

## **WORKFORCE PLANNING IN AGRICULTURE:**

### **Agricultural Education and Capacity Building at the Crossroads**

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Agriculture is a vital part of the Australian economy and is likely to remain so. Its ongoing viability however depends on having a well-qualified workforce at all levels. Current projections are that the gap between the availability of jobs and the supply of graduates is increasing and must be cause for concern. The viability of the industry depends on continuing the innovation process through research and development but the current support for higher research students has deteriorated significantly in the last decade to the point of being unattractive to the best students.

All sectors of the industry have a vested interest in promoting careers in agriculture in order that their own workforce needs are addressed. The minimalist approach to the promotion of agriculture has allowed a negative image of the industry to be portrayed and the perception created that a career in agriculture is not attractive. The reality is however that there are great opportunities in an industry which is high tech, highly mechanised, involved with international marketing and environmental sustainability. Prospective students need to be properly informed and it is the industry as a whole which is responsible for ensuring that they are.

Agricultural education is at the crossroads in Australia and in other parts of the world. There are many facets to this issue and this paper attempts to provide some perspective to underpin changes necessary to address the future. Of particular concern is the widening gap in Australia between the number of agricultural graduates and the demand by the industry for their services. Agriculture is set to move into a period of high demand for its products and there are challenges to be met in respect of climate change, water management, increased productivity, biosecurity and other issues. Thus, never before has there been such a need for a well-qualified workforce in agriculture in order for these challenges to be met.

A case is made that agriculture remains a vital part of the Australian economy despite a poor image and a changing demography. Agriculture maintains its place through research investment to ensure productivity gains that keep the industry viable. It needs a well qualified workforce but there are signs that there is a dearth of agricultural graduates to meet the market demand and the projections indicate that this situation will worsen over the next five years at least. There is concern that the current system of funding provides a disincentive to potential future scientists who are so vital to sustaining the viability of agriculture through innovation.

## Australian demography

There has been a demographic revolution in Australia. Whereas in the early 1900s, around half the population resided in rural areas, it is close to 15% a century later with the majority residing in metropolitan centres, along the coast and in major regional centres (Figure 1). Australia is the world's most urbanised country. When the inland and other rural provincial cities are classed as rural, however, the proportion residing in rural regions is around 27% based on 2000 population figures (ABS 2002)

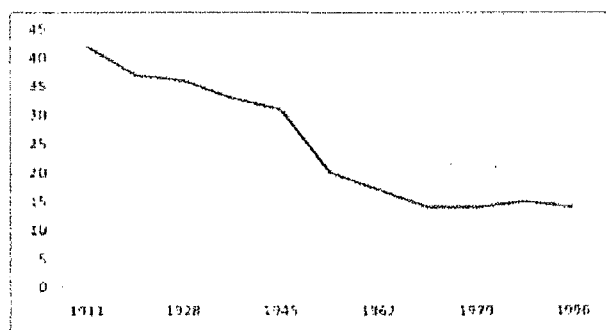


Figure 1 The decline in the rural population (ie those not located in metropolitan and major centres of population) for the period 1911-1996 (ABS, 2002)

There are the obvious consequences. The parliamentary system is based on one person/one vote and so Australia's decision makers largely represent metropolitan interests, thereby exacerbating this imbalance. The majority of the population is divorced from regular or even incidental contact with rural Australia.

## Community understanding of agriculture

School curricula have little agricultural content. The agriculture subjects are gradually being eliminated even for rural students and teachers of agriculture are facing extinction. The emerging generation therefore has little understanding of the importance of agriculture to the national economy, the source of their food or the nature of agricultural careers.

The general population is kept informed by the media of the negative aspects of agriculture and challenges of the inland. There is always a drought or flood to contend with and airplay is regularly given to extremist campaigns, be they environmental vandalism, animal cruelty such as mulesing, anti-GM or even the over-use of water for irrigation. All of this goes to reinforce the notion that agriculture is an industry that does more harm than good and perhaps its time has come for closure. Why then would anyone choose a career in agriculture?

The reality is of course quite different. Agriculture has achieved much in the last 25 years to address its environmental challenges. It has invested in research to make it more productive, efficient and environmentally sustainable than any other industry. It is now 'high-tech', highly mechanised and internationally business focused. There remain issues such as drought management, exchange rates, climate change, environmental challenges such as salinity and the like that require strong intellectual inputs to bring progress. Australia leads the world in clean, green food, labour production efficiency (production per farm labour unit) and consistency of

quality. These attributes are and will be crucial in a future that requires, over the next 40 years, an increase in food supply of around 50% from about the same area of land.

