AGFORCE

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Student Survey Report

Career motivations and attitudes towards agriculture of first-year science students at The University of Queensland

Dr Dale Miller, Karli Kollegger, Allan Lisle, Jackie Mergard & Erin Pearl, Faculty of Science, The University of Queensland and Wendy Allen & Colleen Kleinschmidt, AgForce Queensland.

Career motivations and attitudes towards agriculture of first-year science students at The University of Queensland

Dr Dale Miller[1,2], Wendy Allen[1], Colleen Kleinschmidt[1],

Karli Kollegger[3], Allan Lisle[2], Jackie Mergard[3] and Erin Pearl[4]

[1] - AgForce Queensland

[2] - School of Agriculture and Food Sciences, The University of Queensland

[3] - Engagement Unit, Faculty of Science, The University of Queensland

[4] - Office of the Director, Gatton Campus, The University of Queensland

Executive Summary

The recent steady decline in graduate completions and the number of students applying for agricultural programs in Australia represents a structural limitation to the capacity of Australian agriculture to find continued productivity increases.

In March 2011, a survey of students enrolling at The University of Queensland (UQ) in science courses, either focussed or not focussed on agriculture, was undertaken to better understand career motivations of students, and their attitudes towards agricultural careers. This survey was a collaborative endeavour between AgForce Queensland and UQ.

Of the 486 students who completed surveys, 70% were female, 53% identified themselves as school leavers, 76% had lived in Queensland for the majority of their lives, and close to 80% were from urban backgrounds.

There were 74 respondents doing an agriculturally-related program of study, with a greater proportion of males (41 vs. 27%) and students from rural backgrounds (49 vs. 15%) but fewer School Leavers (41 vs. 57%) than non-agriculture programs.

The most influential group affecting student career decisions were parents (54% of respondents), followed by workers in the field (36%). Students accessed a range of career information sources, and while 84% were satisfied with the available information, they did not express clear or comprehensive knowledge of what those careers entailed.

The cross-over between thinking about and making career decisions occurred in early secondary school, but considerable variation in timing existed in the cohort.

The top five factors influencing career choices were having interesting or challenging work, having a secure future, help/working with animals, good lifestyle and working on important issues. Of these working with animals, protecting the environment and working on important issues were also seen as being descriptive of agriculture, with students holding a 'traditional' field-work view of agriculture.

When asked what would motivate more young people to take up an agricultural career the most common answer was promoting general awareness of agriculture (30%). Highlighting diversity of opportunities, earning potential and the importance of agriculture to society, while students were at school, were identified.

The survey findings indicated that in relation to agricultural careers promotion:

- focus on the vital contribution agriculture makes to society, the strong employment prospects and the diversity of jobs and conditions
- engage from early secondary school
- existing workers are influential
- the internet is a key medium for communicating about careers
- university agriculture studies are satisfying and fulfilling for students
- broad collaborative approaches are needed for recruitment programs and societal engagement to be effective.

Introduction

A structural limitation of the capacity of Australian agriculture to find continued productivity increases is a shortage of younger people taking up a career in agriculture.

Over recent years there has been a steady decline in the number of graduate completions in agriculture for universities in Australia and in the number of students applying for places within agriculturally-specified courses.[1] [2]

There are a number of reasons why agricultural enrolments have declined, including:

- Declining population growth in rural and regional areas
- labour competition, particularly with the mineral resource sector
- negative perceptions about the benefits of working within agriculture.

Reductions in public investment in agricultural R&D[3] likely also contributed.

A survey of students at The University of Queensland (UQ), enrolling in science courses either focussed or not focussed on agriculture, was undertaken in March 2011 to better understand their career motivations and attitudes towards agricultural careers.

The survey was aimed at informing engagement and recruitment programs in Queensland and more broadly about how to encourage more young people to consider agriculture as a career option.

Methods

The survey was undertaken with UQ Human Research Ethics approval.

Cohort

The survey was of newly enrolled first year students studying science-based programs at both the University of Queensland's city and rural campuses. The students were enrolled in introductory Knowledge Management or Theory and Practice in Science courses. These courses have a broad enrolment and included agriculturally- and non-agriculturally focussed students, in order to gather information on both positive and negative perceptions around agriculture and related careers.

Survey design and data collection

Design of the survey was informed by the results of a published study with similar desired outcomes[4], and was tested with 32 other students at UQ prior to being provided to the target cohort.

The survey was delivered via a commercial web-based survey program (Survey Monkey[5]) and included 28 questions in total of which 21 are reported (Table 1).

Questions were of both 'tick the box' and short typed-answer (open ended) formats and collected demographic data (7 questions) and information on interests

[1] Pratley and Copeland, 2008
[2] ACDA, 2009
[3] Mullen, 2010

[4] Cecchettini et al., 1992
[5] http:///www.surveymonkey.com; accessed 30 June 2011

and career choices (10 questions) and also perceptions of agriculture (4 questions).

Scaled questions were allocated a numerical value for ranking the relative importance of provided terms ('Not at all' = 1, 'Somewhat' = 2, 'Moderately' = 3, 'Very' = 4). Participants were given the opportunity to make further comments.

In the survey agriculture was defined as *'the production, processing, and distribution of food and fibre products'*.

Course co-ordinators made time available in their courses for students to do the survey (about 10 to 15 minutes) or provided Survey Monkey details to enable later completion of the survey, or both.

Each participant received an information page, which was also read out, detailing:

- the purpose of the survey
- the organisations involved
- that participation was voluntary
- that answers were confidential
- that no personal information would be released publically
- the contact numbers of the project leader and UQ Human Ethics Officer.

Surveys were completed between the 8th and the 28th of March 2011.

Data analysis

Respondents were grouped into demographically discrete groups (e.g. male or female) on the basis of self-identification in the survey. Data to open-ended questions was examined and grouped into relevant themes where the meaning was consistent. Responses not included in a theme were classified into an 'Other' category.

Respondents were classified as 'agriculturally-related' on the basis of self-identification in Bachelor, Bachelor of Applied Science and Associate Degree programs in:

- Animal Production or Animal Science
- Animal Welfare and Inspection
- Production Animal Science
- Plants or Plant Studies
- Animal and Plant Biosecurity
- Rural Management
- Regional/Rural Business Management
- Agribusiness.

