Inquiry into Meeting the Education and Skills Requirements for the Agriculture Sector in Australia

Specifically:
'An Inquiry into the Adequacy of Current Education and Training Support to Meet the Needs of Agriculture in Australia'

With particular reference to:
"The content, structure and sufficiency of higher education and skills training to support future demand in agriculture and agribusiness in Australia"

A submission to the

Senate Standing Committee on Education Employment and Workplace Relations
Parliament House
Canberra ACT 2600

by the

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2 November 2011

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1. Setting the Scene

Australia is a global leader in agricultural science, particularly in advanced dryland production systems and crop breeding technology, and its farmers are among the most efficient in the world.

The agriculture sector delivers a substantial contribution to the Australian economy and community. Primary industries produce 93 per cent of Australia's fresh food supply and feed almost 40 million others, with export revenue exceeding $30 billion annually, while the overall agribusiness value chain represents a $120 billion-plus slice of the national economy.

The country's 133,000 farms are the more visible manifestation of agribusiness in Australia; however the sector's significant role and the sophisticated technological innovation underpinning it receive little external recognition.

This oversight is one of the key reasons that food and fibre production, our most essential industry, is failing to attract interest from future leaders.

Key issue – The importance of food, fibre and sustainable access to natural resources to feed and clothe Australians (and globally) is not generally recognised nor valued by Australians or its leaders. This is in contrast to other countries where food production is considered an essential pre-requisite to the life of human beings. This is a structural issue underpinning the considerations of the Inquiry.

The number of Australian students completing agricultural undergraduate degrees has declined over the past decade and postgraduate student numbers in agricultural and environmental sciences are also low.

This is a major concern given that Australia's rural sector is on the edge of unprecedented change and its workforce is ageing. More than half of Australia's active farmers are aged over 55 years and the scientific agricultural workforce is similarly ageing, with the lack of replacements creating a skills deficit that suggests demand for rural sector researchers and service providers is expected to outstrip supply over the next 10 years.

The Australian Council of Deans of Agriculture has well articulated this issue and they point to a chronic shortage of future personnel likely to be engaged in food and fibre production. This has been well documented by other government and industry sources.

The situation is complicated by obligations to meet climate adaptation, food security and trade commitments underlying a need to achieve higher productivity in the face of rapid global population growth and a shrinking natural resources base.

Alongside innovation to support more efficient and sustainable food, fibre and fuel production, the need to reinvigorate Australia's rural sector and improve human capacity is critical to addressing these long-term challenges.

Key issue – A chronic shortage of professional personnel in Australia's food and fibre industries is expected to bite within 5-years. There is no time to waste yet few strategic initiatives are in place to resolve this structural issue confronting Australia.

The challenges themselves present unprecedented opportunities to develop a career path addressing the most significant issues confronting humanity and to make a genuine contribution to the future. The pursuit of new ways to feed more people, both in Australia and globally, will generate valuable industry offshoots such as aquaculture, while increasing consumer demand for high quality, sustainably produced food will give rise to cross-sectoral research and development in areas ranging from environmental management and biosecurity to health and nutrition.

By addressing this issue strategically, Australia has the potential to create global business opportunities. Thus it provides the potential for public-private partnerships to collaborate; to not only alleviate the problem, but to export the know-how to other countries who express similar concerns.

Highlighting new employment opportunities, showcasing developments in modern food and fibre production such as biotechnology advancements, and promoting agriculture as a business vocation are essential to encourage more young people to enter the industry.

In 1998 the School of Agricultural Science (UTAS) established the National Primary Industry Centre for Science Education (PICSE) to develop and deliver strategies to encourage more young people to enter primary industry and associated research and agribusiness organisations. Its focus is on creating a desire for bright young people to enter the agri-food and agri-fibre industries as well as informing key career influencers such as teachers about these opportunities. PICSE operates in all States and is continuing to expand, a testament to the value put on the program by Agribusinesses, Rural Research and Development Corporations, Universities, schools and the Federal Government. PICSE has established a pipeline which builds awareness of the importance of agriculture in upper primary school students, develops an interest in the middle school and then encourages participation in the senior school students. The PICSE program is designed to address the serious issue of undergraduate student shortage, as well as bringing top students into the system. PICSE targets these top science students because the Australian research effort relies on a pipeline of the ‘best and the brightest’ to deliver the outcomes on which the progress of the industry relies.

