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## Future human capability building in the sheep and wool industry

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This paper gives an overview of the education environment in Australia and in particular, sheep and wool science education. It includes the results of a survey of the industry's future needs for graduates and outlines the developments in e-learning. The Sheep Industry CRC education program is aimed at building future human capability in the sheep industry by training postgraduates, delivery of a national program of sheep and wool degree units available for students at most universities to study by distance education, and developing VET and school resources. A new Bachelor of Livestock Science degree was developed at the University of New England to enable students to specialise in animal breeding, health and nutrition and sheep and wool science. TAFE and school outcomes include the development of learning materials, training programs, teacher professional development as well as resources to promote careers in the sheep industry. The integration of the use of material across sectors is also discussed.

# Future human capability building in the sheep and wool industry

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## Abstract

This paper gives an overview of the education environment in Australia and in particular, sheep and wool science education. It includes the results of a survey of the industry's future needs for graduates and outlines the developments in e-learning. The Sheep Industry CRC education program is aimed at building future human capability in the sheep industry by training postgraduates, delivery of a national program of sheep and wool degree units available for students at most universities to study by distance education, and developing VET and school resources. A new Bachelor of Livestock Science degree was developed at the University of New England to enable students to specialise in animal breeding, health and nutrition and sheep and wool science. TAFE and school outcomes include the development of learning materials, training programs, teacher professional development as well as resources to promote careers in the sheep industry. The integration of the use of material across sectors is also discussed.

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## Introduction

In July 2001, the Australian Sheep Industry CRC commenced operations. It has a major difference from the previous Wool CRC in that the research, education and training programs involve both the meat and wool industries and their interactions. In the case of the education and training program, it is much broader than the previous Wool CRC education program, with integrated subprograms at the school, vocational education and training (VET), undergraduate and postgraduate levels.

The Sheep CRC education program is providing a closely-integrated education and training system from school, through VET training, and up to postgraduate study. It is increasing credit transfers for students, and ensuring the currency and quality of all education and training programs through its functions within the Sheep CRC.

A different model is being used in the Sheep CRC for development and delivery of educational material nationally to universities. Over the next three years, many of the Universities offering agricultural based degrees will have incorporated the CRC units into their course programs. This national delivery will be made possible by using a format for units including detailed notes, CD ROM and WebCT delivery combined with 3–4 day residential schools. There has been very close collaboration between the CRC and Australian Wool Innovation in developing this program via co-funding, joint participation in the Education and Training Advisory Committee and strategic planning.

The incorporation of a VET subprogram allows the Sheep CRC to develop training materials that support the National Training Framework with high-quality best-practice information. The Sheep CRC in turn benefits from gaining access to a national competency system which describes the work roles within industry. This can improve the relevance and currency of all education sectors, and

provide greater cohesion between the extension of CRC-generated information to industry clients and formal and academic education pathways. The schools initiatives aim to encourage the uptake of science education and entry into science-based careers. This is an identified area of shortage and the CRC program is taking an innovative and proactive approach to raising the profile of careers in science and agriculture to provide for future development of the industry.

## Objectives of the Sheep CRC education program

Objectives of the program are:

- Developing postgraduate research programs integrated with Sheep CRC and AWI research projects with postgraduates who have undergone professional development and leadership training contributing to the future of the sheep and wool industry.
- Developing sheep-, meat- and wool-related undergraduate degree units and developing current, authoritative and comprehensive multi-media material by commissioning a wide range of expert authors.
- Building critical mass of students for sheep and wool university education in Australia.
- Developing innovative delivery mechanisms for university units delivered by distance education.
- Collaborating with other providers to develop multimedia resource material for vocational education and training (VET) via the knowledge warehouse project. Developing professional development programs for VET trainers, as well as short courses for delivery through the VET sector that incorporate research findings of the Sheep CRC and partners.
- Developing a schools program to create more awareness of sheep and wool industry careers and to support school education through professional development of teachers and integration of the science used by the sheep industry into learning resources, organising industry placement of school students with researchers and running industry camps.

