994 to U Sydney →2006 to CSU
Dookie	1886	1973	1997 to U Melbourne
Longerenong	1889	1972	1997 to U Melbourne →2006 to private VET
Glenormiston	1969		1997 U Melbourne →2006 to TAFE, closed in 2014, reopen 2017
McMillan			1997 U Melbourne → VET Community College
Marcus Oldham	1962	1979	Ongoing private residential college
Burnley	1891	1899	1997 to U Melbourne
Gilbert Chandler	1966 (formerly School of Dairy Research 1939)		
Roseworthy	1883	1972	1991 to U Adelaide
Muresk	1926 (→ Muresk Institute of Agriculture, 1990s)		1969 to WAIT/Curtin U →2012 VET

The 1950s saw a succession of good seasons and relatively strong prices for farm commodities. The impacts of post-war research and development and the application of science and technology were becoming very apparent. The demand for training in these technologies was strong and it was felt that the jackaroo system was not adequate to train young people for a farming career. At this time there was also a rise in the discipline of farm management, principally coming from Massey and Lincoln Agricultural Colleges in New Zealand. The Australian agricultural colleges, which had now been operating for decades, did not readily embrace this emphasis on farm management. Entry from the 1960s had become the Leaving Certificate and colleges were seen as indulging in

'academic creep'. Farmers were often critical of the colleges, their farms and courses as they had moved away from farmer training towards extension and other professional careers. As a result, in the 1960s, new agricultural colleges that focussed on farmer training were established in Queensland, NSW and Victoria to train young boys for a career on the land (Table 5). These residential colleges were based on farms and they had strong support from the farm sector.

Two of these colleges (Table 4), Marcus Oldham College and Orange Agricultural College, had particular emphasis on farm management. Special mention should be made of Marcus Oldham College, located in Geelong, which is now the only private agricultural college. Its focus was on farm management, was fully residential and required students to spend time in the industry gaining first-hand experience. It remains successfully in that paradigm although its academic standards now categorise it within higher education. Some Australian universities also established chairs of farm management around that time.

Table 5 Current vocational agricultural colleges in Australia

College	Date established	Coeducational
Queensland		
Emerald	1968	1991
Longreach	1967	1979
NSW		
CB Alexander now Tocal	1965	1972
Victoria		
Longerenong	2006 (from U Melbourne)	2006
Glenormiston	2008 (from U Melbourne) closed 2014 reopened 2017	2008

In the 1960s most colleges were under the auspices of state departments of agriculture. Education was largely the responsibility of the state but increasingly the Federal Government was providing funding to tertiary institutions. In 1971 most of the original colleges became Colleges of Advanced Education (CAEs) in a two tier system of higher education and gradually moved to degree offerings over succeeding years. The Dawkins Report in the late 1980s then removed the two-tier system to a unified model of universities and most colleges moved into existing universities or became new universities (Table 4).

In almost all cases, the early versions of the institutions indicate their mission as educating boys, lads or young men in the 'practice and science of agriculture' for profitable management of farms (Falvey and Bardsley, 1997) . Clearly there was no consideration given in the early days to the possibility that females might have aspirations on farm or in industry. This was the case in agricultural high schools, agricultural colleges of all types and universities. There seems to have been an epiphany in the 1970s as many of the institutions progressively, but suddenly, became coeducational. At that time there was a strong affirmative action push and during the 1960s legislation against discrimination of sex, race and religion was adopted by various States (Gaze, 1997). It also coincided with the social reforms of the Whitlam Government although whether that played a role is a matter for debate. Universities were more liberal earlier and Burnley Horticultural College was well ahead of sister colleges admitting women part-time from 1899 and full-time from 1914. Falvey and Bardsley (1997) recount that many female students treated Burnley as a form of finishing school as it did not lead to a means of livelihood. In the 21st century women now outnumber men in higher education agriculture (Figure 4).

Vocational education and training General education establishments were in place from the early 1800s for post school learning, beginning in Hobart in 1827 and in most major centres by 1840 (Goozee, 2001). These included initially Schools of Arts, Mechanics Institutes and Technical Colleges. After Federation in 1901, these continued to be solely funded by the state governments until the 1970s. Often they were stand alone and regionally independent colleges that had strong industry and community support. Agricultural colleges evolved during the same time but were never directly associated with the technical college system.