Dual degrees including one or more of these programs were classified as being agriculturally-related.

All collected data was statistically analysed[6] and comparisons performed using the Fisher's Exact Test, which is more effective with lower frequency data, or Chi Square Tests where data numbers were large. A comparison was considered different at a 5% level of significance and trends discussed where 10% or less.

"From my experience in talking to my peers about my interest in agriculture, I usually find that their lack of interest is not because they actually dislike the industry/opportunities, rather they are simply misinformed... agriculture is not an appealing industry to the general public, but the agriculture that they judge is not the agriculture of today!!"

[6] Release 8.02, 1999 - SAS Institute Inc., Cary, N.C., USA

Table 1. Survey questions.

	Question	Type of Answer
1	What Program are you enrolled in?	Open ended
2	What mode of Program are you enrolled in?	Single selection (Internal, external, mixed)
3	What is your gender?	Single selection (Female, male)
4	How would you describe your age status?	Single selection (School leaver, After a Gap Year, 2 or more years since school, mature age {>25 years old}).
5	Where have you lived for the majority of your life? (i.e. location of longest residency)	Open ended (3 sections: Town/suburb, Postcode, Country)
6	How would your home environment at that location be best described?	Single selection (City, Town, Farm or rural property)
7	What High School or College did you attend before enrolling at the University?	Open ended
8	What is your major area of interest?	Open ended
9	What job or career are you preparing for?	Open ended
10	What is it that interests you about this area or career?	Open ended
11	Who out of the following influenced you to seek a career in this area?	Multiple choice (9 specified options)
12	What did they say or do that helped you decide to seek a career in this area?	Open ended
13	Did you then seek additional information about working in this area?	Yes/No option. If yes, from where? (open ended)
14	Were you satisfied with the information that was available about working in this area?	Yes/No option. If no, how could it be improved? (open ended)
15	When did you start thinking about what career or job you would like to have?	Single selection (Don't know, early childhood, during primary school, early in secondary school, later in secondary school, since leaving school).
16	When did you make the decision about what career or job you would like to have?	Single selection (haven't decided yet, early childhood, during primary school, early in secondary school, later in secondary school, since leaving school).
17	How important are the following factors in your choice of a career?	Single selection ranking (not at all, somewhat, moderately, very) over 17 characteristics plus open ended 'other' option.
18	How well does each of the following characteristics describe a career in agriculture?	Single selection ranking (not at all, somewhat, moderately, very) over 16 descriptors plus an open ended 'other' option.
19	If you are not studying in a Program focussing on agriculture, why didn't you choose agriculture as a field of study?	Open ended
20	What do you think would motivate more young people to take up a career in agriculture?	Open ended
28	Do you have any other comments about this survey or the subjects covered in it?	Open ended

Results

General cohort information

Of the 486 students who completed surveys, 76% were studying Knowledge Management, which had a 67% response rate, compared to a 25% response rate for the Theory & Practice in Science students. This discrepancy in response is likely due to the course co-ordinator of Knowledge Management providing time in class for the survey and a greater representation of agriculture students in that group.

Of the total cohort:

- 70% were female
- 91% were studying internally
- 5% were studying externally
- 35% were enrolled in Bachelor of Applied Science programs
- 34% in Bachelor level programs
- 11% in Associate Degree programs
- 22 were doing dual degree programs.

A significant number of respondents (n = 99) did not specify a program. This may have eventuated because the survey was run prior to the final census date allowing program changes to be made, or because final program selection does not have to be made until the second year of studies.

Age and geographical groupings

Over half (53%) of respondents identified themselves as school leavers, 18% as returning to study after a gap year, 18% as being 2 or more years past completing high school and 11% as being older than 25. Approximately equal numbers of respondents had previously attended a college or a state school.

Over 75% of students had lived in Queensland for the majority of their lives with only 13 and 11% from interstate or overseas respectively. Their home environment at that location was described as being a town for 42% of respondents, a city for 37% and a farm or rural property for 22%.

There was a lower proportion of School Leavers that were from farms (16%) compared to Gap Year (32%) and Mature Age students (28%), consistent with a link between home environment and age of respondents (Table 2). There were a declining proportion of students studying internally as period since high school studies increased - (97% of School Leavers declining to 84% of 2 Plus Years and 72% of Mature Age students).

The lower proportion of school leavers from farms may reflect the need for students to demonstrate independence from parents by working for a year before obtaining full Government education funding support[7].

Demographics of agriculture students

Of respondents indicating a program of study, 19% were doing agriculturally-related programs (AG, n = 74). There was no difference between AG and Non-AG students in mode of study, but there was a greater proportion of males studying AG (41%) than Non-AG (27%) programs.

There tended to be a lower proportion of School Leavers studying AG than Non-AG Programs (40.5 vs. 56.9% respectively). As there were a greater proportion of AG students coming from a farm or rural property background (49%) than Non-AG students (15%), this is consistent with the finding of a lesser proportion of School Leavers coming from farms.

There was no difference between AG and Non-AG students on the basis of previous school type (state or college) or geographical source location (Queensland, interstate or overseas).

[7] Godden, 2007

Table 2. Previous home environment was related to the age at enrolment of first year science students (P = 0.04)

Home environment	School Leaver	Gap Year	2 + years since school	Mature age
City	56.5	15.8	16.4	11.3
Town	56.3	15.6	19.1	9.1
Farm	38.5	26.9	20.2	14.4

Areas of interest and careers

The greatest areas of interest to students were animal-related:

- wildlife (conservation, care, research & handling) = 25% of students
- veterinary (animal health, care & study of disease) = 17%
- companion animals (domestic & including equine) = 16%
- generalised interest in animals (includes zoology) = 12%
- production animals = 12%.

Plants were of interest to 28 respondents (7th most common area of interest) and farming was specified by 11 respondents (15th most common area of interest). These rankings are reflective of the cohort surveyed and national trends[8].

A greater proportion of students with a farming background had an interest in farming (6% compared to less than 2% for students from urban locations), production animals (30% vs. 6 to 8%) and plants (13 vs. 4 to 5% respectively). These differences were also expressed in careers of interest including farming, animal research, agribusiness, and agricultural consultancy.