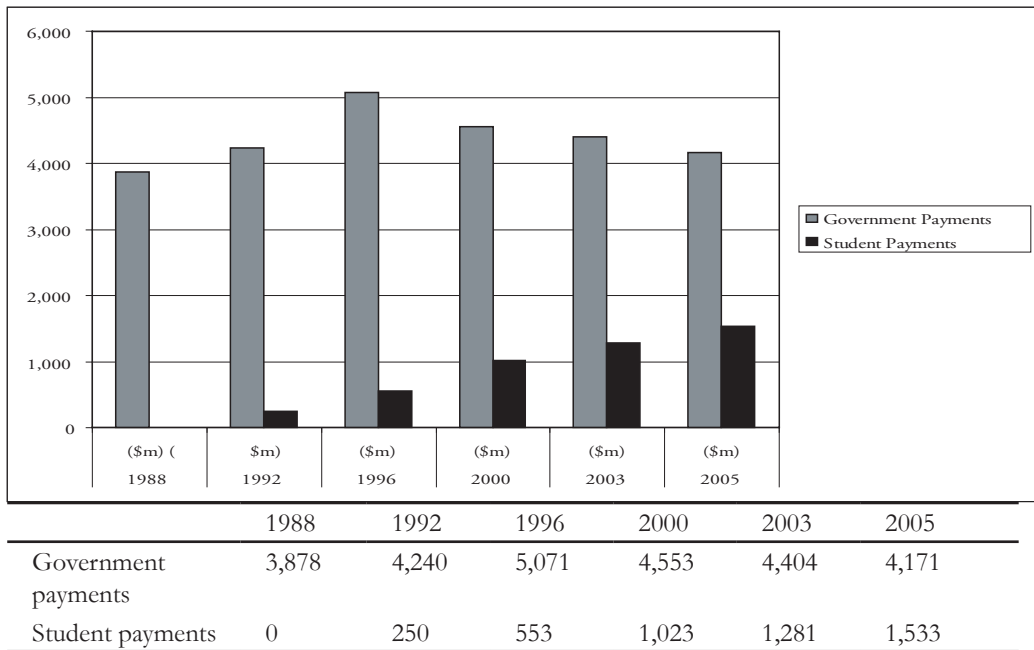
## The education environment

The sheep and wool education environment has been described in detail by Cottle (2003). The education sector can be divided into six segments that form two tiers. The Sheep CRC education and training program has been focused on tier 1, formal education.

There are about 6000 secondary schools in Australia and 583 colleges and universities. Higher education has 45 major institutions and 85 other institutions, with about 750,000 students, of which 75% are doing undergraduate courses and 21% postgraduate. Public investment in higher education as a percentage of GDP is falling.

Australia's public investment in higher education on a per student basis has been in decline (Fig. 1). The expansion in university teaching and learning has been funded since the mid 90s by increasing the contribution made by students. (AVCC Facts, April 2003).

Allocation of university places to fields of study is almost totally driven by student demand (in some cases, e.g., medicine, numbers are constrained), but student demand may not always reflect employment reality, e.g., oversupply of law graduates. If an industry has a need for graduates, it needs to pro-actively generate student interest in careers in the industry via appropriate funding, e.g., scholarships. The percentage of students who are female, mature age and study by distance education is expected to increase (Cottle, 2003). Of the 700,000 higher education students in 2000, the fields of study with the largest numbers of award course students were business administration and economics (24%), arts, humanities and social sciences (22%) and science (15%). Agriculture only accounts for 1.5% of university students (11,200).