In the early 1970s the Commonwealth Government established the Australian Technical and Further Education Commission to develop consistency in technical education across the nation. The desire for consistency continues to this day. The Kangan Report in 1974 defined what was to become the TAFE system with the acronym being adopted as the brand for the various forms of technical education in each state.

Most technical colleges had dated facilities and many were over-crowded and under-resourced. Successive Commonwealth governments poured money into the newly created TAFE system, including the more recent agricultural colleges, and this continued for both capital and recurrent funds until the early 2000s. The TAFE system was, by implication, a monopoly for tertiary, non-university, education. The only anomalies were the few agricultural colleges. TAFE grew rapidly and colleges were established throughout country towns. Courses were mostly free and ranged from recreational cooking through to sophisticated technical courses in engineering and highly skilled vocations. TAFE also became an avenue for social welfare support in the community and developed an important role in outreach and community support. During the late 1970s through to the 1990s TAFE was lavishly funded and grew to have extensive facilities and resources. Throughout its state networks it provided a wide range of agricultural and related courses at certificate and diploma levels and played a strong part in skills development in agriculture. Some TAFE campuses such as at Wagga Wagga and Dubbo in NSW became specialist primary industries campuses.

The monopoly created however was generally inflexible with a relative incapacity to respond to the needs of various industries. Responsiveness and the need for consistency across the states for transportability of qualifications thus became political imperatives. During the 1990s a TAFE revolution occurred whereby national competencies were established. This partitioned work performance into ‘bite-sized’ pieces, i.e. competency based training, which could be taught and assessed within the institution or in the work place. A national structure was put in place through which funding could be provided and provision was made for non-TAFE organisations to deliver TAFE-type programs through the market-based concept of Registered Training Organisations (RTOs). At this time the term ‘Vocational Education and Training’ (VET) was introduced (the VET system) and it is now common parlance. The move to a user choice arrangement meant that the user was funded to take the course rather than the institution funded to provide the course, i.e. a demand funding system rather than the former supply funding model.

Demand funding has its challenges. Courses only run where the demand is strong enough to make the provision economic. Private RTOs ‘cherry pick’ those courses of high demand and profitability thus leaving TAFE to provide the difficult, expensive and low demand courses. Quality of private RTOs has been variable and this has required increased scrutiny of registration and audit.

The legislation for the operation of the VET system rests with the states including registration of RTOs although pressure existed to create a national system of registration. As a result, the Australian Skills Quality Authority (ASQA) was established for national registration in all states but Western Australia and Victoria which still run their own registration system. The funding for VET is a mix of Commonwealth and State funding although there is greater emphasis on user pays.

The training in VET varies from a full qualification to a skill set or an individual competency. An issue which hampers the effectiveness of competency-based training is that competencies are written based on industry intelligence and information at a certain time. They then need to be endorsed and ultimately adopted by RTOs. By this time they can be out of date.

In 1995, a national system of qualifications, the Australian Qualifications Framework (AQF), was established in Australia. The AQF encompassed higher education and vocational education and training and regulates qualifications (Table 6) in the Australian education and training system (AQF, 2013). The objectives of the AQF are to provide a contemporary and flexible framework that:

- accommodates the diversity of purposes of Australian education and training now and into the future;
- contributes to national economic performance by supporting contemporary, relevant and nationally consistent qualification outcomes which build confidence in qualifications;
- supports the development and maintenance of pathways which provide access to qualifications and assist people to move easily and readily between different education and training sectors and between those sectors and the labour market;
- supports individuals' lifelong learning goals by providing the basis for individuals to progress through education and training and gain recognition for their prior learning and experiences;
- underpins national regulatory and quality assurance arrangements for education and training;
- supports and enhances the national and international mobility of graduates and workers through increased recognition of the value and comparability of Australian qualifications; and
- enables the alignment of the AQF with international qualifications frameworks.