These results suggest prior experience of agriculture increases student's interest in agriculture-related areas. Of the agriculturally-relevant careers being prepared for, 11 respondents indicated agronomy, 6 for animal research, 43 for farming/farm management, and 15 for agricultural-related consultancy work.

About 78% of respondents indicated only 1 jobs area they were preparing for, with 11 and 1% indicating 2 or 3 jobs areas that were of interest respectively. A large number of respondents (n = 42) were not sure of their career interests. In general, career expectations of first year students were not very clearly defined, consisting mainly of generic job titles. This suggests a need to provide more information to students as to what experiences and skills are involved in all kinds of different jobs, not just within agriculture.

Agents of influence in career choice

Of respondents, 60% indicated that just one or 2 groups of individuals influenced them in their choice of career. The most influential group were parents, with 54% of students recording their influence. Importantly, the next most influential group were workers in the field (36%), followed by friends (34%) and then other family (23% of respondents). Career

[8] Hynd and Hazel, 2010

advisors, university & industry representatives each influenced around 7% of respondents. There were no differences between AG and Non-AG students in the agents of influence listed. Further, 10% of respondents indicated they were not influenced in their choice. Influencers encouraged students to follow their interests, skills or passion (30%), provided information on jobs or courses (25%) or experience in the area of interest (17%), or passed on their passion (11%). A greater proportion of AG (31%) and farm-based (28%) students were provided work experience by their influencers than non-AG (13%) or urban (14%) students.

Previous home environment was also related to the frequency of reported influence on career selection with a greater frequency of students from farms compared to students with a town or city background being influenced by their parents (66.3 vs. 53.2 and 48.5% respectively) or workers in the field (46.5 vs. 30.1 and 36.0 respectively).

Career information available

Only 1/3 of respondents found the careers information they received from the influencing groups to be sufficient, with no difference between AG and Non-AG students. Of those that sought more information the key sources they specified are reported in Figure 1. This figure shows that while the internet and workers in the field are important students access a wide range of other sources of information.

More females (71%) than males (60%) sought additional career information and there was an increasing proportion of older students that sought additional information (2 + Years since school, 80%; mature age students, 71%; School leavers, 65%; and Gap Year students, 62%).

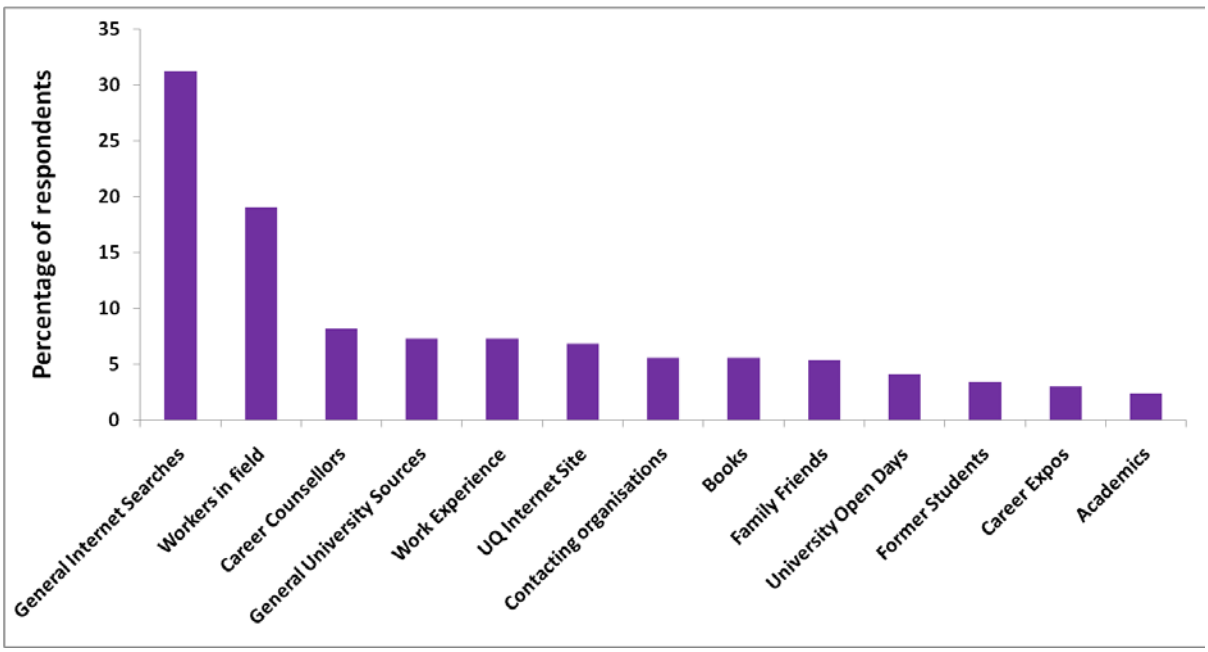

Figure 1. Key sources of additional information about careers for surveyed students.

Around 84% of respondents (379 of 453) were satisfied with the available information on their career of interest. A lesser proportion of AG students were satisfied compared to Non-AG students (75 vs. 85% respectively). This suggests that the majority of student's information needs were being met, but given the generic job descriptions provided by these students; this may not represent a comprehensive base of knowledge on actual career experiences.

Respondents that were dissatisfied indicated a need for more detailed information about careers:

- what jobs actually entail and working conditions, etc (job descriptions)
- identification of professions currently short of people
- training pathways (e.g. courses) required to get into various jobs and the expectations at each phase
- career pathways once in a profession.

''It would be good if there was a website that was dedicated to really getting into the fine details of things you have to do in job roles"..." "The university website...it would be helpful if there were links to explain exactly what each of those careers are and to provide other information such as usual working hours, wage, skills required etc."

Timeline of career decisions

Figure 2 shows when respondents (n = 469) started thinking about careers or jobs and when they actually made the decisions about what job or career they would like. Females tended to start thinking about careers at an earlier age than males, e.g. in early childhood (26 vs. 15%), but there were no differences in making a career decision.

