SCHOOL OF AGRICULTURE, FOOD AND WINE
UNIVERSITY OF ADELAIDE

Submission to the Senate Enquiry: Higher education and skills training to support future demand in agriculture and agribusiness in Australia.

Introduction

The School of Agriculture, Food and Wine is based on the University of Adelaide's Waite Campus, which is considered Australia's foremost precinct for research and education in agriculture and related topics. A unique aspect of the campus is the collocation of several other institutions focussed on agricultural research. These include CSIRO, the South Australian Research and Development Institute, the Australian Wine Research Institute, the Australian Centre for Plant Functional Genomics, the Australian Plant Phenomics Facility (Adelaide node), the ARC Centre of Excellence in Plant Cell Walls, Australian Grain Technologies Pty Ltd and the Australian Genome Research Facility Pty Ltd.

The partners and the University have strong collaborative relationships, which greatly enhance the richness of the student experience both at undergraduate and postgraduate levels. The Waite Campus has excellent research infrastructure and a high quality environment where teaching is informed by research. In the recent Excellence in Research for Australia exercise, the University of Adelaide achieved the maximum score of 5 (well above world class) in the over-arching area of Agricultural and Veterinary Sciences, and in all of the areas of research activity based in the School of Agriculture Food and Wine: Plant Biology, Soil Science, Crop and Pasture Production, Horticultural Production (includes wine), and Nutrition and Dietetics.

The School offers a number of undergraduate degree programs including:

- Bachelor of Agricultural Sciences
- Bachelor of Viticulture and Oenology
- Bachelor of Food and Nutrition Sciences
- Bachelor of Wine Marketing

It also teaches a number of postgraduate coursework programs and undertakes research training for Honours, Masters and PhD students.

The School welcomes the Senate enquiry and this submission will focus mainly on issues related to undergraduate education through the Bachelor of Agricultural Sciences (introduced in 2010) and its predecessor degrees, the Bachelor of Agriculture and the Bachelor of Science (Agricultural Science), which were merged as a result of declining enrolments. The Bachelor of Agriculture program had a practical focus and the majority of graduates would take up employment in the farming or production sectors, whereas the Bachelor of Science (Agricultural Science) was more focussed on the science underpinning agriculture and graduates took up a wide variety of careers in agriculture and related service sectors as well as in research. The new degree has combined the best aspects of both programs.

The Bachelor of Agricultural Sciences is organised and run from the Waite Campus but uses field and other facilities at the University's Roseworthy Campus. In addition, animal-related topics in the

degree are taught by staff from the School of Animal and Veterinary Sciences, based at the Roseworthy Campus. The Bachelor of Agricultural Sciences is designed to train students in the physical, biological, technological and economic bases of modern agricultural systems and demonstrates how scientific and economic principles are applied to manage agricultural systems and the natural resources on which these systems depend. Key features of the degree include an industry internship program (of up to 12 weeks) and field trips focusing on different agricultural and horticultural systems. A synopsis of the degree program is attached (attachment 1).

Since 2004, there has been a decline in the numbers of students enrolling in the School's Agriculture degrees. A total of 72 students enrolled in the Bachelor of Agriculture and the Bachelor of Science (Agricultural Science) degrees in 2004. By 2008 this had declined to 45 students and numbers have stabilised at about this level since then. The merger of these two degrees to form the Bachelor of Agricultural Sciences has not affected enrolment significantly, in spite of predictions that abolishing the Bachelor of Agriculture, which was based at Roseworthy, would limit enrolments by students from rural areas and numbers would decline. In 2009, 45 students enrolled in the first year of the two separate degrees and 53% of these were from rural SA. In 2010, when the merged degree was introduced, 42 students enrolled and 52% were from rural backgrounds.

Over the period 2002 to 2010, an average of 35 students graduated each year from an agriculture degree at the University of Adelaide with a high of 55 in 2006 and a low of 25 in 2003; 44 students completed in 2010. Thus there is little evidence of a wholesale decline in students completing these degrees, which is somewhat in contrast to the trend nationally, as highlighted in the submission to the Enquiry by the Australian Council of Deans of Agriculture (ACDA).