### The agricultural workforce

In Australia in 2008, the community enjoys near full employment. Most sectors of the economy are experiencing difficulties in recruiting appropriately qualified staff. Agriculture is a case in point but there are many others, notably health workers and teachers. Agriculture is thus not a special case but, in saying that, it does not help those agricultural firms trying to recruit suitable staff. To make progress therefore, Agriculture needs to position itself to be highly attractive to the emerging workforce.

A study on the “farm-dependant economy” (Australian Farm Institute 2005), involving the farm sector and agribusiness, showed that some 17% of the Australian workforce are employed in the FDE. About half are employed in the rural areas and the other half in metropolitan centres. It would appear, however, that there are barriers to the interchange between city and country – on the one hand, those in the city have an established social network and investments and a shift usually has a requirement for suitable spouse employment, *ie* there needs to be two jobs. On the other hand, people in the country usually cannot afford the real estate prices in the cities and would need to live distant from their city place of work and use much time in travel, with consequences for family life.

### Rural employment

A recurring theme from agricultural employers is their difficulty in recruiting professionals particularly for rural postings. Again, this is not specific to agriculture as there are shortages in most professions in inland Australia, including doctors, dentists, veterinarians, accountants, teachers and pharmacists. A study of veterinary graduates (Heath and Niethe 2001) highlighted the issues of different lifestyles between city and country and the issues of employment for spouses. Few graduates remained in rural practice beyond five years post graduation. At the time of the study, all Veterinary Schools in Australia were in metropolitan-based universities.

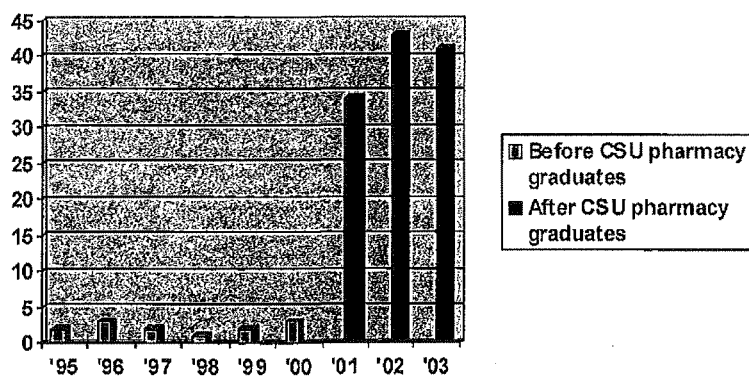


Figure 2: NSW Pharmacy graduates employed in rural areas following graduation. The year 2000 represents the first year of Pharmacy graduates from CSU (Western Research institute, 2006).

A study of Pharmacy graduates in NSW (Figure 2) provided stark evidence that the availability of rural employees related strongly to their training being based in rural areas. Whereas around three graduates per year traditionally crossed the Great Divide, the availability of Charles Sturt University (CSU) graduates from 2000 transformed the availability of graduates in rural areas significantly (Simpson and Wilkinson 2002).

This prompted an analysis of CSU graduate employment across all professional areas, including agriculture. Figure 3 (Western Research Institute 2006) shows that, overall, around two-thirds of graduates of rural origin obtain, and remain in, rural employment for extended periods. Those with metropolitan backgrounds are more likely to return to the metropolis and only about 15% gain rural employment. In agriculture the picture is different – around 88% of graduates of rural origin remain in the country, as do over 40% of graduates with city backgrounds. These data have generated the theme of “train from the country, in the country, for the country” and this has been recognised by the Federal Government with the funding of rural based programs in Veterinary Science, Dentistry and to some extent Medicine.

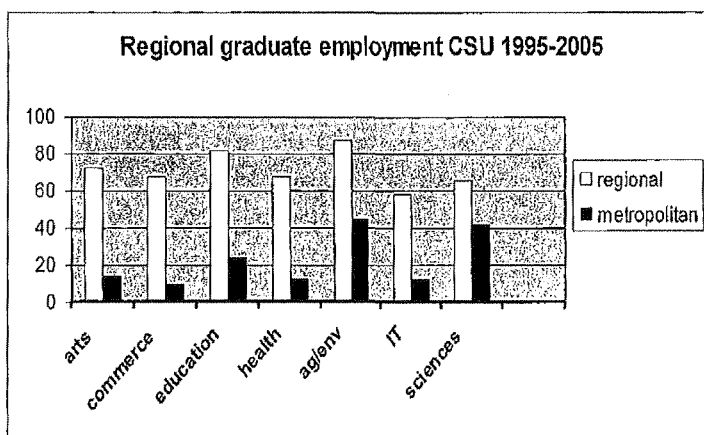


Figure 3: CSU graduate employment in regional areas across the professions based on student origins for the period 1995-2005 (Western Research institute, 2006)

### Tertiary education provision

The provision of agricultural training for both metropolitan and rural employment is not at issue. Every State capital city has at least one provider of agriculture and most States also have rural providers. There are rural Universities like UNE and CSU and country campuses of metropolitan universities such as UQ, UM, UA and CUT. The availability of providers *per se* is thus not an impediment in the provision of professionals but the downturn in student demand presents a potential threat to the sustainability of at least some of the current providers.