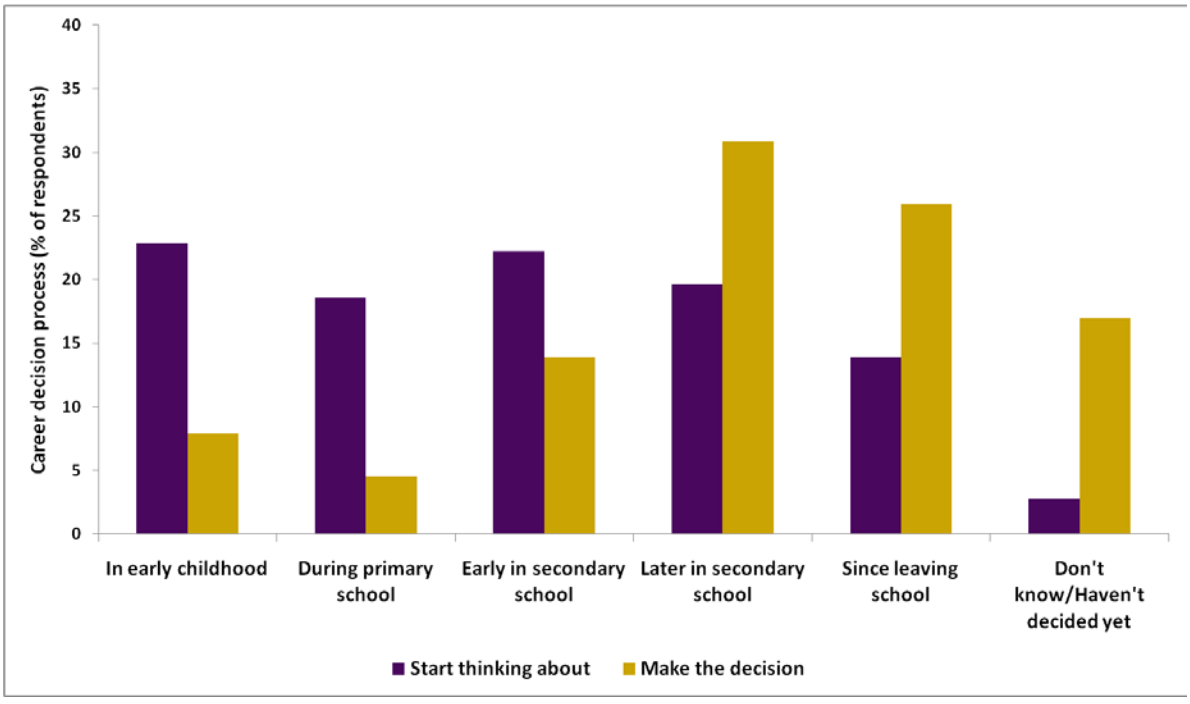

Figure 2. Timeline of career decision making for first year science students at the University of Queensland in 2011.

Over 55% of Mature Age students reported not thinking about career decisions until after secondary school and 67% reported making their career decision after leaving school, compared to 48% of students more than 2 years out of school and 9% of School Leavers. Almost 43% of School Leavers reported making their career decisions later in secondary school.

Across the age groups about 15 to 17% of students were still undecided about their career choices.

"This survey made me stop and consider why I am studying what I am, but also made me consider what other fields can offer."

There was no difference between AG and Non-AG students in when they started thinking about or made the decision on what career they would like.

Important factors influencing choice of career

Table 3 shows the ranking of importance of different factors that potentially influence a student's choice of career, and highlighting those factors where AG students differed from other students. There were also sex, age and background differences in these career factors.

Table 3. Percentage of students indicating the relative importance of factors in their choice of career and the average importance rating for each factor.

Factor	N =	Not at all	Somewhat	Moderately	Very	Rating Average	Fisher exact test AG vs. Non-AG.
Interesting/ challenging work	468	0.6%	4.9%	32.7%	**61.8%**	3.56	NS [α]
Secure future	468	2.1%	13.9%	32.6%	**51.4%**	3.33	NS
Help/work with animals	468	11.3%	10.7%	13.0%	**65.0%**	3.32	0.01
Good lifestyle	466	2.8%	12.5%	38.4%	**46.4%**	3.28	NS
Work on important issues	468	3.2%	14.1%	41.2%	**41.5%**	3.21	NS
Job/career opportunities	468	3.2%	17.7%	39.3%	**39.7%**	3.16	NS
Work outdoors	467	10.7%	17.8%	34.5%	**37.0%**	2.98	< 0.01
Protect the environment	465	6.5%	25.8%	31.4%	**36.3%**	2.98	NS
Work using science	468	8.4%	27.6%	**38.8%**	25.3%	2.81	0.02
Help/work with people	466	12.0%	26.4%	**39.3%**	22.3%	2.72	NS
Apply creativity	467	10.5%	31.3%	**36.2%**	22.1%	2.70	NS
Respect/Prestige	467	13.3%	28.1%	**39.8%**	18.8%	2.64	NS
Earn lots of money	467	13.3%	32.5%	**42.2%**	12.0%	2.53	NS
Own boss/ independence	468	16.9%	31.9%	**34.5%**	16.7%	2.51	NS
Work with cutting-edge technology	461	14.8%	**35.4%**	34.5%	15.4%	2.51	NS
Meet family expectations	468	27.6%	**34.8%**	25.9%	11.8%	2.22	NS
Work with plants	468	**48.9%**	28.2%	15.0%	7.9%	1.82	< 0.01

[α] – NS = not a significant difference (P < 0.05).

AG students saw working outdoors (3.36 vs. 2.84), and working with plants (2.28 vs. 1.70) as more important characteristics in a career than non-AG students. Meeting family expectations (2.47 vs. 2.14), respect/prestige (2.85 vs. 2.58) and being their own boss (2.77 vs. 2.45) also tended to be more important to AG students.

Helping or working with animals scored more highly for Non-AG students (3.32 vs. 3.28), reflecting their greater veterinary and wildlife interests. Non-AG students also ranked using science as a more important characteristic for their desired career (2.89 vs. 2.64).

'Other' important factors listed included:

- enjoyment, happiness, adventure and having fun
- having meaning in & passion for a career
- work/family balance and flexibility
- job satisfaction & making a difference
- increasing in knowledge and learning
- international travel.

In career choice, females ranked helping/working with animals and protecting the environment more highly than males, but helping/working with people and working with plants as being of lower importance in career choices than males.

Males ranked applying creativity, being their own boss, earning lots of money, working with cutting edge technology, using science, and having a good lifestyle more highly in their career choices.