The School's response to the Enquiry's Terms of Reference is below. The School has contributed to the submission from ACDA, so the following complements that submission.

- **The adequacy of funding and priority given by governments at the federal, state and territory level to agriculture and agribusiness higher education and vocational education and training**

  Agriculture and agribusiness education and training in universities are not seen as a priority by Federal and State governments. Current educational priorities of the South Australian State government, for example, are mining, defence and health. This is despite the contribution that agriculture makes to the State's economy, earning 53% (or $4.8 billion) of SA's export earnings. Further, the Federal Government appeared to be, until the work undertaken by the ACDA, ignorant of the decline in agricultural graduates because it did not collect data for this subject separately. As a result, there was no recognition of the problem and the impacts it may have for a major sector of the Australian economy. Consequently, the national decline in the number of agricultural graduates largely went unnoticed and no analysis was done of the consequences or what action could be taken to reverse it.

  The capacity of agricultural producers to meet the world's food needs is under extreme stress. The combined effects of an increasing world population, improving living standards that drive increased consumption of high quality agricultural products, climate change, water shortages, peak oil, land degradation, urban development encroaching on prime agricultural land, and diversion of agricultural production to biofuel production threaten the world's food security.

There has never been a more pressing need to increase the education and skills base of primary producers to enable them to optimise production in a sustainable manner. Analysis of data from the National Census by the ACDA indicates that only 7% of farmers have tertiary qualifications compared with 22% in the broader economy. This is in contrast to other countries which have a more highly qualified farmer base. This may affect the competitiveness of Australian agriculture. In addition, Australian farmers are increasingly relying on consultants for advice, and training programs for consultants and advisers need to take this into account.

A well-educated farming community alone is not sufficient to meet the future challenges in agriculture. An increase in strategic agricultural research will also be crucial to securing the world's food supply in the coming decades. The sectors that service and collaborate with the agriculture industries (such as banking and natural resources) also need to be aware of the challenges facing agricultural production and to contribute to innovative and strategic placement of the industry into the future in Australia. For these reasons DEEWR should designate "Agriculture" and "Agricultural Sciences" as priority areas. Furthermore, recent changes to eligibility criteria for the Youth Allowance have disproportionately affected rural students, providing a disincentive for them to move from home to study at university.

- **The reasons and impacts of the decline in agricultural and related educational facilities**

Agriculture is perceived by many to be a sunset industry, and media coverage is overwhelmingly negative. Images of droughts, floods, pestilence, farmers leaving the land and cruelty to livestock deter prospective students and their parents. Furthermore, a recent survey of secondary students (Hargraves et al., 2011, attachment 2) has identified a lack of awareness of the career pathways arising from a degree in agriculture as a crucial factor in deterring prospective students. This has been attributed to (i) segmentation of the industry according to production, for example grains, horticulture, livestock, and (ii) focus of the media on production aspects of farming. As a result, there is scant awareness of sectors, such as agribusiness, banking, rural media, and research, which service all aspects of agriculture and which offer a wide variety of careers.

Declining enrolments in agricultural degree programs have led universities to discontinue or downsize such programs and to invest their resources elsewhere. As facilities to support training in agriculture, which include laboratories, farms or field sites and the care of livestock, are costly to maintain, such investment decisions are difficult to counter when student numbers are small. Nevertheless, the Vice-Chancellor of The University of Adelaide is committed to agriculture education because of its importance to the nation and the world over the coming decades. Further, he recognises the global influence of the Waite Campus in agricultural research and education and its historical significance in enhancing the reputation of the University of Adelaide. As such, The University of Adelaide has made investments and commitments to both the Waite and Roseworthy campuses, including significant investment in teaching facilities on the Roseworthy Campus for the new Veterinary Science degree.

Nationally, however, there has been a decline in the number of Universities and Campuses teaching agriculture, as highlighted in the ACDA's submission. While student numbers remain low, this decline is likely to continue because much of the spending on teaching facilities in

universities is driven by student load, and Faculties and Schools teaching agriculture have difficulty mounting persuasive arguments for investment when other areas have rising student numbers. Academic staff with expertise in agricultural science who leave or retire are replaced if student enrolments are sufficient to warrant this, or if arguments can be mounted for the essential nature of their subject area, otherwise, the positions may be allocated to other disciplines. The University of Adelaide is fortunate to be able to draw on the expertise of staff of collocated organisations on the Waite Campus so that students, especially Honours, Masters and PhD students, can access facilities, advice and supervision from non-University staff. Other universities are not so fortunate.