Key issue – By strategically addressing this issue, Australia has the potential to alleviate key food and fibre security issues, while exporting the technology to do so to the world. The PICSE program, which has been in operation since 1998, is one such strategy that can be expanded in Australia and exported globally. Its expansion can occur rapidly.

2. An overview of a well regarded national agricultural education partnership

The PICSE Program

Starting from small beginnings in the NW of Tasmania, the School of Agricultural Science, through the Primary Industry Centre for Science Education (PICSE), has been addressing the issue of human capacity in the area of Food Security since 1998. Australia's capacity to achieve future food security will be seriously compromised without a stream of young tertiary trained people dedicated to agricultural science, science, innovation and research.

PICSE's goal is to foster and support young people's interest in science, and their subsequent participation in tertiary study leading to research or careers relating to the Food Security sector. The Federal Government, national agribusinesses, research organisations and universities financially invest in PICSE because of its demonstrated ability to generate a positive and sustained attitudinal change in science students, leading them into careers in primary industries.

Across the Nation, PICSE Science Education Officers (all ex-science teachers) facilitate the building of professional relationships between teachers and students, with primary industries and research organisations and with agribusinesses at a national and local level along with universities. The creation of working relationships and mutual understanding and engagement is a Key Success Factor and KPI of the PICSE program.

It does so through a structured, proven and well evaluated program. The elements of the program include – Industry Camps, Industry Placement Scholarships (IPS), Science Investigation Awards (SIAs), teaching resources and professional development courses for science teachers. The Science Education Officers (SEOs) operate out of, or are linked with, a local university and manage their PICSE Activity Centre. These Activity Centres are currently located at UTAS (Lead Institution), UWA, Curtin University, Flinders University, CSU, UNE, USQ, USC, Cotton CRC and the Riverland in SA. Plans are well advanced to bring JCU and University of Ballarat into the PICSE program.

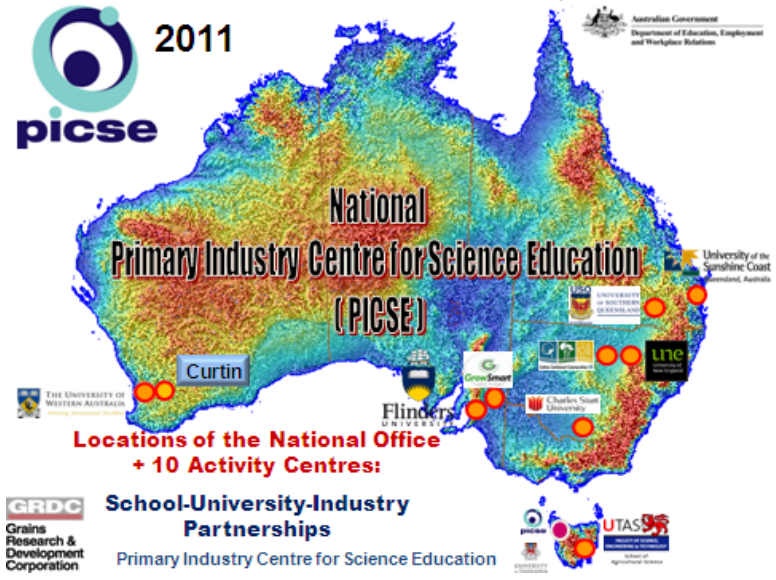

Figure 1: Current PICSE Activity Centres. Victoria will be included in 2012

PICSE's established, integrated program and strategy is multi-faceted and that remains the key to its success. The science class activities, teacher professional developments, student camps, industry placements and ongoing teaching resources, which are freely available on the PICSE website (www.picse.org), are fully linked and integrated through national quality control and innovation. Collectively, these activities build strong and sustainable relationships with science practitioners, researchers, employers, educators and students.