In choice of career, older students (2+ Years and Mature age) were more strongly motivated by working on important issues, protecting the environment and working with plants than younger students. School Leavers were less motivated by working outdoors in their career choice than older age groups.

A greater proportion of students with a farm background ranked having a good lifestyle as very important (61%) to their career choices compared to city (44%) and town (41%) students. Further, a greater proportion of city and town students ranked respect and prestige as not at all important to their career choices (16%) compared to students from farms (5%).

Perceptions of agriculture

Table 4 presents how students perceive how well different characteristics were as being descriptive of a career in agriculture. Males thought that help/working with people was more descriptive of agriculture than females.

AG students perceived agriculture as providing more opportunities for applying creativity, providing a good lifestyle, protecting the environment, helping people and earning lots of money than Non-AG students. These characteristics were generally at the lower end of the overall rankings. For more highly-ranked terms, Non-AG students saw working with plants as more highly descriptive of agriculture than AG students (3.38 vs.

3.14), but also being less interesting or challenging careers (2.92 vs. 3.28).

Likewise good lifestyle, respect/prestige, being their own boss and interesting/ challenging work were seen as more descriptive of agriculture by students with a farm background. A similar association was also seen for working outdoors.

When asked why they did not choose an agricultural program the most common categories of answers by students (n = 325) were that they had other interests (41%), no interest in agriculture (37%), or a specific dislike (e.g. sounds boring, don't want to produce animals for meat, don't like the outdoors, agriculture is risky) for something associated with agriculture (13%). Only 4.3% did not know why.

"I have many cousins than own farms in NSW and had to close down the farms due to drought and debt. I don't want to end up like that."... "Very hard for the average person to afford the land needed to make a commercial living in agriculture"..."My father works as an agricultural scientist, and the work/importance of work to reward ratio is quite low".

Table 4. Perceptions of a career in agriculture of first year science students.

Factor	N =	Not at all	Somewhat	Moderately	Very	Rating Average	Fisher exact test AG vs. Non-AG.
Work outdoors	457	1.3%	5.5%	26.7%	**66.5%**	3.58	NS [α]
Help/work with animals	456	3.5%	12.3%	31.4%	**52.9%**	3.34	NS
Work with plants	456	3.7%	11.2%	32.2%	**52.9%**	3.34	0.02
Work on important issues	456	2.9%	15.1%	35.5%	**46.5%**	3.26	NS
Protect the environment	456	4.2%	15.4%	32.7%	**47.8%**	3.24	0.05
Work using science	456	3.7%	15.8%	**42.1%**	38.4%	3.15	NS
Interesting/ challenging work	454	2.4%	22.0%	**45.2%**	30.4%	3.04	0.01
Job/career opportunities	456	2.4%	25.2%	**48.9%**	23.5%	2.93	NS
Work with cutting-edge technology	450	5.6%	24.9%	**46.9%**	22.7%	2.87	NS
Secure future	455	4.0%	28.1%	**46.8%**	21.1%	2.85	NS
Help/work with people	456	5.5%	28.7%	**42.8%**	23.0%	2.83	0.03
Own boss/ independence	457	6.4%	29.6%	**42.5%**	21.5%	2.79	NS
Good lifestyle	455	3.7%	34.5%	**44.4%**	17.4%	2.75	0.01
Apply creativity	456	8.6%	35.4%	**38.9%**	17.1%	2.64	0.01
Respect/Prestige	454	11.0%	37.9%	**39.4%**	11.7%	2.52	NS
Earn lots of money	455	13.4%	**53.9%**	28.6%	4.2%	2.24	0.01

[α] – NS = not a significant difference ($P < 0.05$).

More students with a city (43%) or town (38%) background than farm home environment (20%) expressed no interest in agriculture as the reason for not doing an agriculture program, with more previously farm-based students expressing interests in other areas (33, 42 and 56% respectively).

Identified motivating factors for careers in agriculture

When students were asked what would motivate more young people to take up a career in agriculture 417 responses were received. The answers are presented as a 'word cloud'[9] in Figure 3.

The highest frequency answer was the provision of more information promoting general awareness of agriculture (30%). In order of frequency of mention the next most common answers were:

- Highlight the diversity and opportunities existing within agriculture (17%)
- Provide information on agricultural jobs including availability (14%)
- Highlight the money-earning opportunities (14%)
- Highlight the importance of agricultural jobs and careers (11%)
- Make agriculture more 'interesting' or less 'boring' (10%)
- Start Early – engage people about agriculture when they are younger or still at school (10%).

"I think if people had a better understanding about what is involved in agriculture - that it is not just growing plants or being a farmer, more people could be interested in undertaking an agriculture degree"

There were no differences between AG and Non-AG students with the exceptions of more AG students (13 vs. 5%) suggesting a focus on industry image and more Non-AG students (13 vs. 3%) suggesting making agriculture 'more interesting'.

More males than females thought that highlighting earning potential (21% vs. 11%) or highlighting agriculture's importance (18 vs. 9%) would be a motivating factor for recruiting young people. A greater proportion of females than males thought that providing additional information (34 vs. 20%) or advertising (10 vs. 4%) would be more motivating.

More students with a farm background tended to highlight promoting industry image, more security and lifestyle benefits, whereas more urban students tended to mention making agriculture interesting, or they didn't know what would be effective.

Program and campus selection for agriculture students

In reasons for their choice of program a greater proportion of The University of Queensland AG students highlighted the additional career or study options that their program would provide in comparison to non-AG students. Further information about the university was sought primarily from the website (85%), secondly from Open Days (56%), and thirdly from campus visits or tours (34%). While still significant, there was a lesser proportion of AG and previously farm-based students getting information from the university website (about 78 vs. 88%) and a lesser proportion of AG students undertaking a campus visit (15 vs. 28%) than non-AG students surveyed.

[9] http://www.wordle.net/, accessed 11/05/2011

Figure 3. Word cloud showing relative frequency of the use of words by students responding to a question of what would motivate more young people to take up a career in agriculture.

General Discussion

General demographic observations

The age and home location distribution recorded in this study is similar to that reported[10] for first year university students in Australia, although with a greater proportion of female students (70% vs. 60%) possibly as students with an interest in animal studies are predominantly female[11].