It is estimated that, on average, there is demand for at least 2000 new graduates in agriculture per year. Although government data on graduate numbers in agriculture from universities are available, they represent a significant over-estimate because of the way official data are categorised. These data distort the picture provided to decision makers, such as Ministers, to the extent that they have considered the number of graduates as adequate. Data collected under the

auspices of the Australian Council of Deans of Agriculture directly from agriculture faculties (Table 1) suggest that Australian universities now generate fewer than 800 graduates in agriculture (*ie* science and business) per year. There is, therefore, considerable discrepancy between supply and demand. This discrepancy is set to worsen as predictions indicate that workforce demands will increase by more than 30% or so in the next six-eight years (Faculty of Agriculture, Food and Natural Resources, University of Sydney 2007 unpublished). Further, agriculture, like other sectors, has an ageing workforce. The average age of farmers is 54 years and most state agencies have more than half their professional staff moving to retirement in the next five years. Job opportunities are not the problem now or into the future.

Table 1. Graduate completions from Australian Universities in undergraduate agriculture and related programs, for the period 2001-2006. Fewer than half the animal science graduates would be directed towards the agricultural sector.

COURSE	2001	2002	2003	2004	2005	2006
agric 4yr	215	185	162	158	164	149
agric 3yr	304	293	324	239	231	216
hort/vit	80	77	93	86	111	67
anim sc	219	230	267	250	252	227
ag eco	51	52	58	53	61	84
ag bus	107	140	204	110	112	149

Government data suggest that there has been a downward trend in applications for university agriculture for some time (Table 2). From 2001-2006 this decline was 18% and the proportion of agriculture applicants to total applications declined from 2.3% to 1.9%.

Table 2 Student applicants for undergraduate agriculture at Australian universities 2001-2006 and their proportion of the total cohort (DEST 2007)

	2001	2002	2003	2004	2005	2006
Eligible applicants	4819	4894	5113	4891	4161	3888
As % of total	2.3%	2.2%	2.2%	2.1%	1.9%	1.9%

Advice from DEST also indicates that attrition rates for agriculture students are higher (16.3%) than for the general student population (13%). Such attrition is more likely to be due to financial reasons for agriculture students (9.4%) than for other students (4.9%). Course satisfaction, however, is slightly higher for agriculture students than for others.

### Industry credentials

The agricultural industry has a lower level of formal tertiary qualifications than the Australian community at large. In 2004, only around 7% had a degree compared with over 22% of the population (Figure 4), although the relative increase over the previous 20 years (about 3x) has been higher than the overall average (over 2x), albeit from a small base. There has also been a significant improvement in the level of post-secondary education (32%) over the same period but 60% of the workforce remains untrained. The challenges that lie ahead require the best minds and the best trained workforce available.

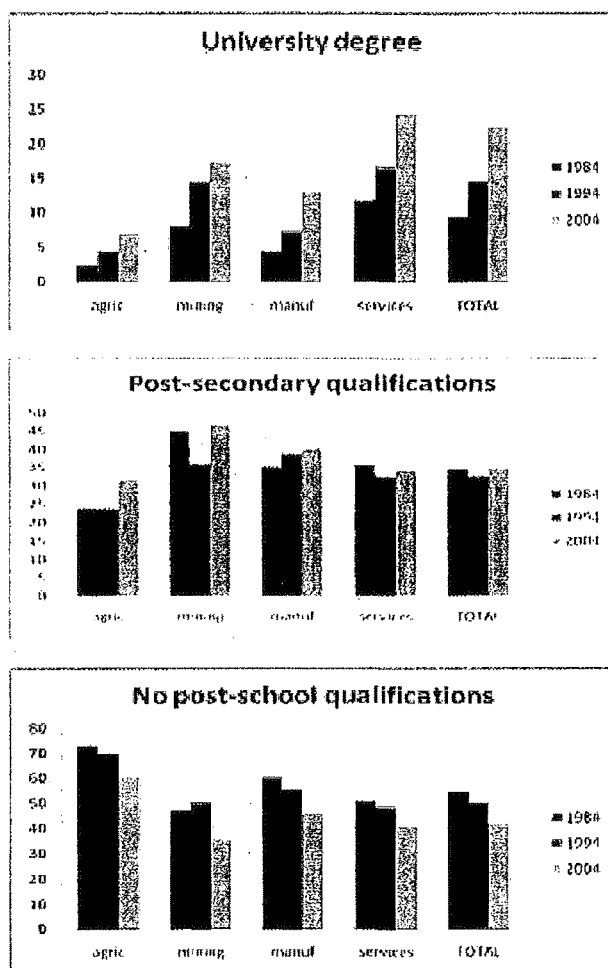


Figure 4. The percentages of levels of qualifications of the agricultural workforce in Australia relative to those of the mining, manufacturing and services sectors and to the community as a whole (Productivity Commission, 2005)