**Fig. 1.** Public and student contributions (million dollars) to university operating grants.

The only university that provided a specialist degree course in sheep and wool science from 1950–1993 was UNSW. The School of Wool Technology was founded in 1950 and became the School of Wool and Pastoral Sciences in 1967. The School of Fibre Science and Technology was established in 1986 within the Faculty of Applied Science by the amalgamation of the former Schools of Textile Technology and Wool and Pastoral Science. In 1997, the Faculty of Applied Science was closed.

UNSW, UNE, UA and UWA participated in the education program of the CRC for Premium Quality Wool, which ran from 1993 until 2001. The CRC participants recognised that individual universities could not justify the resources necessary to offer wool science units within their curricula. An innovative approach of using experts from industry, research groups and universities to simultaneously deliver lectures via video conferencing to the four participating universities was used (Hynd et al., 2000). However, it became apparent that this format could not be sustained in the absence of CRC funding. Powerpoint slides (~2500) created for the video lecturing were placed into a database and can be purchased and downloaded from the website, [www.woolwise.com](http://www.woolwise.com). There are very few experts in wool science at Australian universities who use this resource.

There is sufficient student demand for specialist courses in wool and sheep meat science at Australian universities provided there is national and not single-site delivery. It is unlikely that a specialist wool education degree program could be financially justified at more than one Australian university. No Australian university has offered wool metrology as a unit since the UNSW school was closed. As sheep breeding, sheep nutrition and wool marketing teaching and research all rely heavily on objective measurements of wool, this is a major deficiency. University degrees that could potentially incorporate sheep and wool training were listed by Cottle (2003).

VET has 3000 institutions (1000 state technical and further education Colleges) and 1.5 million students (75% at TAFE) of which 60% are state-funded and 25% are federal-funded. Unpublished data from a scoping study of VET provision (Kilpatrick and Millar, 2005) showed that for delivery of VET related to livestock production, there are around 4000 enrolments nationally, with the 15 most active registered training organisations (RTOs) delivering to about 75% of these.

The VET sector has been shaped by agreed federal and state government policy, but is administered within each state. It is based on a national framework of industry qualifications that are aligned to industry roles. The qualifications are made up of competencies that mirror the tasks a person would be expected to be able to complete in a specific job role. Each competency describes the relevant knowledge and work skills that a person should have to perform a particular task. RTOs have to meet national QA requirements including demonstrating close links with industry and meeting assessment and recording requirements.

Both public and private RTOs operate in the VET sector. The public RTOs are principally the TAFE organisations in each state, but government agriculture colleges are also funded in NSW, SA, WA and Qld. These RTOs typically derive around 25% of their funding from the federal government, 55% from state funding and up to 20% from commercial (fee for service) training activities.

There is an increasing trend to make federal funds contestable between private and public RTOs. The Farmbis program offers subsidised management training to producers and does not require formal assessment, but providers must be RTOs. This has allowed a wide range of short courses to be run. Over the past three years, there have been about 69,000 enrolments of beef and sheep producers, covering areas such as business planning, quality assurance, risk management, marketing and natural resource management.

The development by CRC of training materials that can be used for delivery of both competencies and short courses will significantly increase the level of training that extends the outcomes of CRC projects. The national traineeship system is based on VET qualifications and this provides an opportunity to resource trainers and their trainees with the latest information and outcomes from Sheep CRC programs.

## Results of TNS graduate needs survey

The Sheep CRC and AWI commissioned TNS to conduct a survey on the graduate training needs of the sheep industry via telephone interviews with staff from 100 organisations across Australia. One request was "I would like you to distribute a total of 100 points amongst the following ten broad attributes your organisation may be looking for in employees within the sheep and wool industry" The most important attributes are shown in Table 1.

**Table 1.** Ranking of employee attributes.

Ranking	Attribute	Distribution of points
1	Effective communication skills	1280
2	Problem-solving skills	1269
3	Practical, hands-on skills	1130
4	Ability to seek out new information and interpret it	1065
5	Planning, organising and self-management skills	1035
6	Teamwork	1010
7	Client focus	802
8	Knowledge of technology	778
9	Theoretical skills	715
10	Global perspective	435

This survey indicated that students in schools, VET and universities should all be encouraged to develop skills in communication and problem solving as a priority. These key areas should be addressed in CRC learning resources and professional development programs. Both practical and theoretical skills are valued by employers, and this validates the Sheep CRC approach of an integrated approach to education and training.

