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VOL 18 NO 1 MARCH 2014 ISSN 1174-524X



Primary Industry Management



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Graduates in agriculture

Headlines such as ‘A dearth of agriculture graduates is threatening food sustainability’ in the United Kingdom, ‘Concerns over shortage of agriculture graduates’ and ‘Australia running out of food freshers’ from across the Tasman, along with ‘Agriculture begging for graduates’ from New Zealand have featured in the media in the last 12 months. They indicate a failure globally to explain to society the realities of what it takes to produce food sustainably. They also show that we have failed as an industry, despite all best endeavours, to encourage and enable the younger generations to move into the rewarding and challenging careers which are available in the primary sector. This article considers the change in students over the last few decades, why the world is in its current predicament, what other countries are doing about it, and how New Zealand can take action.



The past

A report in this journal in 1998 suggested that ‘until the late 1980s, agricultural graduates were 8 to 11 per cent of the total, and increased from 600 to 1,000 between 1975 and 1988.’ This data came from the New Zealand Vice-Chancellors’ Committee *University Graduate Destination* reports. From 1988 to the early 1990s there was a rapid slide in numbers and proportion, some of which might reflect a change in accounting by the committee. It reported in 1993 that the ‘number of New Zealand agriculture and horticulture graduates surveyed was 226’. This was 1.4 per cent of the graduate numbers of 16,002 and consisted of agricultural commerce, agricultural science, horticultural commerce, horticultural science, horticultural production and technology, with farm management and valuation. No distinction was made between university levels of qualification.

By 2000 agriculture had been moved to the biological sciences in terms of classification and 100 students graduated, with 171 in resource and environmental studies. In commerce and business there were 67 students who graduated in management or land-based production, and 123 in property and valuation. This suggests production-based degrees were still 1.3 per cent of the 22,735 graduates with no distinction on level of qualification.

The current state in New Zealand

Current Ministry of Education tables reveal that graduate numbers have fluctuated over the last few years, as shown in the table on the next page, and were at their lowest in 2008 when only 50 agricultural science and 40 agribusiness students graduated. This was fewer than the agriculture and horticulture graduates from Massey University alone in 1981 – 125, with a similar number from Lincoln University.

Comparisons with earlier years are fraught with challenges in terms of which qualifications were lumped together. However, of the 25,380 domestic graduates in bachelors degrees in 2012, which is the latest data from Ministry of Education, 100 had completed their studies in agriculture, 30 in horticulture, 80 in farm management and agribusiness, and 170 in environment.

Ministry of Education completion data, also in the table, shows that in undergraduate and postgraduate qualifications over the last few years the production science degrees have not competed well with the environmental qualification. Doctoral qualification data is not presented as many agricultural PhDs complete under the grouping of natural and applied sciences.

The Ministry of Education reports that all agriculture and horticulture

Ministry of Education data for domestic completions

Bachelor degrees	2006	2007	2008	2009	2010	2011	2012
Agriculture	110	80	50	70	100	80	100
Horticulture	30	30	20	40	30	20	30
Farm management and agribusiness	100	100	40	90	70	90	80
Environmental science	90	60	80	120	70	170	170
Graduate cohort	21300	19010	20840	21130	20560	23150	25380

Honours, postgraduate certificate and postgraduate diplomas	2006	2007	2008	2009	2010	2011	2012
Agriculture	20	20	10	20	20	20	20
Horticulture	n	n	0	n	10	n	10
Farm management and agribusiness	30	20	30	10	10	10	10
Environmental science	90	90	90	110	120	190	140
Graduate cohort	7620	7040	7660	8160	8500	8910	8960

Masters degrees	2006	2007	2008	2009	2010	2011	2012
Agriculture	10	10	n	10	10	10	10
Horticulture	0	n	n	0	0	n	0
Farm management and agribusiness	10	10	10	n	n	10	n
Environmental science	50	50	50	50	40	50	40
Graduate cohort	3530	2670	3250	3100	3220	3470	3370

bachelor degree graduates in 2012 were aged between 20 and 24, indicating that most students went to university straight from school or after a year. Most have had some employment experience and many try to work part-time when at university. The latter can have an unfortunate effect on attendance.

While part-time work is regarded as a necessity to offset fees and living expenses, in agriculture a considerable number of students have significant scholarships and because of online teaching and study guides, books are rarely bought. No comment about cars, mobile communication devices, take-away food and holidays. The young are living the lifestyle their parents can afford, supported in too many cases by a student loan.