### Why should we bother?

Agriculture has been the backbone of the Australian economy since early settlement. Whereas the nation 'rode on the sheep's back' until the mid to late 20<sup>th</sup> Century, its proportional dominance has receded as other sectors of the economy have grown. Nevertheless agriculture is a significant part of what we are as Australians.

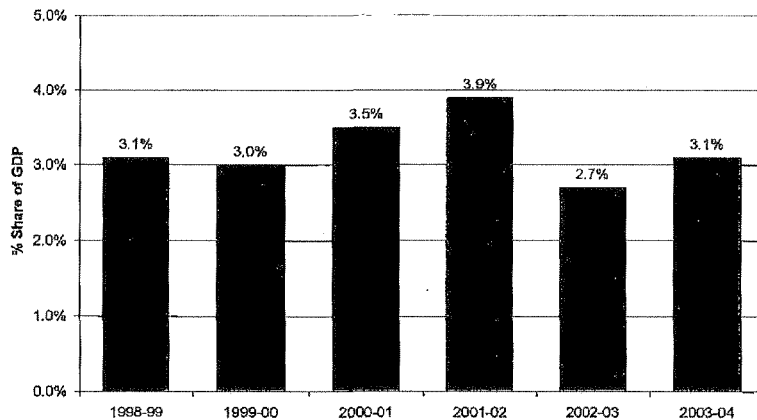


Figure 5: The share of national GDP, over time, by agricultural production (Australian Farm Institute 2005).

The contribution currently to gross domestic product (GDP) is camouflaged by the way it is publicly presented. Thus agriculture *per se* contributes about 3% of national GDP (Figure 5).

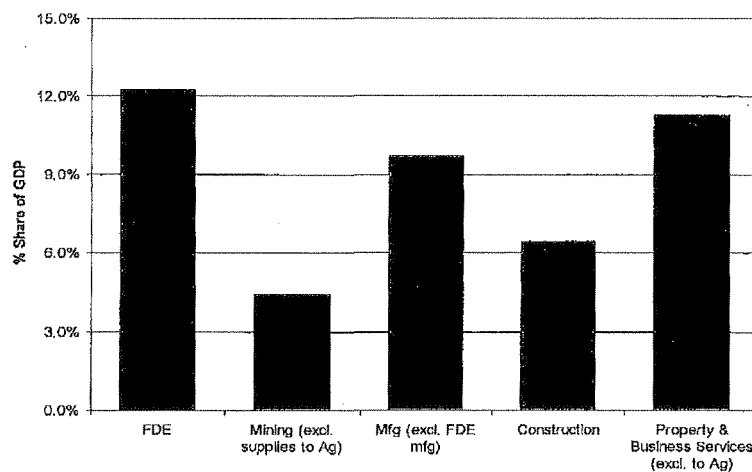


Figure 6: The share by the Farm Dependant Economy, over time, of national GDP (Australian Farm Institute 2005).

However this does not acknowledge the contribution of either the supply sector or the post farm gate component. These three components (*ie* farm supply, farm production and post farm gate) are described together as the farm dependant economy (FDE) and contribute annually about 12% of national GDP making it the largest sector of the economy (Figure 6). Australian Food Industry is worth about \$80 billion and is larger than, for example, the mining industry with a worth of about \$60 billion.

It is recognised that agriculture is not particularly strong as a political force in modern times, yet it remains, together with mining and innovation, as the nation's major avenue of wealth creation. In addition, farmers manage 60-70% of the surface area of the continent and more

than 70% of available water resources and so are the principal custodians of the Australian environment and its natural resources.

### Global needs

There are some 6.5 billion people in the world today. This is estimated to climb to 9.3 billion by 2050. There will therefore be an increase in demand for food, and particularly protein, as the affluence increases and tastes change. There is no significant increase in the availability of arable land and so there will need to be an increase in productivity of substantial proportions in a likely climate of water restrictions.

A further pressure is now emerging with the world's attention turning to renewable sources of energy. Most countries are converting, to a greater or lesser extent, to ethanol and biodiesel to deliver part of their energy needs. It is a sobering thought that Australia does not have enough arable land to satisfy its current fuel needs as biofuels, even if no food crops were grown. In the US for example, already there are concerns about impact on food supply as the total corn crop in some States has been redirected to the biofuels industry which is likely to consume up to 80% of the total US corn crop in the next few years. It is now clear that whilst arable land resources are static there will be competition for that land between the food industry and the biofuels industry. The demand for agricultural produce is likely to intensify.