The finding of a lower proportion of School Leavers derived from a farming background may be related to deferment of studies to qualify as being independent so as to receive greater Government supports[12]. A risk for students deferring studies is that they do not return to university. Re-examination of the eligibility rules may increase enrolment of rural students and hence the number of students doing an agriculture degree, due to our and other's[13] observations that students from non-urban areas are more likely to apply for courses in agriculture. Further, more flexible external agricultural course offerings might appeal to a greater number of mature age students.

Over 75% of students had come from urban environments, in line with other studies[14]. This urban background suggests a lack of prior exposure to agriculture and this is consistent with the nomination by participants of receiving more information on, and experience with, agriculture as a factor motivating more young people to choose a career in agriculture.

Areas of interest

The greatest areas of interest nominated by respondents were animal-related,

[10] ACER, 2010b
[11] Hynd and Hazel, 2010
[12] Godden, 2007
[13] ACER, 2010a
[14] Hynd and Hazel, 2010

particularly including wildlife, veterinary, and companion animals. Findings from the USA and Australia indicate that animal science students are predominantly urban females with these interests[15] and this is consistent with our finding that female respondents ranked helping or working with animals more highly important to their career choices than males.

Only 12% of respondents specifically expressed an interest in production animals, and this was greater for students from a rural background. Hynd and Hazel (2010) report that interest in livestock rises as students are exposed to them during their studies and so some of this cohort may transfer their interests to working with production animals before completing their programs.

The strong interest in animal studies is consistent with a national trend towards greater demand for animal science degrees, and low levels of interest in plant, food and soil sciences[16]. In this survey interest in plants was only the 7th most common area of interest, more so for students with a rural background, with farming only the 15th most common area of interest. Given potential gains to be made in feeding the world's population and managing climate changes through crop biotechnology and genetic modification, the lack of focus by students on plant and soil sciences is concerning.

Careers of interest and influencers of career decisions

The career expectations of respondents were not clearly defined, even though around 84% appeared to be satisfied with the information available on their career(s) of interest. This lack of clarity is consistent with the comments about a need for more information on what jobs actually involve, including working conditions, training and career pathways, and those professions short of personnel.

An important finding of the survey is that workers in a field are second only to parents in influencing the career decisions of students, with 5 times as many stating worker-influences than from career advisors or industry representatives. In contrast, US data from the late 1980s[17] indicated that secondary student's career decisions were most affected by workers in the field of interest, then parents and teachers. While it is important to engage with all influencers of career decisions, this points to a need to target existing agriculture workers with information about career options. It also reinforces that industry-level 'morale' and working conditions have a large direct impact on recruitment success.

Influencers provided encouragement to the student to follow their interests and skills, information on jobs or courses, work experience and their passion for a field. The provision of work experience was more significant for AG students and those with a rural background. This influence of generous engagement is consistent with the excellent levels of satisfaction reported by university

[15] Hynd and Hazel, 2010
[16] Hynd and Hazel, 2010
[17] Cecchettini et al., 1992

agriculture students, derived from a combination of good learning support, challenge and active participation[18]. Cecchettini et al. (1992) also reported that offering or attending an agricultural program in high school increased student interest in a career in agriculture.

Students obtain additional information on careers from a wide range of sources, although the internet was an important identified source. Female and older students showed more initiative in seeking additional information, indicating that a more active engagement process may be appropriate for younger male students, such as computer-based learning games or hands-on practical experience programs.

It is important to note that a greater proportion of AG students were less satisfied about available careers information. The development of, or more effective publicity of existing, websites providing clear and detailed information about careers and job descriptions is important for both AG and non-AG students seeking more information.

Timing of and important factors in career choices

The finding that the greatest proportion of students made their career decisions later in secondary school is consistent with US data[19] that showed the majority of secondary students make their career decisions during the 11th grade. Apart from students with a passion for a career from early childhood, the cross-over between thinking about and making a career decision appears to coincide with the middle of secondary school. It is important to ensure students at that age are exposed to information on agriculture and to continue to engage with students after they leave school, as up to 2/3 of older students did not make career decisions until after leaving school and 15% of these first year students had still not decided on a career.

The most important factor for both AG and non-AG students in career choice was doing interesting or challenging work, followed by having a secure future. A survey[20] of Grade 11 and 12 students in Canberra reported that the most important factors in a career choice were a stable and secure future, the ability to use special talents, and the use of creativity. In contrast our survey reported applying creativity to be only moderately important, similar to achieving respect/prestige, earning lots of money and being their own boss. Lower scores for being their own boss and holding a respected position in the community were also reported in the Canberra survey. In support, Carroll (2010) reported no agriculture and environmental studies graduates surveyed were self-employed by 3 years after graduation.

Non-AG students ranked 'interesting work' as being less descriptive of agriculture than AG students. A survey[21] of 94 bachelor-degree-qualified agriculture and environmental students graduating in 2006 showed that in 2009

[18] ACER, 2008; 2010a
[19] Cecchettini et al., 1992
[20] Cecchettini et al., 1992
[21] Carroll, 2010

they were employed predominantly as professionals (59%) and managers (14%). They were employed in a diverse range of industry groupings including professional, scientific or technical services (31%), public administration (26%), mining (10%, reflective of included environmental students), and around 5% in each of; agriculture, forestry and fisheries; manufacturing; electricity, gas and water supply; wholesale and retail trade; and healthcare and social assistance. By 3 years after graduation, almost 90% of these graduates, and 92% of post-graduates, were in full-time employment related to their long-term career goals.

These statistics highlight the diversity of opportunity and capacity for agriculture graduates to select a type and location of work that suits them, including satisfying the need for interesting work, in line with their long-term aspirations. These are key messages that need to be transmitted to potential students and their influencers.

The second most important factor in career selection for all students was having a secure future. Given the shorter periods of time that workers in Australia now spend in a position it is likely that graduates will have a number of jobs in their working lifetime, such that employment security will lie in possessing adaptability and having a transferrable skills base. As discussed, agriculture graduates find employment in a broad range of areas and the outlook for employment in agriculture is very positive. An analysis of job advertisements during 2007 to 2009 showed a conservative estimate of over 15,000 advertisements per annum[22] and growth in full-time employment rates of agriculture and environmental studies graduates in the order of 20% from 2006 to 2009[23]. While some inter-disciplinary transfer will occur, recent estimates are that there is up to a 6-fold shortfall in the number of agriculture-degree graduates produced nationally each year (800 graduates for *circa* 4800 positions), related to declining student enrolments[24]. The strong employment prospects will be supported by the aging farmer population and expectations that over 50% of agricultural scientists will retire in the short term[25]. Agriculture therefore offers secure job opportunities in the medium to long term.