The school foundation

Top students are as good as they have ever been. There are excellent graduates of both genders who are making a contribution to the agricultural sector, helping it to drive the economy. However, as the proportion of the school completion students coming into tertiary training is now much higher than it was during the 1970s and 1980s, there has been a change in the breadth of ability appearing. Of further note is that New Zealand has a very high rate of involvement in tertiary education. A total of 52 per cent of school leavers complete an undergraduate degree in New Zealand – the OECD average is 40 per cent. A further 29 per cent of school leavers complete a sub-degree programme – the OECD average is 11 per cent.

It is a result of a deliberate government policy of educational inclusion that more people are encouraged to go to university.

The younger generations also tend to have greater self-belief than previously. They have been given high grades – in the United States 43 per cent of grades given are As – and rewarded for participation rather than effort or achievement. They have also been encouraged to evaluate and challenge other people's ideas and decisions. Peter Sheahan, author of *Generation Y: Thriving and Surviving with Generation Y at Work* and a Y-generation member himself, says that Y-generation members 'are inclined to argue if they don't like what is being said or done, whether or not they have taken the time to inform their opinion.'

The result has been the development of an education system with more focus on 'teaching to the exam', mastery tests where students can have repeated attempts at passing, as well as multi-choice and internal assessment so that teachers can justify the assessment. In New Zealand, research by Professor Luanna Meyer of Victoria University has shown that this style of education has suppressed motivation. There is also research which suggests that creativity has been suppressed in this generation because of constant supervision, toys that switch on, and the use of templates in assessments.

Below expected levels

The National Education Monitoring Reports state that students are interested in science and see it as having value for the future when in years four and eight. However the results

of the National Monitoring Study of Student Achievement released at the end of November 2013 indicated that 80 per cent of final year primary and intermediate school students are performing at below the expected level in science.

The Programme for International Student Assessment education achievement results released in early December by the OECD reported that New Zealand's 15-year-old students had slipped from seventh to thirteenth in reading, seventh to eighteenth in science, and from thirteenth to twenty-third in maths. Education academics have warned that the data should be treated with caution, as it is hard to compare different education systems accurately with different languages in different parts of the world. They suggest that it would be more useful to look at how current New Zealand students compared to previous New Zealand students. 'Not well, but otherwise' might be the answer from those of us who have been in tertiary education in the numeracy, literacy and science disciplines for some time.

Dramatic changes

Part of the problem with the perceived quality of graduates is the amount of bridging teaching, whether it is or is not acknowledged as such, which is required because learning at school has changed so dramatically. Subject liberalisation was an attempt to make education more relevant for a greater proportion of the population, and choice increased. New subjects such as recreational studies, media studies, photography and drama, all for academic credits rather than after-school activities, were part of reforms designed to enable every child to complete a qualification with a sense of achievement.

At the same time, the need for a scientifically literate society able to understand the benefits and risks of new developments was recognised and the approach to teaching traditional subjects was changed. This meant a move away from a system where knowledge and abstract facts were considered to be important and exams were final, to what is termed a child-centred approach with greater emphasis on course work, open-ended tasks, context-dependent knowledge, analytical skills and verbal reasoning. The unintended consequence is that children have tended to opt for subjects which they perceive to be enjoyable and where acceptable achievement can be obtained for minimum effort.

Research from the Centre for Evaluation and Monitoring at Durham University has shown it is more difficult to obtain a high grade for subjects where memory and accuracy are required such as physics, chemistry, biology, maths, French and German than in what are termed the creative subjects such as drama, design, photography and media studies. The Australian headline in mid-December 'Maths and science lecturers struggle with ill-prepared university students' provides further evidence for a global problem. The Chair of the National Committee for Mathematical Science has said that students have great difficulty completing first-year university subjects because they had been given 'very dangerous advice' at school to choose subjects they thought would boost their Australian tertiary admissions rank.

Keep a broad mix of subjects

The result for agriculture at universities is that students do not have the expected science background. The fact that numbers are lower than might be expected is because the lack of required science background means they have enrolled in a different degree. Germane to the current predicament in agriculture is the advice to just follow your passion. Research in the United States by Cal Newport, author of *So Good They Can't Ignore You: Why Skills Trump Passion in the Quest for Work you Love*, has shown that famous people who have given this advice publicly actually did not have passion until they had worked at it for some time. At 15 years old it is unlikely that a lifetime's passion will be identified, and keeping a broad mix of subjects actually limits future options, whereas doing what are termed the hard subjects allows diversity later in life.

Science, technology, engineering and maths subjects have declined in popularity in formal education globally. This is despite the fact that knowledge from these subjects is vital in meeting the challenges in –

- Food and the environment
- Economic development, which is linked to tertiary education in science and technology
- The ability to create wealth from innovation, linked to scientists and engineers in the workforce.