It has been estimated that the intensification of agriculture and the associated increase in productivity has saved about one billion hectares of wildlife habitat across the world. The challenge is on to continue to make substantial productivity gains from agricultural lands to provide for the increased need for food, to deliver to the biofuels industry and, at the same time, protect existing wilderness areas.

Table 3. OECD: Producer Support Estimate by country (%PSE)

COUNTRY	%PSE	COUNTRY	%PSE
Australia	4	Mexico	19
Canada	25	New Zealand	2
Czech Republic	29	Norway	72
European Union	36	Poland	8
Hungary	28	Slovak Republic	25
Iceland	72	Switzerland	71
Japan	59	Turkey	29
Korea	61	United States	15
OECD	30		

Source: OECD, PSE/CSE database 2005. PSE – proportion of farmer's gross income from subsidies and support measures. For Australian farmers, about 50% of the value comes from the diesel fuel rebate.



### Australia's competitiveness in agriculture

Australia competes on the world market for many agricultural commodities and products. It has a reputation for delivering consistent quality of product and it is relatively free of pesticides *ie* 'clean and green'. The international market is distorted by government subsidies despite the best intentions of the Australian Government to 'level the playing field' and to enter into bilateral free trade agreements. Table 3 shows the OECD report on the level of subsidy across the globe, expressed as PSE (the proportion of a farmer's gross income coming from subsidies and support measures). It is very clear that Australian and New Zealand farmers are lightly supported by government relative to their international counterparts but continue to remain competitive. About 50 % of the support in Australia is the diesel fuel rebate.

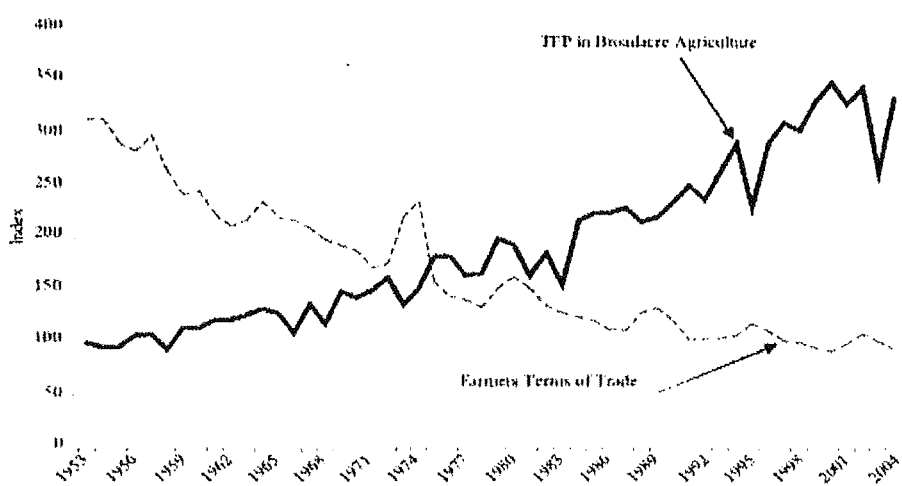


Figure 7: Total Factor Productivity in Australian agriculture and farmers' terms of trade 1953-2004 (Australian Farm Institute 2007).

It is also well promoted that farmers' terms of trade have been in continual decline for a long period of time. Costs have increased at a faster rate than the value of the product but farmers have counteracted that by productivity gains. Figure 7 shows that dramatic relationship (AFI, 2007). What is evident however is that the terms of trade have not deteriorated to any extent (*ie* <1% per annum) since about 1990 (Figure 7) and so declining terms of trade ceases to be a real issue generally for agricultural profitability. Farmers are thus benefiting from the productivity gains of the recent past.

A recent report of the Productivity Commission (2005) describes an expansion in production agriculture in absolute terms and there are good prospects for a sound rate of growth. The report indicates that one of the *key drivers for productivity growth will be appropriate tertiary training*.

Figure 8 shows how Australian farmers have managed to maintain their production in dollar terms by productivity growth and the contribution of research to that effort. Whilst there is an impact from R&D done overseas, the greatest impact comes from the R&D done in Australia. It

is clear from these data that without such research the Australian industry would be in significant decline. It is pertinent to note that the agricultural industry invests heavily in its own future through industry levies that are directed to research effort, albeit matched by the Federal Government. Studies have shown that research investment provides a positive return on that investment.