The survey also estimated future job opportunities in the industry. The number of jobs for university degree graduates specialising in livestock in the Australian industry is estimated at 3780 over the next five years or about 756 per year. There were approximately 5.78 degree recruits projected per employer surveyed. Education and training has a vital role in encouraging workers into the industry and in adding to the expertise of those already in the industry.

## **Distance education and on-line learning**

The Australian universities in 2002 with the highest proportion of their students enrolled in distance education were UNE (76.5% of 18,202 students), USQ (76.0% of 24,271), CSU (72.6% of 39,776) and Deakin (42.8% of 33,033) (The Australian, 2004).

Student access to resources is improved immensely with new technology, and interaction with peers is much easier than in the past. External students do not feel isolated and they can build up a rapport with other students, which would be much harder without technology. Students need to be self motivated and disciplined to make the best use of an online environment.

Many on-line science-based courses are working well with stand-alone lectures supplemented with email links, direct contact with lecturers through chat rooms and interacting groups across the web. Courses that have a high practical content need to have residential schools to supplement their online component (Cottle, 2003).

The use of innovative technologies to develop learning materials can improve the access of many people to education and training. The use of videoconferencing, CD, DVD and computer-based learning, and flexible training pathways all help to improve access for those wanting to enter the industry, as well as those already working in the industry. Sheep CRC resources incorporate the latest in educational technologies to provide these benefits.

Information for university students as well as for the VET and industry sectors needs to be more readily assembled into a range of customised publications and media that are more rapidly disseminated and more easily accessed and utilised by target audiences. This requires the use of a learning materials management system (LMMS), or content management system (CMS). Such a system is under development at UNE and anyone will be able to access the resources through organisations which have appropriate access licences. These licences will be allocated in three cost categories; core CRC and funders, support CRC parties and third parties.

About 18% of Australia's wool producers used the internet in 2002 to obtain information for managing their wool enterprises, which is less than half the percentage with computers (ABARE, 2003). Among those producers using the internet, most (85%) sought market information, market intelligence (67%) or weather information (69%), with only 24% seeking education resources. Therefore, only about 4% of wool producers currently use educational resources via the internet. There is great potential to develop internet-based resources to provide short course 'just in time' education and training to sheep producers.

## **Sheep CRC E&T outcomes**

AWI, MLA, the Australian Wool Education Trust and the Sheep CRC Education Program have been collaborating closely to improve the expertise and skills of the sheep industry workforce to assist the industry develop to its full potential. Collaboration has occurred in the development of complementary organisation strategic plans for education and training, co-management of scholarship programs and

education advisory committees and co-funding of projects.

Thirty-two postgraduate students have been offered scholarships. Student details are available on the CRC website. Postgraduates have undergone professional development and attended a wool workshop at CSIRO's Textile and Fibre Technology Division.