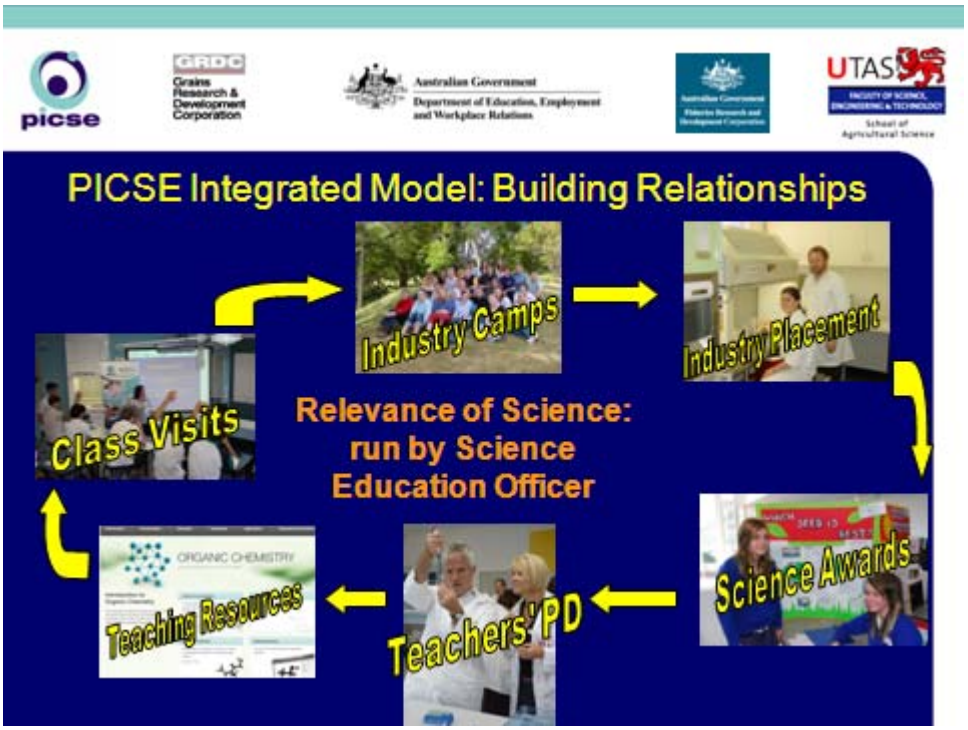

Figure 2: The PICSE Model of school, industry and research engagement

3. Behavioural change is the key element

The program recognises that there are several key elements of any behavioural change – raising Awareness, creating Interest, fostering Desire, facilitating Action, then leading to longer term Participation.

Unlike many existing awareness and promotional programs, PICSE Science Education Officers are offered class time by teachers to engage with high school science students. In the Middle School, the SEOs work with the students to plan their individual open ended PICSE Science Investigation Awards (SIAs), often relevant to local primary industries. This helps de-mystify the primary industries and create relationships.

In the Senior School, the primary focus of the presentations by the SEOs is to provide current practical examples of today's science applications and relevant careers in primary industries and research organisations. Following the school presentations, students are invited to apply for the PICSE Industry Placement Scholarships (IPS), which consists of a Science/Industry Camp, an Industry Placement and a Reporting Back Session.

At the five day residential Science/Industry Camp, students are engaged in activities at the university and have the opportunity to interact with lecturers, undergraduates, postgraduate students and agribusiness employers. In addition, students visit research organisations, learn about current agricultural research, as well as touring primary industry facilities, research/demonstration farms and agribusiness employers. A travelling scholarship program exists that funds students to attend an IPS program away from their home State.

The Industry Placement occurs in January. For one week, students are embedded in a scientific research or extension team, experiencing working alongside a scientist or scientific professional in the public or private sector, aiding in the current research work of their mentor scientist or industry professional. This is a great opportunity for students to gain a deeper knowledge of what is involved in working in a field that takes their interest.

A Reporting Back Session is held after students have completed their Industry Placements. Students give a short presentation about their experiences, the highlights and how the program impacted on their study and career pathways. These presentations often reveal significant attitudinal shifts in thinking and new perceptions regarding potential career choices in primary industries. They provide the opportunity for their peers and teacher influencers to become aware of the breadth of opportunities – some of which they themselves were unable to experience.