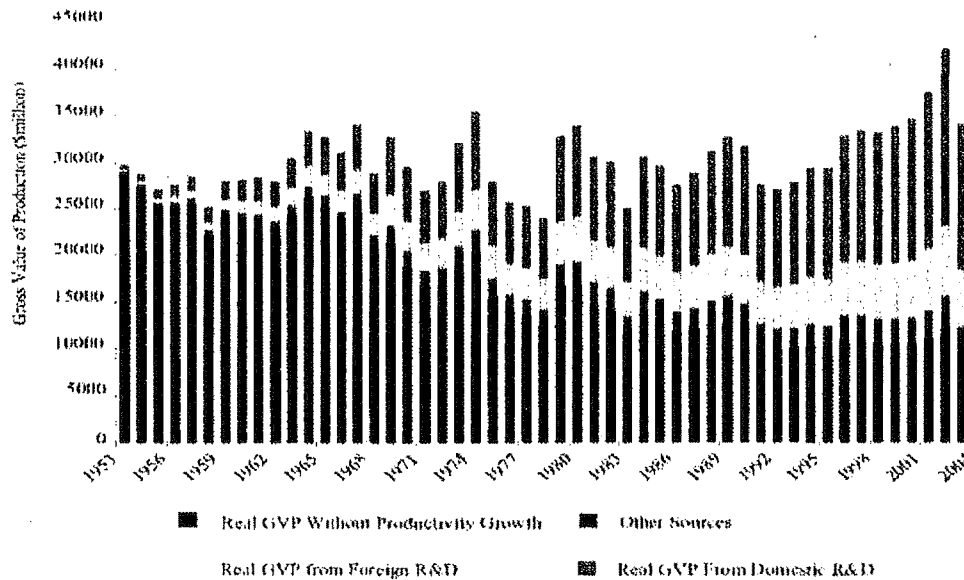


Figure 8: The value of productivity growth in the Australian agriculture sector, 1953-2004 and the role of research in its achievement (Australian Farm Institute 2007).

The Productivity Commission (2005) found that, over the last 30 years, productivity growth in agriculture outstripped growth in all other 'market' sectors of the economy, except for the communications sector. During the 1990s, productivity in agriculture outstripped that in all other sectors and its relative performance has improved since the mid 1980s. Such data are provided in Table 4 based on Australian Bureau of Statistics (ABS) sectoral data from the National Accounts.

In absolute terms real agricultural output has doubled in the last 40 years. Agricultural exports have tripled in value in real terms since the mid-1970s and comprise 20-22% of Australia's export earnings. Two-thirds of Australia's agricultural production is exported.

This analysis shows the healthy position of agriculture in the Australian economy, the substantial contribution it makes to GDP and export earnings and the very positive prospects for this industry into the future.

Table 4. Productivity growth in sectors of the Australian economy: 1975-99 (Australian Farm Institute 2007)

	1975-82 <sup>a</sup>	1994-99
<b>Agriculture</b>	1.6	4.3
Mining	-1.7	1.2
Manufacturing	2.1	1.3
Electricity, Gas & Water	2.0	1.8
Construction	1.4	0.4
Wholesale Trade	-0.7	3.2
Retail Trade	1.0	1.0
Accommodation, Cafes & Restaurants	-0.9	-0.3
Transport & Storage	2.2	1.9
Communication Services	6.5	3.7
Finance & Insurance	-2.0	0.8
Community & Recreational Services	-1.4	-3.3
<b>Market economy</b>	<b>1.1</b>	<b>1.8</b>
<i>Agriculture/Market Economy TFP</i>	<i>1.4</i>	<i>2.4</i>

### What can be done?

It is clear that the current minimalist approach to the promotion of agriculture is not a way forward. The approach of letting market forces determine the university student selection outcome is also not a useful mechanism. There needs to be a way for agriculture to penetrate the minds of prospective students and their families and create a positive reception to the notion that agriculture is a worthwhile career pursuit, that Australian agriculture is important to the nation, that it is a modern industry and is a world leader in quality assurance and environmental sustainability. What is clear is that all players in agriculture must play their part in this promotional revolution – farmer organisations, agribusiness, governments, R&D organisations, professional societies and academic institutions.

### Farmer renewal

There is no doubt that the industry needs ongoing renewal of its farmers. Not only is the age structure of concern, but never before has the industry needed such a highly trained, business-astute and technologically capable workforce as it does now. Farmer organisations therefore

need to be promoting this message. There are obvious conflicts of interest however as these organisations are also the conduit to governments in respect of exceptional circumstances funding for droughts, floods and plagues. It is a dilemma then as to how the one organisation promotes the industry in one breath and then “cries poor” in the next. Nevertheless, promotion of the importance of farming and how well farming is practised needs to be a responsibility of such organisations.