Table 6 Components of the Australian Qualifications Framework (AQF 2013)

Level	Qualification	Providers
1	Certificate I	VET, schools
2	Certificate II	VET, schools
3	Certificate III	VET, schools
4	Certificate IV	VET
5	Diploma	VET
6	Advanced Diploma Associate Degree	VET VET, universities
7	Bachelor Degree	Universities, some VET
8	Bachelor Honours degree Graduate certificate Graduate Diploma	Universities Universities, some VET Universities
9	Master Degree	Universities
10	Doctoral degree	Universities

Apprenticeships The system of training involving a legal contract (an 'indenture') between an employer and employee has been in operation in Australia for over a century. Detail of the history is given by Knight (2012). Traditional apprenticeships typically run for three to four years and 80% of the apprentice's time is spent in training on the job, with the remaining 20% spent at TAFE undertaking off-the-job training, the cost of which is borne by government. Originally,

apprenticeships were only available in traditional trade occupations, and an upper age limit (23 years in most states) restricted this mode of training to young people. Young people entering a traditional apprenticeship usually left school at the Intermediate Certificate or School Certificate or earlier if they had passed the statutory minimum school-leaving age. As apprentices were frequently minors, considerable government regulation was involved. Wages, which were specified in industrial awards, were low. In the 1980s the traditional apprenticeship model was extended to non-trade occupations under the banner of 'traineeships'. As the skill requirements were usually much less than in traditional trades, the duration of the training contract for traineeships was much less—six months to two years but typically a year—and the level of training was lower. In other respects traineeships operated in much the same way as traditional apprenticeships, including government funding for the off-the-job training and low wages, even for older adults undertaking this form of training. Traineeship numbers were slow to grow until the Australian Government introduced incentive payments to employers of trainees in the 1990s. Knight (2012) suggests that much of the training has been at a low level of qualification giving little economic return and "neglects the general education needs of young people".

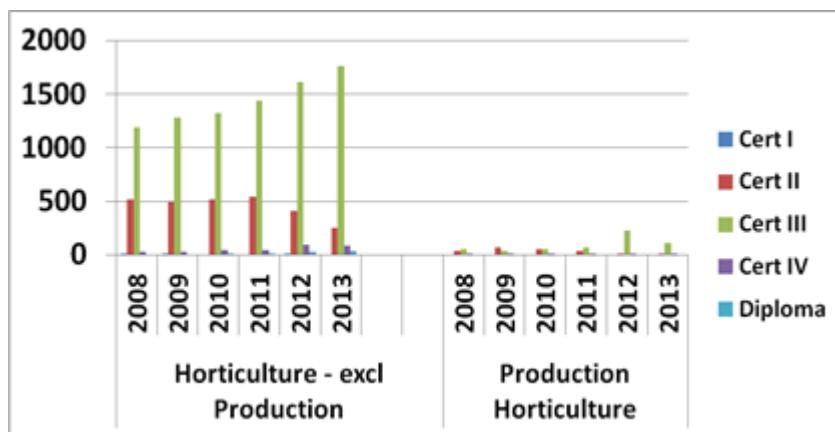


Figure 3 Completions of apprenticeships and traineeships in horticulture and production horticulture 2008-2012 (NCVER, 2014)

Agriculture has not widely embraced the apprenticeship opportunities although there has been more interest in traineeships. An exception was the Dairy industry particularly in Victoria which led the way with farm apprenticeships in the 1970s followed by NSW Dairy Industry in 1980. The amenity horticulture sector also embraced apprenticeships and traineeships (Figure 3) but the remainder of the sector minimised involvement because of general disdain for qualifications and the resultant need to pay labour more. Interest in establishing a farm apprenticeship more generally in NSW was not progressed as the leadership of NSW Farmers at the time did not believe in any form of industrial award and would not entertain the idea of an apprenticeship even though there were significant funds for the purpose. This view was strong in the National Farmers Federation as late as a decade ago where the mantra was that 'I didn't have any qualifications and have done ok so why should those following need them'. Farmers occasionally saw the need for skills training (known as 'just-in-time' training) but without qualifications attached as this would increase the cost of the labour. Given that in the 2000s qualifications are the currency for job seeking and career progression the attitude was regressive and helps explain why careers until recently have not been sought in the sector by new players.