While respondents reported earning lots of money as only moderately important to career choice (ranked 13th), highlighting earning potential was the 4th most frequently nominated motivating factor for promoting a career in agriculture. This divergence may be due to earning potential actually being more important to career choice than revealed by the rankings provided. Alternatively earning potential in agriculture is seen as being low and restrictive, as supported by our findings on the perceptions of agriculture. From post-graduate surveys the earning potential for an agricultural bachelor graduate is higher than for veterinary science and in the order of $46,300 per annum and $70,000 for a research higher degree[26]. A post-graduation survey of

[22] Pratley and Hay, 2010
[23] Carroll, 2010
[24] ACDA, 2009
[25] PMSEIC, 2010
[26] http://www.graduatecareers.com.au /Research/ GradJobsDollars/index.htm, accessed 7 July, 2011

students awarded bachelor degrees in 2006 showed median full-time salaries of agriculture and environmental studies students went from $48,000 in 2007 to $58,000 in 2009, with achievement of gender parity[27]. Post-graduate salaries went from $73,500 to $84,000. This compares favourably to a number of other employment areas, although significantly lower than engineering fields.

There were a number of gender-related differences in important factors for career choices, with agricultural recruitment programs aimed at females potentially being more effective by emphasising opportunities to work with animals and protect the environment. The range of factors highlighted by males suggests broad approaches may be effective for that group. Agricultural jobs featuring more indoors-based work could be described to the School Leaver age group, while lifestyle opportunities, such as working outdoors, are more important to students from a rural background. The point should be made that while no single message will appeal to all groups, in a holistic approach emphasising different aspects of agricultural careers to different audiences will likely be more effective.

Perceptions of agriculture

The respondent's perception of agricultural work was quite a traditional view; being based outdoors and involving working with animals or plants, and this is consistent with past studies[28]. The low scores for respect/prestige by non-AG students also reflect the attitude that agricultural work is not interesting or you don't need to be well educated to work in the field. The proportion of people with a degree working in agriculture is around 7%, compared to 22% for the community as a whole, with about one third more operators of the top 30% of farms (on estimated value of production) having a degree qualification compared with the operators of the bottom 50% of producers[29]. Levels of education within agriculture will increase in the future as it moves more strongly to a business focus, due to normal competitive pressures.

Interestingly, respondents in the current survey perceived agriculture as involving working on important issues, such as protecting the environment or helping animals, which was also ranked as important to career decisions. The study by Cecchettini et al. (1992) reported that high school students rated the greatest descriptor of a career in agriculture to be making a contribution to society. These common themes should be highlighted in recruitment efforts.

While a secure future is seen as only being 'moderately' or 'somewhat' descriptive of agriculture by ¾ of respondents, as previously stated agriculture graduates end up in a wide range of work-places, with an overwhelming majority working in line with their long term career goals, and strong medium term job prospects.

Students with a farming background saw a good lifestyle as more descriptive of agriculture than urban students,

[27] Carroll, 2010
[28] Cecchettini et al., 1992
[29] ACDA, 2009

consistent with findings that 88% of graduates of rural origin remain in rural locations after graduation[30]. The perception that all agricultural jobs involve working in isolated urban areas away from the benefits of urban life has been identified as a possible source of labour market failure[31]. Educating urban students about the range of urban-based agricultural jobs or the lifestyle benefits of rural living will help address this issue.

Frequently aided by campaigns for short-term political or financial support, negative media portrayal of agriculture, such as drought or low financial returns, act as a disincentive to young people considering a career in agriculture[32]. It is important for a wide range of industry and education stakeholders to engage with potential students and the media to present agriculture to society in a way that more closely reflects the technology-based, efficient and sustainable production systems existing, and the contribution of these to addressing issues like food security, animal welfare, climate change and environmental stewardship.

However, there are criticisms of simple awareness-boosting approaches. Malcolm (2010) points out that declining student enrolment into agriculture have occurred *'despite significant investments by agricultural educational institutions in attempts to increase awareness of and attractiveness of studying agriculture'* and *'Notions that much can be done to attract large numbers of young people back to agriculture...are a distraction from the main game: ensuring that those young people who are so inclined to work in agriculture are better skilled for the task and so are able to be better and more competitively rewarded for their efforts.'*

As a cause of sub-optimal labour supply, poor perceptions of agriculture may simply be a result of the normal market competition for land, labour and capital resources[33]. Malcolm (2010) proposed that combined efforts of stakeholders is required to skill interested young people to the point where they can be paid competitive wages, likely by the most profitable businesses. While providing financial incentives is part of the solution, without concurrent engagement of the urban population, slow rural population growth will slowly erode the number of interested young people available.

Respondent's perception of motivating factors for careers in agriculture

The top three most frequently identified motivating factors for recruiting more younger people into agriculture (providing general information, highlighting opportunities and providing information on jobs) is consistent with the low-level understanding of the importance of agriculture to society both in Australia[34] and overseas[35]. In 2009/10, the farm sector contributed 2.16% of Australian GDP and employed 325,000 people (2.9% of total), characteristic of a mature economy, but contributed significantly to exports ($28.5 Billion, i.e. 11.2% of total

[30] Pratley, 2008
[31] Malcolm, 2010
[32] Pratley, 2008
[33] Malcolm, 2010
[34] Pratley, 2008; Malcolm, 2010
[35] Cecchettini et al., 1992

exported goods and services) while managing over half (410 million ha) of Australia's landscape[36]. A greater awareness and knowledge in school children of the production and processing of food and nutrition is expected to increase tertiary enrolments, particularly if food production is presented as a profession valued by society[37].

Urban students indicated that making agriculture 'more interesting' would be effective and, from the responses on influencers, this would point towards encouraging students to follow their existing interests in an agricultural context or inspiring them via facilitating contact with individuals with a passion for agricultural pursuits, for example existing or newly-graduated agriculture students. Students doing agriculture and environmental studies in Australia reported excellent levels of satisfaction with their university education, derived from a combination of good support, challenge and participation in projects and internships while achieving the highest levels of general learning outcomes[38]. University experience also helped them develop knowledge and skills that contributed to personal development the most of all surveyed students[39]. This was consistent with our finding that a greater proportion of AG than non-AG students highlighted the additional career or study options that their program would provide and this could be linked to the good employment prospects that exist.