Key issue – The solution to attracting more young people into the industry rests on a structured program of raising Awareness, creating Interest, fostering Desire, facilitating Action, leading to longer term Participation. All elements of the Behavioural Change Continuum are necessary in order to foster increased and longer term participation by bright young people.

4. Creating a Supply Chain

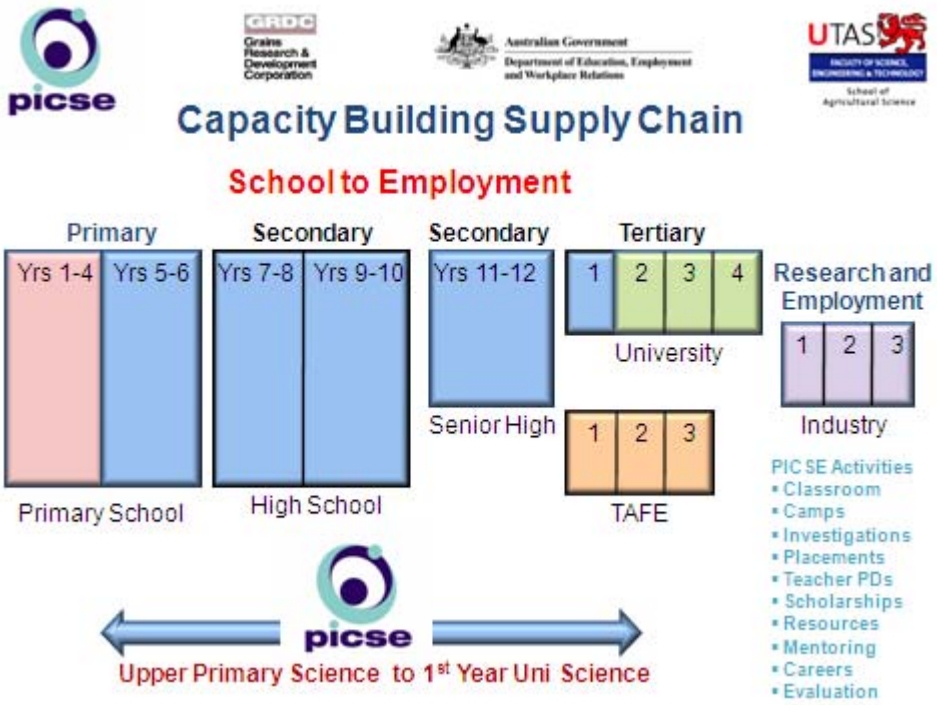

Figure 3: PICSE activities are designed to build a capacity supply chain

Throughout this "capacity supply chain" PICSE promotes the importance and relevance of sciences that underpin primary industries, rather than blatantly promoting farming, agriculture or specific primary industries. Being well grounded in the education sector, PICSE has always been of the view that to be able to attract the top students into agricultural science, any teaching resource must provide relevant industry exemplars to be discussed in chemistry, biology and physics classrooms. To that end, PICSE produces teaching resources to complement and inform the national science curriculum. These resources are produced in conjunction with science teachers in each state.

While many rue the decline of agriculture or rural studies in the high school curriculum, PICSE's focus of engagement with schools is to support science teachers, with positive case studies of research and production in primary industries, with a program of building relationships with selected industry and research staff. Such engagement is the catalyst for a positive attitudinal change in science teachers and students. PICSE's strategy of "fishing in the ocean" of science students, rather than "fishing in the small pond" of agricultural students, has been one of the drivers for success in attitudinal change.

As PICSE expanded from Tasmania to WA and then the other States, the outcomes of all aspects of the program has been independently measured, evaluated and reported on, both qualitatively and quantitatively by QualDATA a national, independent external evaluation company. Each year these evaluation reports are used to determine the impact of the program against the goals, as well as to fine-tune the program at each Activity Centre.

An important aspect is the tracking of the PICSE students from high school, through universities and into the workforce. PICSE engages “Ambassadors” who have had their aspirations and study directions changed by the program as high school students, who are graduates and now working in Primary Industry. These mentors of current PICSE high school students provide a valuable resource.

In the Activity Centres that focus on agricultural science, depending upon the annual cohort of students, between 45% to 70% students reported a change in enrolment into agricultural science and a pathway leading to careers in primary industries. More generally in 2010, 84% of the participating IPS students positively changed their attitude towards careers in primary industries.