- **The impacts of any shortage on agricultural research**

At postgraduate level, it is becoming increasingly difficult to recruit well-qualified Australian students to fill scholarships for Honours, Masters and PhDs. Our analysis of data collected by Graduate Careers Australia shows that over the period 1999-2010 only approximately 20% of agriculture graduates were in further study one year after graduation. This contrasts with over 40% for life science graduates. One reason for this is that agriculture graduates are in high demand; there are approximately 4000 graduate jobs advertised each year in agriculture and agribusiness but only about 300 agriculture graduates produced per annum (see ACDA submission). Lack of movement into postgraduate programs, including PhDs, means that there will be a shortage of researchers in the future, especially in key field-based specialisations such as agronomy, plant breeding, crop protection and soil science, which often do not appeal to non-agricultural graduates. Further, these are areas in which the majority of researchers are approaching retirement and there will be an urgent need to replace them over the next decade.

Across Australia, States are examining their investment in agricultural research and extension and there has been a withdrawal of resources for these key activities as other portfolios, especially health, require more investment. This will mean that universities, which currently account for about 25% of the national agricultural research effort, will become proportionally more important. It is essential that agriculture faculties are maintained both to provide the skilled workforce needed for the industry and also to undertake research and education in the universities.

The withdrawal of States from agricultural research and extension has impacted on the totality of such activities. Extension of research is a critical factor in adoption of new findings and withdrawal of extension services has decreased the availability of independent advice. Decisions have largely been taken on a State-by-State basis. While this is obviously the prerogative of individual States, the consequences for national capabilities need to be understood and we suggest it would be valuable for ABARES to examine what the impact of these trends might be.

- **The economic impacts of labour shortages on Australia's export oriented agricultural industries**

Agriculture is a major sector of the Australian economy and has performed well even when other sectors have experienced downturns. It exports approximately 60% of its production. Gains in productivity were made for a sustained period from the 1960s onward but this has not continued

over the last decade. This is a world-wide phenomenon and is attributed to a decline in investment in agricultural research that started in the 1980s. Because there are long lag times in the relationship between investment in agricultural research and on-farm effects, the consequences of that change in investment in R&D took several decades to appear. Likewise, the time between discovery and on-farm impact through widely-adopted changes in farming practice are equally long, generally of the order of 15-30 years. Therefore, shortages of researchers now will have reverberations for a long time.

- **The incorporation of animal welfare principles in agriculture education**

  At the University of Adelaide, animal welfare is taught as a stand-alone subject and its principles are embedded in all other animal-related courses. Thus all animal science and veterinary students take a first-year course entitled "Principles of Animal Welfare, Behaviour and Ethics" and another on "Animal Handling and Husbandry". In addition, all procedures used in practical classes and in research projects involving animals must have the approval of the University's Animal Ethics Committee.

- **Solutions to address the widening gap between skilled agricultural labour supply and demand**

  This is a multi-faceted problem that will require several approaches to solve. Ideas proposed by the School of Agriculture, Food and Wine as worthy of consideration are:

  Promotion by industry
  There needs to be a concerted promotion of a positive image of agriculture from all relevant sectors of the industry, including producers, processors, retailers and educators. This needs to highlight the career opportunities and the national and global benefits that flow from involvement in agriculture both before and beyond the farm gate. For example, greater involvement of all relevant sectors of the agriculture and agribusiness industries in offering work placement programs and graduate training programs would help to provide students and prospective students with clear ideas about pathways into satisfying careers. Financial and administrative support from Federal and State Governments would greatly enhance the prospects for successful implementation of such programs.