### **Agribusiness professionals**

The agribusiness sector is experiencing a severe shortfall in professionals. Currently companies and organisations pilfer staff from each other. When that fails, they employ staff who are inadequately qualified and experienced for the position. It follows that, in many cases, there is discontent with performance. Thus the agribusiness sector needs to become proactive in generating professionals for its businesses. Firstly, through their collective bodies, they could publicly promote careers in agribusiness via the media, careers days, schools and youth organisations. They could provide traineeships to potential or actual tertiary students to help them financially through their studies and provide them with work experience out of session. In this way the students, upon graduation, will already have knowledge of the company or organisation and require less orientation at employment. Further, they could sponsor their own staff, where there is a need to upgrade qualifications, through their studies. It seems evident that agribusiness will need to invest in encouraging potential professionals into the market in order to ensure a supply of quality staff for their respective organisations.

### **The public service**

Governments at all levels also require agricultural graduates, be it as weeds officers, research scientists, advisory officers, regulators or bureaucrats. Their needs will not be met by the current level of graduate supply, particularly given the likelihood of a high proportion of retirements in this sector in the short to mid-term. In the past, governments offered cadetships in the university system with an expectation of public service post-graduation. This program was reasonably successful and it is worthy of consideration for re-instituting.

Governments, if they are so minded, can also be influential in promoting opportunities, in image building, and in manipulating “markets” by altering the ground rules – for example, reducing HECS for agriculture students. Current contribution from agriculture students is \$7,260 annually (or \$21,780 for a 3 year degree, \$29,040 for a 4 year degree) whereas the national priorities courses only attract a \$4077 annual contribution (Table 5)

Of particular concern is the lack of science, including agriculture, in the primary schools curricula, the decline in the availability and qualifications of science teachers in high schools, the ‘dumbing down’ of the high school curricula, and the proliferation of ‘sexy science’ such as biotechnology and forensics at the expense of the enabling sciences. All these issues are within the scope of governments to address if they wished.

Table 5 The annual student contribution fee for fulltime study in the range of disciplines available at Australian universities (DEEWR, 2008)

STUDENT CONTRIBUTION BAND	ANNUAL STUDENT CONTRIBUTION FROM 2008
<b>BAND 3-</b> law, dentistry, medicine, veterinary science, accounting, administration, economics, commerce	\$8499
<b>BAND 2-</b> mathematics, statistics, computing, built environment, health, engineering, science, surveying, agriculture	\$7260
<b>BAND 1 –</b> humanities, behavioural science, social studies, foreign languages, visual and performing arts	\$ 5095
<b>National priorities –</b> education , nursing	\$4077

### Innovation workforce

Professional societies, research funders, universities and other research providers, including governments, have a vested interest in attracting the best minds into the agricultural profession. For a person to become a research scientist, there is the requirement of a 4 year undergraduate qualification plus usually a 4 year PhD, ie a total of 8 years. At the postgraduate level, students commonly have a scholarship. The Australian Research Council sets a stipend benchmark of around \$20K per year tax free but GRDC and some CRCs elevate the stipend to \$25K -\$28K with the intention of attracting better students. However there is a dearth of postgraduate students in all disciplines, including agriculture.

Figure 9 shows, relative to 1994 levels, the evolution of the Australian postgraduate award (AWA) stipend as it relates over time to equivalent taxable incomes, average weekly earnings (AWE) for males and the consumer price index (CPI). Several aspects become apparent. Until about 2001, there was a 1:1 relationship between stipend and equivalent taxable income but recent changes to the tax scales have reduced the value of the tax-free status.

The data show that stipends have not maintained parity with the CPI, were that to be used as the measure of relativity. Most starkly however is the discrepancy between stipend and average weekly earnings which has substantially diverged from scholarship relativity. The value of the scholarship would need to be around \$25,780 (or around \$30,000 taxable) to have parity with AWE.

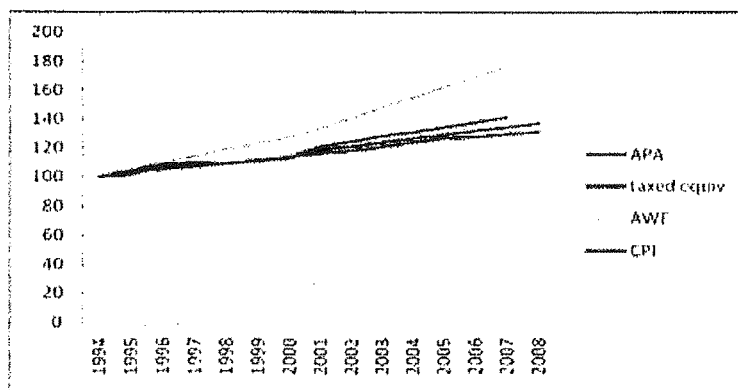


Figure 9 The relative increase in value of the Australian Postgraduate Award stipend in relation to the equivalent taxable income (Australian Taxation Office,2008), the average weekly earnings in February for males (ABS, 2008) and the consumer price index in February (ABS,2008), from a base of 100 in1994