Analysis for the United Kingdom Parliament published by Westgate in 2007 has suggested that factors behind the decrease in science, technology, engineering and maths students include –

- Shortage of specialised teachers in these subjects
- Poor image of science and scientists
- Perception of science as a hard subject
- Lack of knowledge about careers in science, technology, engineering and maths.

All of these factors are true, but research for the Ministry of Research, Science and Technology published in 2006 showed that schoolchildren still take the sciences if they want to be doctors or veterinarians. Research from the United Kingdom reports that young people take subjects which are useful, enjoyable, that they can comprehend and that complement each other and do not take those that are difficult or boring. In New Zealand, studies of the effect of the NCEA led by Professor Luanna Meyer report that students mainly choose subjects because they are of interest to them and because they are related to a future job or career goal.

Workforce planning

Workforce planning is necessary for ensuring that the right career aims are in place in the young so that they have the right knowledge, skills and attributes available when needed. It is notoriously hard to achieve. Isaac Asimov's novella *Profession* focused on identifying by brain analysis exactly what profession would be best for a person – no choice was allowed. Children were taught to read at the age of eight and then educated at the age of 18 by an almost instant process known as 'taping'. The top educated people competed in

professional Olympics in the hope of being bought by an advanced outworld. Market forces were at work.

These forces also operate in New Zealand, but are not being picked up by schools. The Ministry of Business Innovation and Employment has produced *Occupation Outlook* in an attempt to help career advisors. It gives many different types of occupations, the demands, the fees associated and remuneration. For farm management, the *Outlook* states that income is average, fees are low because it is not necessary to have a degree, although increasingly qualifications are important, and job prospects are good for new entrants who like an outdoor lifestyle and rural location.

A Federated Farmers survey reveals that total value packages on the farm are better on average than in the city, as shown in the table.

Remuneration on the farm 2013

Position	Mean in dollars	Change from 2012 per cent
Dairy assistant	38,803	+3.5
Dairy assistant herd manager	46,256	+2.0
Dairy herd manager	56,061	+7.0
Dairy farm manager	70,336	+6.5
Dairy operations manager	69,323	-2.7
Sheep and beef general hand	41,981	+2.1
Sheep and beef shepherd	46,902	+4.3
Sheep and beef head shepherd	55,256	+11.7
Sheep and beef stock manager	55,770	0.0
Sheep and beef farm manager	66,740	6.6
Grains arable tractor/machinery driver	47,652	0.0
Grains arable senior tractor/machinery driver	55,818	+6.9
Grains arable farm manager	66,359	+11.0

Remuneration in agribusiness – industry response

Position	Salary dollars	Benefits
Field representative seeds	44,000	Car, computer, telephone, clothing
Field officer fertiliser	48,000	Car, computer, telephone, clothing
Bank intern	50,000	
Rural portfolio manager	50,000	Car, computer, telephone, clothing
Farm technician	48,000	Accommodation
Farm business technician	55,000	

For rural professionals in agribusiness the starting salaries are rather higher than those for the average graduate. The problem for agriculture in the Ministry of Education data is that it is in the same category as environmental science.

Median and quartile annual earnings of young domestic bachelor graduates

Field of study	One year after study	Two years after study	Five years after study
Agriculture, environment and related studies	\$48,063	\$53,197	\$61,559
	\$38,613	\$44,728	\$49,157
	\$28,146	\$33,036	\$37,224
Education	\$46,749	\$48,205	\$56,280
	\$44,590	\$45,815	\$49,804
	\$38,885	\$41,011	\$36,155
Engineering and related technologies	\$49,830	\$53,878	\$69,975
	\$43,124	\$46,287	\$58,287
	\$33,273	\$37,422	\$46,716
Management and commerce	\$45,690	\$51,320	\$68,014
	\$39,838	\$44,741	\$53,791
	\$31,061	\$36,891	\$41,373
Natural and physical sciences	\$44,662	\$51,320	\$59,961
	\$36,874	\$43,074	\$48,974
	\$26,153	\$32,349	\$36,212
Total students	\$46,642	\$51,244	\$63,366
	\$39,701	\$44,474	\$50,938
	\$28,543	\$34,311	\$37,576

Salaries are exceedingly important for the younger generations, ranking number one in surveys by Robert Half International as shown in the next table. More promotion of the higher salaries, as well as the benefits and opportunities for career development which are available in agriculture, will help in improving the calibre of recruits in the future. Other important aspects in recruitment are the brand as the younger generations want to be regarded highly.