  Promotion of agriculture in schools
  Promotion of agriculture by industry should be coupled with the vigorous promotion of science, particularly agricultural science, in secondary schools in order to provide a larger pool of students suitably qualified to enrol in tertiary studies in agriculture, agricultural science and agribusiness. At present, where agriculture is taught in schools it is often seen as a subject for the less able students. There needs to be more embedding of agricultural examples in science and business/economics subjects so that students see the relevance of what they are being taught to food production and global food security. Agriculture should be included in, and promoted in, the National Curriculum. Likewise, improving awareness about career paths in agriculture and agribusiness amongst careers advisers in schools would facilitate recruitment of the best young people into degree programs in agriculture, agricultural science and agribusiness.

Student support

As noted above and in the ACDA submission, we recommend that the government make agriculture a National Priority area. National Priority subjects, currently mathematics, statistics and science, require a lower student contribution than other subjects. Currently, agricultural degrees are in HECS Band 2, which requires students to contribute up to $7756 p.a. while National Priority subjects require a contribution of up to $4355. Designating agriculture and related degrees in the National Priority Category would send a clear signal that the Federal Government sees agriculture as an important subject for the nation's future, requiring a highly skilled workforce. In addition, the criteria used to assess suitability for Youth Allowance should not disadvantage rural youth and should allow full support for their time studying at University. Indeed, further provision of scholarships for rural youth to pursue studies in agriculture may overcome the financial burden associated with studying away from home for these students.

Work placement programs and graduate training programs offered by industry would improve awareness about career paths. They would also provide students with invaluable hands-on experience of working with different facets of the industry, as well as a modest income to support their studies.

Articulation with the Vocational Education and Training sector

There is scope to improve articulation between the Vocational Education and Training sector and universities to provide tertiary vocational training. This is not well served by current arrangements and support for such articulation would provide new opportunities for improving the skills base of the farming community.

Research and development

There is a need to recruit the best young people into agricultural research. Recruitment of postgraduate students into key agricultural areas would be boosted by increasing the stipend. The School of Agriculture, Food and Wine agrees with the ACDA's viewpoint that current postgraduate stipends are not competitive and need to be doubled in value to be attractive. The brightest students, who have the potential to become excellent research scientists, are likely to be offered well-paid jobs when they graduate from their first degrees.

Attention should be given to retaining postdoctoral researchers in agricultural science. With little new recruitment of academic staff in agriculture in universities and cutbacks in State Governments, the opportunities for a career in agricultural research are diminishing. Well-qualified postdoctoral scientists see these signals and move into other careers. If they stay in the field, they almost inevitably do so via a series of short-term contracts that cause uncertainty for them. A period of 3-5 years as a postdoctoral fellow immediately after a PhD is appropriate and should be encouraged but, after that, longer-term opportunities are required to develop a satisfying career.

University support

Small class sizes in agriculture make it difficult to maintain the expertise and facilities needed to teach the range of subjects needed. At the University of Adelaide, as in other universities, income to the School of Agriculture, Food and Wine is restricted because we do not teach large, financially lucrative "service" courses in the first year – the School is a customer for these courses

delivered by other parts of the University, not a provider. Mechanisms need to be considered for making agricultural Faculties and Schools financially viable whilst operating within a funding regime that rewards large class sizes, but not the national importance of the subject.

- **Other related matters**

There needs to be a change in the perception of agriculture by students and their parents but there seems to be no peak body that has taken responsibility for this. The recent moves to form an Agribusiness Council of Australia may provide the opportunity to tailor a more positive message about agriculture and its importance for the future of both Australia and the global population, and the exciting career opportunities that exist. In this context, the Primary Industries Centre for Science Education (PICSE) has been an important initiative and should receive continued Federal Government support.

With the support of DAFF, the ACDA has developed a website, "Career Harvest", which gives prospective students information about careers in agriculture and related subjects and the qualifications and training they need to undertake them. This should help to improve awareness amongst students about the opportunities and careers available in agriculture.

Representatives of the School of Agriculture, Food and Wine would be pleased to discuss these matters with the Senate Enquiry if the opportunity is available.