Between 1998 and 2010, the PICSE program has:

- presented to 44,540 students in 2,272 Year 11/12 science classes nationwide,
- selected 778 Year 11/12 students for science/industry camps and industry placements,
- conducted practical professional development programs to 850 secondary science teachers using select primary industries to demonstrate the science,
- supported 3,336 secondary school students in the participation of Science Investigation Awards (2009/2010),
- partnered with the Commonwealth Government, universities, RDCs, research organisations, state governments and industries to secure in excess of $12m (2000 - 2010) to grow the program from a single Activity Centre with one SEO to a National Program of nine Activity Centres with 26 staff.

The relationships built by the 12 PICSE Science Education Officers with their local primary industries and universities, are fundamental to the success and sustainability of the program to date. The outcomes of the PICSE program are further supported by research that indicates the significant value of building long term relationships to affect changing attitudes and perceptions amongst students, teachers, industry and the broader community.

It takes approximately 8 years for young people who become enthused by the career opportunities in the agriculture sector to make their way through the supply chain. This comprises 3 years of changing attitudes in Yrs 10/11/12 at school, 4 years of tertiary study and allowance for a gap or travel year before they reach productive employment.

Key issue – The PICSE program recognises and accommodates the 8 year lead time required to change a young person’s preference for a career in agriculture through application of the Behavioural Change Continuum. Further it utilises graduate PICSE students to mentor school students.

5. Adequacy of funding and priority given by government

The national funding of PICSE is an essential aspect of sustainability of the program. An important part of the business case was to garner financial support to match Federal Government funding, not just from partner universities, but national R&D Corporations (RDCs). During 2010, there has been a high level of activity by the PICSE National Coordination Office to bring together this essential support.

Currently, Memorandum of Understandings have been approved by nine non-university organisations for annual cash contributions of a total $475,000 in 2010. Those non-university investors are the Grains Research and Development Corporation (GRDC), Fisheries Research and Development Corporation (FRDC), Cotton Research and Development Corporation (CRDC), Horticulture Australia Ltd, Cotton CRC, Murray Darling Basin Authority, Dow AgroSciences, Woolworths Ltd and the National Centre for Groundwater Research and Training.

PICSE is funded 50% by the Federal Government's Diversity and Structural Adjustment Fund (DEEWR). The university partners have contributed $558,000 cash during 2010, matching the DEEWR investment of $1,200,000 for 2010 (note: this does not include any "in-kind" contributions). The university financial partners are the University of Tasmania, University of Western Australia, University of New England, University of Southern Queensland, University of the Sunshine Coast, Flinders University, Charles Sturt University, and Curtin University.

Approximately $250,000 is required to manage each Activity Centre. This funding is used to implement the holistic program, many current partners who strongly support the PICSE program regard this as value for money. This is because they understand the importance of the Behavioural Change continuum described earlier.

Some potential investors however either demonstrate interest in only one part of the continuum, e.g. raising awareness, whilst others fail to understate the importance of an integrated approach to the Behavioural Change Continuum. A key success factor of this Continuum is that all elements are required to be undertaken, in a logical order, through strong relationships and in context of a long term vision that is implemented step-by-step over time. However this is often at odds with the 3 year funding and decision making cycles of government.

Key issue – The long term nature of implementation of the Behavioural Change Continuum is often poorly understood at government and investor level.

In 2011 PICSE continues to expand. With the recent establishment of a National Advisory Board chaired by Prof Alan Robson (UWA), PICSE will continue to develop and maintain a clear strategic direction for the future. In 2010, new partnerships were established with a large agribusiness and additional university. In 2011, discussions are well advanced with 2-3 new university partners with the outcomes being the establishment of new Activity Centres.

The advice and guidance from the Board, and the formation of new relationships and partners are critical for the ongoing development and longer-term sustainability of PICSE. This contributes to maintenance of PICSE's strategic vision and its implementation over time.

Key issue – The implementation of a Behavioural Change Continuum has as a pre-requisite, the development of strong and robust vision, with capacity to undertake it through the support of a range of high level champions.