Consideration before joining the workplace Robert Half International 2008 and 2012

Consideration	Score in 2008 out of 10	Score in 2012 out of 10
Salary	9.1	9.0
Benefits	8.9	8.9
Company stability	N/A	8.9
Career growth	8.7	8.6
Location	8.4	8.4
Leadership	8.0	8.0
Brand	7.6	7.8
In-house training	N/A	7.2
Job title	7.2	6.7

Graduate destinations

In 1993 the New Zealand Vice-Chancellors' Committee reported that job titles for agriculture and horticulture graduates, for both undergraduate and postgraduate, were – agricultural and horticultural scientist, agronomist, agricultural or horticultural manager/worker, life scientist or technician, management trainee, insurance/real estate representative, farm/horticultural consultant. Employers were – government departments, research institutes, universities, private or self-employment, trading banks, producer boards, mercantile firms/seed companies, and farmers, orchardists and market gardeners. Animal nutritionist and landscape architect appeared in the next two years.

In 1997 the agricultural graduate data was incorporated into the biological science data. This meant that it was no longer possible to see where graduates from specific degrees were being employed. In 2008 DairyNZ analysed where its scholarship holders were working, as shown in the next table, and reported that the bulk were in agriculture but not all were in dairying.

Employment destinations for DairyNZ scholarship graduates 2008

Employment	Percentage
Accounting	1
Dairy farming	22
DairyNZ	5
Environmental science	3
Farming including overseas	5
Fonterra	8
Job seeking	6
Other industries	3
Overseas	9
Postgraduate studies	6
Rural banking	9
Rural professional consulting	23

The employability of graduates in agriculture is high. Professor Quintin McKellar, Vice Chancellor of the University of Hertfordshire, estimates that British agriculture needs 60,000 more workers for optimal productivity, and that to be internationally competitive the sector will require graduates with advanced problem-solving skills. There are currently 7,000 agriculture students graduating from universities and colleges in the United Kingdom each year, which is insufficient to replace the approximately 10,000 leaving the industry by retirement. Increasing the workforce is out of the question without recruitment from overseas. Similarly, Australia is graduating approximately 700 young agriculturalists a year and analysis of job advertisements indicates a demand for 4,500 agricultural graduates annually.

Actions taken

The United Kingdom has taken action. In something of a volte face the British Government stated in September 2012 that, 'We do not currently have the basic science base to deliver more sustainable food production practices.' Only 19 months earlier it had accepted a report from the Food Research Partnership Skills sub-group which said that 'the supply of high level skills to provide the research to support effective, joined-up policies; to develop and disseminate new knowledge and technologies; and to exploit the opportunities for innovation' was sufficient.

The problem is that the people reviewing the problems failed to predict demands for sustainable food production, and did not foresee the challenges of food production in climate unpredictability or anticipate the effect of pests and diseases. The British Government then announced an expansion of its agri-apprentice scheme to £1.4 billion, and another £12 million was provided for postgraduate education in sustainable efficient food production, advancement of the United Kingdom agri-food industry, food quality and health, and livestock health in production.

In addition, in September 2012, the UK Education Secretary stated that school league tables would be scrapped and a focus on traditional subjects would be instigated to stop schools promoting soft subjects. Internal assessment would go and subjects would be wholly end-of-course exams. New courses in English, maths and science split into biology, physics and chemistry, foreign languages, history and geography would be introduced. A new suite of qualifications would also be created for other subjects such as art, religious studies, design and technology. The changes were welcomed by business leaders condoning rigorous assessment in the school system as part of raising achievement.

In contrast, New Zealand has recently brought in school ranking. The Australian Council of Deans of Agriculture was formed in 2007 because of concerns about market failure in agriculture – declining roles and increasing jobs. However, the Council has yet to gain significant traction with government support that has any effect, for example decreasing fees and increasing government-funded scholarships.

In New Zealand, significant programmes to raise awareness have been in place for some time. Outstanding in the Field, Windows on Dairying, Go-Dairying, Agri-kids, Agri-teens, media support through Young Country, special editions in newspapers, and now the Pathway in Agriculture, are all good initiatives but are taking some time to have effect. Part of the problem is the over-arching dirty dairying and redneck perception of farming, which is untrue but permeates societal reaction as well as agribusiness as a whole.

The future

The agricultural value chain from plant-to-palate, farm-to-fork or block-to-bowl needs greater understanding by society so that the productive end of the food chain is regarded favourably. It also needs a revolution to feed a growing population sustainably. Professor McKellar has

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