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THE UNIVERSITY OF ADELAIDE AUSTRALIA

BACHELOR OF AGRICULTURAL SCIENCES

ENTRY REQUIREMENTS

SATAC Code:

Assumed knowledge: SACE Stage 2 Chemistry, Mathematical Studies

Campus: Waite, Roseworthy, North Terrace

Bachelor of Agricultural Sciences is a new program which commences in 2010. It supersedes the Bachelor of Agriculture, delivered at Roseworthy, and the Bachelor of Science (Agricultural Sciences) programs delivered at Waite. This new program takes into account the changing needs of industry and broadens the range of agricultural career paths available to our graduates.

Key features of this program are:

- Two 4-5 day interstate field trips which will expose students to a broad range of farming systems across southern and eastern Australia and enable them to create lasting social networks.
- An internship program, approximately 12 weeks long, where students can engage in a range of agricultural work experience from farm labouring to working in agribusiness or agricultural research.
- The program will be based at the Waite Campus; however the livestock courses and practical component of the agronomy courses will be delivered at Roseworthy campus.

Program Outline

The Waite and Roseworthy campuses are recognised as centres of excellence in agricultural science and this reputation underpins the new Bachelor of Agricultural Sciences.

The program trains students in the physical, biological, technological and economic bases of modern agricultural systems and is designed to demonstrate how scientific and economic principles are applied to manage agricultural systems and the natural resources on which these systems depend.

Graduates are highly sought after for positions in a range of rural industries including consulting in the livestock and cropping industries, banking and research as well as related areas in natural resource management.

Program Structure

The course is designed to provide a broad training in science and agriculture.

The first year develops basic skills in chemistry, biology and statistics as well as offering core courses in soils and agriculture. In the second and third years students enrol in courses in soil science, animal science, agronomy, crop protection, business and communication. Some specialisation is possible in the third year.

There are a number of field trips and excursions during the 3-year program that expose students to best practice in industry. Practical skills are developed through a professional internship during the second half of the program.

STUDY PLAN

LEVEL 1: Core courses in the areas of: Agricultural Systems, Biology, Chemistry, Professional Skills, Soils and Landscapes

LEVEL 2: Core courses in the areas of: Animal and Plant Biochemistry, Crop Production, Plant Science, Livestock Production Systems, Microbiology, Agribusiness, Soil and Water Resources

LEVEL 3: Core courses in: Research Methodology, Agricultural Resource Management, Agricultural Economics and Policy, Professional Skills, plus non-core courses chosen from a range of courses in soil science, animal science, plant and crop science and plant protection.

Careers

Graduates will be equipped to solve industry problems and apply new technology in their areas of specialisation. Areas where graduates can expect to find employment include advisory, research and regulatory services, agronomy and banking, agricultural production, farm machinery, management and operation, journalism, communication and marketing and research and technical work. Graduates are likely to find employment in a range of, including Agriculture-related industries, commercial enterprises, government and semi-government agencies and secondary, tertiary and vocational education.

Further Information

For further information please contact:

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Attracting Youth into Agricultural Careers: Factors Influencing Youth Interest in the Industry in South Australia

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More students entering the agriculture industry, and particularly through universities, are required to fill the gap between the supply and demand of graduates. The purpose of this action research study was to produce a set of recommendations that can be used by authorities charged with developing human capital in agriculture, to increase the number of graduates. This was achieved through a process of discovering current South Australian student perceptions of agriculture and careers within it, factors influencing their career choices and the tools most used by students to research careers. There were four aspects of the action research cycle: focus groups; an online questionnaire; interviews of careers counsellors; and trial of a stall as a student career research tool. A sample of 47 students participated in the focus groups and 144 in the online questionnaire. These students were a mixture of year 9 (14 year olds) and year 12 (17 year olds). Eleven careers counsellors participated while 27 students answered a questionnaire about the career day stall. This paper shows that promotion of a more positive image of agriculture as a career choice, and informing more youth (particularly metropolitan youth) about agriculture itself, and the career opportunities available in the industry is required. This could be achieved through developing a more positive marketing strategy, running a career day stall, developing a work experience program, running a 'youth talking to youth' program and developing a brochure.

Abstract from thesis submitted in partial fulfilment of the requirements of the Bachelor of Science (Agricultural Science) with Honours, The University of Adelaide, 24 October 2011.