[36] ABARES, 2010
[37] PMSEIC, 2010
[38] ACER, 2008; ACER 2010a
[39] ACER, 2010a

The range of factors highlighted by respondents as messages to encourage more young people into agriculture suggests no one single message will be effective in addressing this issue, but that general awareness programs are vital and that these need to reach students thinking about careers in early secondary school. Given the lesser proportion of AG and previously farm-based students getting information from the university website and campus visits, the needs of these groups should be considered further to facilitate their use of these options.

Conclusions

This survey has provided useful information about the career decision process and attitudes towards agriculture and agricultural careers of first year science students. A number of potential actions derive from this information.

Examining and streamlining government supports and removing barriers to rural and regional student enrolment may increase tertiary enrolments in agriculture. Effectively educating and inspiring urban students (particularly in early secondary school), and their career influencers, about modern agriculture will require building a coalition of stake-holders willing to share the costs of delivering such a program; from farmer organisations, agribusiness, and education providers through to government. This process should extend to consideration of the image of agriculture being presented in public policy discussions.

Education programs should include the importance of food production to society in Australia and the range of challenges facing the rural environment of which agricultural workers can contribute to finding solutions. Internet sites describing the range of interesting career choices, detailed job descriptions and career pathways, including with animals, would be one arm of this education effort. This information should include the job security to be found in agriculture, the prospect of reasonable remuneration and the range of interesting and challenging employment opportunities resulting from accruing the set of transferable skills that an agriculturally based education can provide. Agriculturally-related jobs in urban areas that offer an increased range of lifestyle attractions could also be highlighted.

Involving passionate champions, including recent agricultural graduates, is likely to more effectively inspire prospective students. Delivering agricultural and work experience opportunities to urban-based youth, particularly males, and to more mature people seeking a career change is another potentially fruitful activity.

A supportive coalition would be able to more widely spread the cost of skilling workers such that they are in a position to be paid more competitive wages, provide access to higher degree scholarships above the poverty line, and providing clear career development pathways[40], including cadetships/traineeships and awards, and mentorship by current and retired workers, that result in improved retention of existing workers.

Given declining productivity growth it is vital that education levels on farm and in supporting industries rise to meet the significant challenges facing Australian agriculture[41].

Acknowledgements

Helpful input into the project was gratefully received from Professor Michael D'Occhio, Karissa Douglass, A/Prof. Tony Dunne, Darren Mitchell, Professor Jim Pratley, and Professor John Taylor. Course co-ordinators Professor Helen Ross and Professor Peter Adams kindly made time available in their courses for the survey to be delivered.

References

ABARES 2010, *Australian commodity statistics 2010,* Canberra

ACDA, 2009 Capacity in Agriculture – A matter of national concern. Australian Council of Deans of Agriculture submission to PMSEIC, August 2009. http://www.csu.edu.au/special/acda/papers.html, accessed 13 May 2011.

ACER, 2008. Australasian Survey of Student Engagement Research Briefing – Beyond happiness: Managing engagement to enhance satisfaction and grades. Vol 1, June 2008, Australian Council for Educational Research, Camberwell, Victoria.

[40] PMSEIC, 2010

[41] Cribb, 2010.

ACER, 2010a. Australasian Survey of Student Engagement Report – Doing more for learning: enhancing engagement and outcomes, Australian Council for Educational Research, Camberwell, Victoria.

ACER, 2010b. Australasian Survey of Student Engagement Research Briefing – Getting first-year students engaged. Vol 6, May 2010, Australian Council for Educational Research, Camberwell, Victoria.

Carroll, D., 2010. Beyond Graduation 2009. The report of the beyond graduation survey. Graduate Careers Australia Pty Ltd, Melbourne, Victoria.

Cecchettini, C.L., Sommer, R., Leising, J.G. 1992. Australian student's perceptions of agricultural careers. Journal of Agricultural Education. 33(1): 30-36.

Cribb, J. 2010. The Coming famine. The Global Food Crisis and what we can do to avoid it. CSIRO Publishing, Collingwood, Vic.

DAFF, (2011). Australian Food Statistics, 2009-10. Food Policy and Programs Section, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, ACT.

Godden, N. 2007. Regional Young People and Youth Allowance: Access to Tertiary Education. Centre for Rural Social Research, Charles Sturt University, Wagga Wagga, NSW. (http://www.csu.edu.au/research/ilws/research/docs/youth-allowance.pdf, qaccessed 08/07/2011).

Hynd, P.I. and Hazel, S.J., 2010. Animal science education in Australia – Current situation and future needs. Are current training and education programs appropriate for the animal industry needs over the next 10-15 years? Proceedings of the Australian Society of Animal Production, 28:24-31.

Malcolm, B., 2010. Agriculture and agricultural science: where have all the young people gone? (online) Agricultural Science, 22(3): 35-39.

Mullen, J. 2010. Trends in investment in agricultural R&D in Australia and its potential contribution to productivity. Australasian Agribusiness Review, 18: 18-29.

Pratley, J. 2008. Workforce planning in agriculture: Agricultural education and capacity building at the crossroads. Farm Policy Journal, Australian Farm Institute, 5(3):27-41.

Pratley, J. And Copeland, L. 2008. Graduate completions in agriculture and related degrees from Australian Universities, 2001-2006. Farm Policy Journal, Australian Farm Institute, 5(3), 1-11.

Pratley, J.E. and Hay, M., 2010. The job market in agriculture in Australia. Agricultural Science, 22(1):35-40.

PMSEIC, 2010. Australia and food security in a changing world. The Prime Minister's Science, Engineering and Innovation Council, Canberra, Australia.

AgForce Queensland
PO Box 13186
Brisbane QLD 4003

School of Agriculture
and Food Sciences
The University of Queensland
Gatton Campus
Gatton QLD 4343

Engagement Unit
Faculty of Science
Building 62, Level 2
The University of Queensland
QLD 4072

Office of the Director
The University of Queensland
Gatton Campus
Gatton QLD 4343