Higher education Agricultural Science education in higher education commenced at University of Melbourne (1905) and University of Sydney (1911) with other universities following over the next 80 years or so (Appendix 1). A similar pattern existed in New Zealand. All Australian universities were located in the metropolitan areas until the University of New England in the 1950s although agricultural education was available through the rural-based colleges. The number of ‘agricultural’ universities grew to 9 by the 1980s. Together with the CAEs in agriculture there were about 22 campuses offering higher education agriculture at the time of Dawkins reform in 1989. The McColl Report (1991) into agricultural and related education indicated *inter alia* that multi-disciplinary institutions were educationally more desirable than specialist agricultural institutions and that there should be fewer, stronger campuses. Further, the Report indicated that there was a shortage of agricultural graduates and this should be addressed. From that time, however, intakes to higher education started to decline and that decline continued through to 2012. In the process the number of campuses shrank to about 11, with the number of rural campuses reduced by 50%, fulfilling the recommendation of McColl *et al.*, except that reduced numbers of students at almost all campuses had weakened all schools of agriculture. The composition of the agricultural student body at the time of the McColl Report is given in Table 7. Males dominated, indigenous students were very poorly represented and international student numbers were low. The only change has been the attainment of gender balance in recent times.

BOX 5 - Future of Australian Education

“In rural production we are passing, if we have not already passed, out of the era in which only certain staple lines of production needed to be engaged in, for which there was a reasonable assurance of a world market. The period been described by some experts as the period of exploitation.

We are passing out of that. We are entering the period when there will be much more difficulty in obtaining markets. I am now taking the long view. We are passing into the period when we must direct ourselves to much more intensive use of our soil, with much more scientific knowledge of its treatment and possibilities and with much greater variety of production. If our rural industries are not to enjoy a brief period of high prosperity, while the world is going through the reconstruction period, followed by a shrinkage in the period of fierce competition that will then probably ensue, it seems clear that we must increase our efficiency and get our costs down.

That will involve, I believe, at least two things. It will involve a large development of scientific research in its relation to the agricultural and pastoral industries. It will involve serious attention to the problem of, not theoretical training, but scientific training for the actual work of the farmer. In regard to scientific training for the man on the land, it has seemed to me for a long time an anomaly that in a country so largely dependent for its true prosperity upon production from the soil, such meagre facilities should exist in relation to agricultural colleges, and that most of the existing colleges –and I have had a close look at a few – should be so obviously starved of plant, equipment, staff and buildings. If our attitude is to be that rural production is a mere matter of practical experience sharply limited to the locality in which it is acquired, and that a sound preliminary mental training is not needed, we shall fall very rapidly behind the other competitor countries.

On these matters, I should like to mention without discussing it further the position of agricultural and other technical experts in this country, often underpaid and overworked, who are the advisers of the man on the land. They have given and are giving notable service.”

R.G. Menzies. 1945

The decline in university enrolments since 2001 is shown in Figure 4. This also shows the relative decline in funding to these faculties as universities are funded on a per student basis. The decline shown represents the loss equivalence of about 100 academic staff across the nation. What is also

important to note is the changeover in student gender during this time in stark contrast to earlier times of boys only and then minority proportions of women.

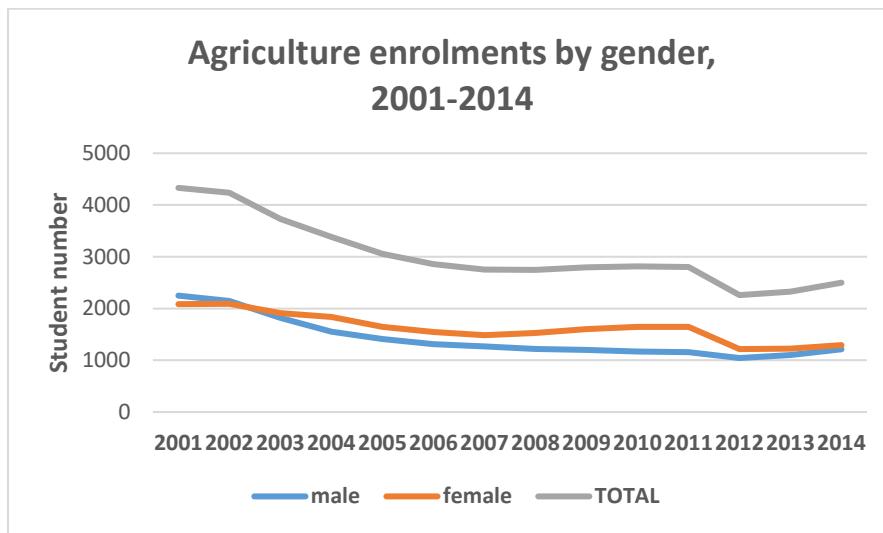


Figure 4. Annual enrolments of students in agriculture and their gender composition in Australian universities, 2001-2014