6. **The importance of robust evaluation to assess Impact and ROI**

For at least the last four decades, the major strategies employed to improve public perceptions of agriculture and increasing the enrolment in agriculture courses has been to provide isolated media stories of agriculture, provide stand-alone teaching resources in agriculture and teach agriculture in some high schools.

Given the current poor public perception of agriculture, the removal of agriculture from the school curriculum and the significant decline of students studying tertiary agriculture, these strategies in themselves, patently have not been effective. Unfortunately, the key players in these promotional activities have been content to fund these strategies for several reasons, including the fact that a glossy poster, a resource CD, media stories of school students raising animals, “Expos” for students and the like, can be held up as evidence of use for promotional funds.

Traditionally, the missing factor in all of these activities has been the lack of any meaningful evaluation of predetermined short and long term impacts on public perception and student uptake of agricultural courses. The focus of such evaluation is to assess the extent of changed behaviours that have occurred and will lead to reduction in the increasing gaps between supply and demand of skilled professional personnel in agriculture, including the increasing shortage of skilled agricultural research and advisory personnel.

Key issue – The implementation of strong and robust evaluation of social impact is a pre-requisite to measuring the success of initiatives regarding this issue. PICSE’s own evaluation process is used as an investor and stakeholder reporting and internal management tool. The lack of such evaluation by others is due to poor understanding of evaluation methodology and lack of insistence by funders on its implementation.

PICSE has based its approach to creating attitudinal change in students and teachers, leading to an ongoing participation in understanding the scientific basis of food and water security for the future. PICSE remains focused on achieving impact focused outcomes.

Key outcomes include:

- SEO becoming a valued member of the community of PICSE partners,
- an increasing cohort of science teachers act as PICSE ambassadors in schools,
- increases in students who change their study and career pathways towards primary industries,
- increased retention of urban and rural students into tertiary agricultural science courses, and
- the return of students to their rural areas to be employed in local primary industries.

In an attempt to improve public perception around pursuing a career in agriculture, when engaging with the media, PICSE focuses on the strategies listed below:

- redefine agricultural science as a modern, sophisticated bio-science,
- strengthen awareness of the increasing overlap of the biological sciences covering both agriculture and the environment,
- raise community awareness of science and interest in food production and quality,

- proactively influence broader community understanding of Australia as a world leader in agricultural technology and innovation,
- highlight the essential contribution of Australian agriculture to national and global food security,
- highlight the major contribution of agriculture and agribusiness to the Australian economy,
- promote the role of farmers as environmental stewards who employ best practice management to deliver sustainability,
- promote the exciting career options available in agriculture and related areas.

The following is a list of the key drivers that PICSE uses to increase the enrolment of young people in agricultural education at university:

- provide exciting and relevant science activities (Science Investigation Awards)
- promote the relevant sciences that underpin food and water security,
- build relationships with science teachers (delivering resources and PDs),
- build relationships with students (in class, SIAs, camps, IPS),
- building relationships with local industries (Industry Placement Scholarship),
- maintain strong relationships with school, university, RDCs and industry partners,
- provide an integrated package for schools, year in, year out,
- provide a passionate team of Science Education Officers as mentors,
- build a PICSE Alumnus as ambassadors in university and industry.

Summary

In summary, the key issues of interest to the Inquiry, using PICSE as a case study, include:

- the focus of addressing this issue must be on an integrated approach that addresses each element of the Behavioural Change Continuum,
- to do so is a long term initiative over at least 8-years,
- addressing the scope of such as structural community issue, that impacts on Australia's food security, is outside the scope of government and industry 3 year horizons,
- however the impact remains considerable if attention is given to the issue and an integrated approach is taken that builds relationships and has high level champions and mentors that talk the same language as young people,
- certainty of funding over a decade remains a key element of dealing with such a high level structural issue,
- a public-private partnership, such as is used by PICSE, is the ideal model and this can lead to business opportunities,
- a robust evaluation process must be used to provide investor certainty that impact is being delivered over time.

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2nd November, 2011

Attachments:

a) Outcomes of PICSE-Agrifood Skills Think Tank Canberra – June 2011
b) QualDATA Paper-"Attracting young people into the agri-foods and fibre industries"