Table 6 The relationship between taxable income, based on 2007-08 tax rates, and postgraduate stipends

TAXABLE INCOME	TAX PAYABLE	NETT INCOME	SCHOLARSHIP EQUIVALENCE
\$20,000	\$2,100	\$17,900	
\$22,000	\$2,400	\$19,600	APA scholarship
\$24,000	\$2,700	\$21,300	
\$26,000	\$3,000	\$23,000	
\$28,000	\$3,300	\$24,700	GRDC scholarship
\$30,000	\$3,600	\$26,400	
\$32,000	\$4,200	\$27,800	CRC scholarship
\$35,000	\$5,100	\$29,900	
\$40,000	\$6,600	\$33,400	
\$45,000	\$8,100	\$36,900	
\$50,000	\$9,600	\$40,400	

Table 6 shows the relativities between taxable income and the value of the tax-free scholarship in 2008. What is quickly apparent is the low level of real income provided to research students. It is worth noting that an Australian Postgraduate Award (APA) is considered prestigious and requires first class honours. Yet it is the equivalent of around 80% of the current Australian *minimum* wage of \$27K per year. The GRDC award is about the minimum wage level.

It comes as no surprise that the brighter, highly employable graduates are attracted to immediate employment in the workforce, particularly as the low level of unemployment provides attractive opportunities to new graduates. Clearly innovation and research capability are now not properly valued in Australia and paradigms need to be adjusted to working conditions in the 21<sup>st</sup> Century. The notion that there is eventual personal gain and hence stipends can be less than market value would seem outdated when the nation needs to invest in the best for the nation's benefit. The likelihood of short term contracts post higher degree is a more common scenario than in the past and the changes in superannuation conditions to those in employment is a further disincentive. All this is on top of a \$20,000 to \$30,000 HECS debt which increases during the period of the PhD.

The imbalance is further explained by the common scenario of a research student working alongside a recently graduated technical officer. The TO will be on a salary in excess of \$40K and will be accumulating superannuation whereas the research student will receive only their scholarship stipend which is not even incremented annually or on a performance basis.

This discrepancy has evolved through the stipends not keeping pace with the costs of living or the increase in salaries. The value of the stipend has also been compromised by the significant adjustments in taxation rates, such that tax-free status is of little consequence at this salary level, and the developments in superannuation over the last decade or so.

Such scholarships are usually accompanied by research funds of \$5K per annum for science-based programs. This value has not changed for more than a decade and makes very little contribution to real costs of the research and research student development. Such support needs to be adjusted.

The solution would appear to lie in raising the level of stipend to at least graduate employment salary levels, ie an increase of 70-120%, and perhaps abandoning the tax-free status. Research funds need also to be doubled at least, to provide reasonable assistance towards the costs of the research.

## Conclusions

The agricultural sector is facing a shortage of professional staff and this is likely to intensify. Universities are graduating fewer than half the number required because they have been unable to attract sufficient students. This unattractiveness of agriculture as a career is a result of a poor public image of agriculture despite the importance it plays locally and globally.

There needs to be a strong, focused effort by all agricultural employers to promote agriculture and agricultural careers. There needs to be penetration of the message into the community and particularly the households of potential tertiary students if demand for places is to increase. There is ample capacity in the universities in Australia for significant increases in intake. Financial incentives are needed to encourage students into agricultural careers.

The financial basis of post-graduate research studentships is in urgent need of reform in order to attract the best and brightest into the innovation system if agriculture is to maintain and strengthen its position and meet the challenges that lie ahead.

## Summary

- Employment opportunities in agriculture are substantial and the prospects are bright into the foreseeable future;
- The level of qualified people employed in the agricultural industry needs to be raised substantially to meet the challenges that lie ahead;
- The network of university providers in agriculture in both metropolitan and rural areas is more than adequate to meet the needs of the industry;
- There is cause for concern about the availability of scientists and other professionals to service the needs of agriculture in the short to medium term;
- At the present time there are in excess of an estimated 2000 jobs annually for new graduates but fewer than 800 new graduates in agricultural science and agricultural business in any year. The shortfall is partly met by the appointment of less qualified staff;
- Application and enrolment trends in universities are in decline across Australia, indicating that agriculture is not perceived as a desired career;
- The image of agriculture, compounded by the ignorance about the industry by the general public, needs to be made positive and exciting;
- It is the responsibility of all players in the industry to positively promote the industry and careers therein – government, education institutions, farmer organisations, professional societies and agribusiness.
- Postgraduate scholarships need to be made competitive with mainstream employment and research support funds need to be raised to realistic levels.

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