Table 7. Composition of participants in agricultural and related education in 1990 (McColl *et al.*, 1991)

Category	Percentage
women	34
indigenous	0.2
rural	55
Interstate	11
External study	16
International	6

Most universities are established under State Acts and States were initially responsible for their funding. In the early days, entry to universities required the payment of fees and so was largely for the elite. Following World War II the Commonwealth made increasing contributions to the funding of universities and from 1974 assumed full funding responsibility. From 1951, the Commonwealth Scholarship Scheme was instituted whereby entry was based on merit rather than capacity to pay. Such scholarships had both fee and accommodation components, subject to a means test of the student or parents, and this provided greater scope for rural students to attend the metropolitan-based institutions. In the late 1960s and early 1970s there was a concerted effort to make higher education more available to the working classes and, on election to office, the Whitlam Government abolished fees for university study, substantially increasing participation rates. Free university education became unaffordable for governments and in the mid-1980s the Higher Education Contribution Scheme (HECS) was introduced which provided the opportunity for students to postpone their fee liabilities until employed with a threshold salary. HECS has evolved into HELP (Higher Education Loan Program) which extends the concept to VET students. Agriculture seemed to have missed most of the opportunities that have arisen through this period.

BOX 6 - Murray Report 1957

"Primary industries have played their part. Among the many industries of the country agriculture is still the most important single source of wealth in this country and has progressed rapidly in this post-war period; wool production has increased by 44.3% between 1946-7 and 1955-6 and in the same period beef and dairy cattle production has also risen considerably. In southern Australia this expansion has been largely due to the control of the rabbit and to the application of scientific research whereby large areas of native pasture of low stock-carrying capacity can be converted to high quality sown pasture, the area of the latter having increased in the last nine years from 11 million to 33 million acres; intensive scientific investigation of similar problems in Queensland and northern Australia offer promise of no less spectacular improvement in the productivity of semi-tropical and tropical pastures in the next decade. While shortage and uncertainty of rainfall are likely to remain the most important handicaps from which Australian agriculture will suffer, scientific advances and new techniques, if continued, will extend far the physical limits of expansion in that industry.

For example the Australian Institute of Agricultural Science over the past three years has conducted a vigorous campaign to attract more undergraduates to the Faculties of Agriculture in view of the difficulty of maintaining and effecting some expansion of the present sparse agricultural advisory services of the State Governments..... in spite of the fact that all States attempt to ensure a minimum intake of both agricultural and veterinary graduates by the offer of cadetships in the several universities."

A consistent theme through many reports over time has been the commentary on the shortage of graduates in professional agriculture. It was inferred by Menzies in 1945 (Box 5), explicit in the Murray report of 1957 (Box 6) and in the McColl Report of 1991. It has been the focus of activity by the Australian Council of Deans of Agriculture in the last decade (Pratley 2012, 2016). The question is raised as to why students have not followed the employment opportunities.

A further theme has been the opposition by farmers to formal tertiary education for farmers. This is particularly so with respect to university education. Farquhar (1966) commented that "in Australia there has been comparatively little interest in and demand for university agricultural courses for farmers". Falvey and Bardsley (1995) record that "the image of agriculture has not been assisted by the relative neglect of farmer education. This has allowed criticism of the knowledge levels of persons charged with managing the bulk of the country's terrestrial resources". They cite Campbell (1980) who claimed "distressingly low levels of farmer education in Australia in the face of evidence linking education to the adoption of new practices". In the 1960s, less than two per cent of the 6,000 to 8,000 persons entering farming in Australia each year had formal post-secondary education (Falvey and Bardsley, 1995).

The data for the past three decades or so provide stark evidence of the discrepancy between those in farm production and the remainder of the Australian workforce (Figure 5). It is pleasing to note that between 1984 and 2012 there has been substantial improvement in the proportion holding a degree from around 2% to nearly 12% and that improvement can be expected to continue as the age distribution reconfigures through generational change from a skewed distribution towards the higher age bracket. The increasing influence of corporate farming may also contribute. The challenging statistics however are the increasing gaps between agriculture and the rest of the population, although the relativities have narrowed (i.e. the population was 4.5 times as likely as agriculturalists to have a degree in 1984 and about 2.3 times in 2012).

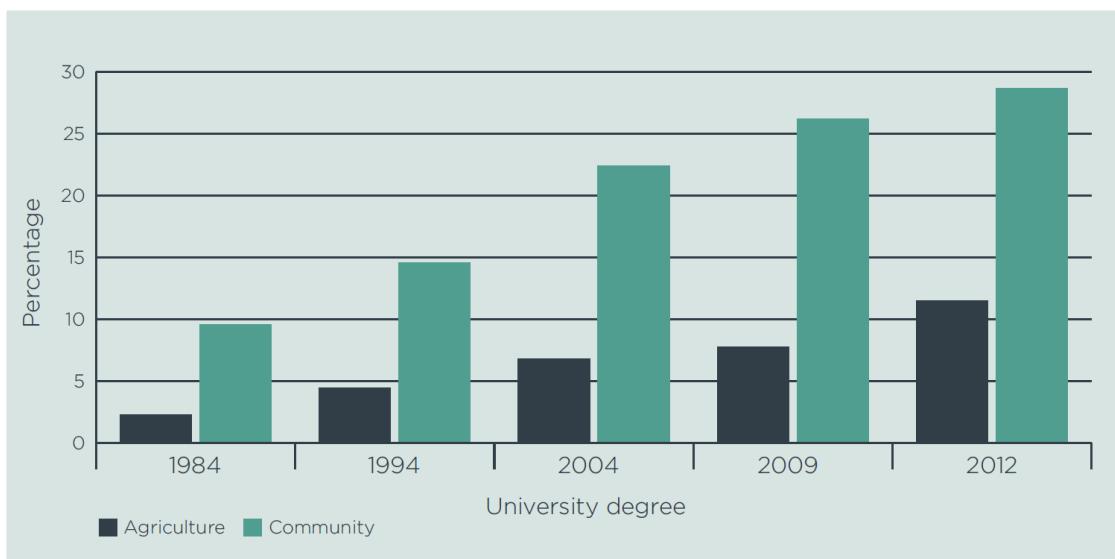


Figure 5. Trends in degree attainment in agriculture relative to the Australian workforce (Australian Bureau of Statistics Catalogue No. 6227.0 and previous iterations)

Another way of considering this quandary is to look at the data for lack of post-school (largely tertiary education) qualifications (Figure 6). In 1984 more than 70% of agriculturalists had no qualifications following school relative to just over 50% of the national workforce, with these percentages declining to around 52% for agriculturalists and 34% for the Australian workforce, again a significant improvement but the gap remains.

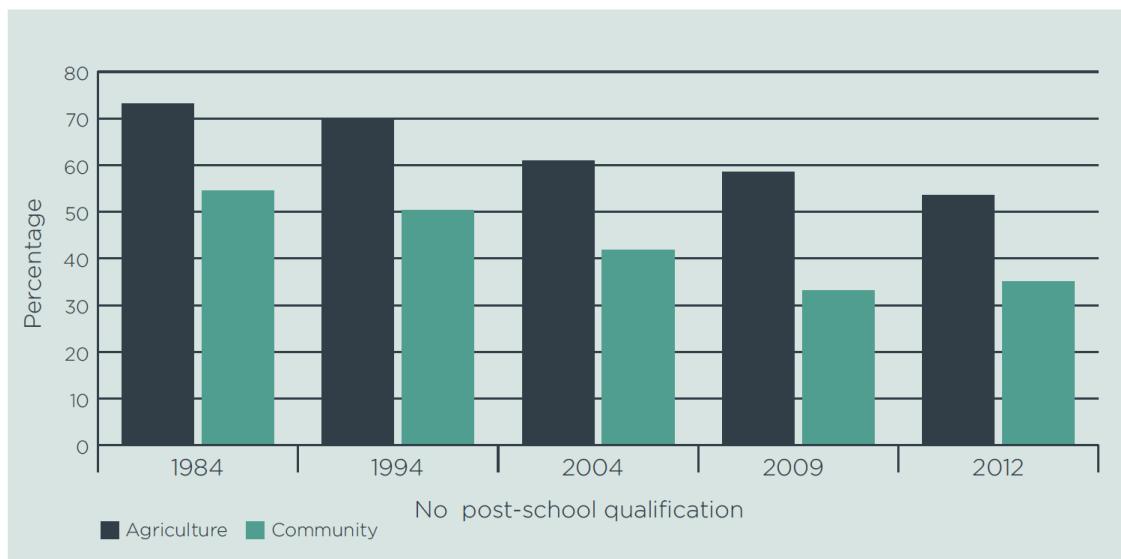


Figure 6. Trends in no post-school qualifications relative to the Australian workforce (Australian Bureau of Statistics Catalogue 6227.0 and previous iterations)

The paradigm that farming can be learnt on the job has been a powerful one and remnants are seen today. Why it continued this long is a matter for debate but there were contributing factors. Prior to the 1970s agriculture had a powerful voice in parliaments. The Country Party, the forerunner to the National Party, had strong leadership which protected farmers. It was able to do this because there was a higher proportion of the population in the rural areas, albeit in decline, which, with gerrymandered electorates, provided them with a strong political powerbase. Farmers benefitted from the superphosphate bounty, tariff protection, public plant breeding institutes, the single desk

for wheat marketing and free extension services. In 1973 with the Whitlam Government elected federally, much of this protection was removed – ‘one man one vote’, removal of subsidies and gradual tariff removal altered the power dynamic. The Australian Conservation Council came into being in the 1960s and the Greens in the 1970s. Soil erosion becoming a political issue as well as an environmental one and provided a basis for raising the profile of these activist organisations at the expense of agriculture. The suddenness of the changes caught the sector unprepared and it adopted a defensive position from which it took decades to recover. The anti-education stance meant that little advantage was taken of free education introduced by the Whitlam Government and so the sector became uneducated relative to the rest of the community. The lack of strong industry leadership allowed the sector’s image to be tarnished and the disconnection between city and country exacerbated this.

Whereas in decades past the support of government could mask the need for education other than ‘on the job’, the development of technology, the need for compliance, the environmental imperative, the biosecurity imperative, the importance of strong business acumen and the need for a positive sector image all point to the need for a well-educated and trained workforce. There has been significant change in the past decade in particular as these issues are progressively addressed and the industry has moved from the early 20th Century education paradigm to the 21st Century paradigm based on qualifications.

Summing up

Education evolution in Australia has been rapid and we are fortunate that education is readily available and of a good standard that is recognised globally. Agricultural education has featured strongly and with greater emphasis than for any other industry sector, both in the school system and in post-school offering. In the specialist schools, academic excellence has been a key principle but in many other schools it has suffered until recently from disdain.

The availability of tertiary education has been strong since early days and has served the service industries well. Farmer education however had been shunned by farmers themselves until recent times but the challenges now faced have created a new imperative for education and the emerging generation is taking advantage of the vast opportunities that exist through better capability in new technologies and in business principles.

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APPENDIX 1. Australasian ‘agricultural’ universities

University	Year university established	Year of first intake into undergraduate agriculture	Year of first intake of females into UG agriculture	Year of first PhD graduate in agriculture
UQ (See also Qld Agricultural College)	1910	1927	1969	1953
CQU	QIT 1967 CQU1994	2016	2016	
JCU	1961 university college of UQ 1970 JCU	2006 Ceased 2009	2006	1995
U Sydney	1850	1911	1917	1929
UNSW	1949	1951 Ceased 1997	1960	1959
UNE	1938 (university college of U Sydney) 1954 UNE	1950s		
CSU (See also Wagga Agricultural College)	1989	1990	1990	1995
WSU (See also Hawkesbury Agricultural College)	1989	1990	1990	1993
SCU	1994			
U Melbourne (See also Victorian Colleges of Agriculture)	1853	1905	1914	1949
La Trobe U	1964			
U Tasmania	1890	1960s		
U Adelaide (See also Roseworthy Agricultural College)	1874	1905 (RAC grads could articulate to BSc) 1928		
UWA	1911	1913 (chair established)	1923	1950
Murdoch U	1975	1987	1987	1978
Curtin U (See also Muresk Agricultural College)				
Lincoln U NZ	(1878 as School of Agriculture, Canterbury College) 1990	1880 (Certificates until 1896)	1946	1961
Massey U NZ	1927 (Massey Agric College) 1963 – Massey University	1928	1938	156