Undergraduate scholarships were awarded in 2004 to: David Brown, Reola Station, Broken Hill NSW, at UNE studying Agricultural Science; Sarah Houston, of Richmond, Tasmania studying a Bachelor of Agricultural Science at the University of Tasmania; Colin Bignell, of Bothwell, Tasmania studying a Bachelor of Agricultural Science at the University of Tasmania; Neroli Smith, of Boyanup, WA an external student of UNE studying a Bachelor of Agriculture; Matthew Dwyer, from Emu Plains, NSW a Bachelor of Science in Agriculture student at the University of Sydney and Peter Cain, of Natte Yallock, Victoria, studying a Bachelor of Agricultural Science/Bachelor of Commerce at the University of Melbourne. In 2005 scholarships were awarded to: Emma, Downie, "Dungrove", Bothwell, Tasmania studying a Bachelor of Agricultural Science, University of Tasmania, Hobart Campus; Richard Flavel, Tamworth NSW studying a Bachelor of Rural Science at UNE; Claire Lewis, Montrose, Victoria studying a Bachelor of Agriculture at Melbourne – Dookie Campus; Tarsha Macklinshaw, Werris Creek NSW studying a Bachelor of Livestock Science at UNE in 2005; Rebecca Ting, Baulkham Hills NSW studying a Bachelor of Animal Science at the University of Sydney and Tim Salmon, Oberon NSW studying a Bachelor of Livestock Science at UNE. In 2006 the new scholars will be Edwina Lumsden, Fiona Fishpool and Pieternella Van Eerden at UNE and David Lawson at Charles Sturt University.

An 'encyclopaedia' of undergraduate unit material is being produced (Table 2) and will be freely available to the industry at the cost of printing and distribution. A CD is available with information on all units. Each unit includes detailed lecture notes. VET and schools resources have been produced (Table 3).

**Table 2.** Sheep CRC university sheep and wool degree units.

Topic	Code
Wool Marketing and Clip Preparation	WOOL422
Genetic Evaluation and Breeding	GENE412
Early-stage Wool Processing	WOOL452
Wool Metrology	WOOL431
Sustainable Agriculture and Catchment Management	RSNR421
Meat Technology	MEAT418
Wool Biology	WOOL442
Sheep Production	WOOL412
Applied Animal Nutrition	ANUT300
Late-stage Wool Processing and Product Development	WOOL462
Sheep Meat Production	ANPR420
Sheep Production Systems	tba



**Table 3.** VET resource projects.

Topic	Date published	Available from
VET		
National survey of sheep and wool resources	Available	CRC
The Sheep Business learning guide	Jan 06	NSW DPI
Interactive DVD for novice shearing	Available	AWI
Trainer Guide for Merino Sheep Breeding	Dec 05	CRC
Industry short course (Internal Parasite Management)	Nov 05	CRC
Grazing Management Guide	Feb 06	CRC
VET scoping study	Dec 05	MLA
Wool handling DVD (including in-shed testing)	Jan 06	AWI
Schools		
Careers CD package	Feb 06	AWI and MLA
Rotary Youth in Agriculture package	Dec 06	CRC

### Integration of resources and articulation

The Sheep CRC will customise some of the material in the university units for use in schools resources (Table 4). A business plan for a national sheep and wool E&T centre is under development.

**Table 4.** Matrix of CRC Units applicability to education sectors.

Sheep CRC Units	School	VET TAFE College	Industry	University
Clip Preparation and Wool Marketing		✓	✓	✓
Sheep Production	✓	✓		✓
Early Stage Wool Processing			✓	✓
Sheep Genetics	✓	✓	✓	✓
Sheep Meat Technology		✓	✓	✓
Late Stage Wool Processing and Product Development				✓
Sustainable Agriculture	✓			✓
Wool Metrology			✓	✓
Wool Biology				✓
Sheep Meat Production and Marketing			✓	✓
Animal Nutrition				✓
Sheep Production Systems				✓
Practical Skills				✓

The development of VET resources based on the Sheep CRC units, combined with an articulation arrangement with university programs, will increase the uptake of sheep and wool training in the VET sector and encourage more VET students to move on to university. The articulation arrangement will allow students entering university from VET to fast-track their study in the Sheep CRC units. This will encourage VET students undertaking management training to include study of sheep and wool as part of their qualifications. There is potential for both the VET and university sectors to utilise the Sheep CRC units to develop accredited short-course programs for existing industry personnel.

## Conclusions

With the advent of the Sheep Industry CRC education program and the expanded role of UNE in sheep and wool education, it is an exciting time for young people to engage in tertiary education around Australia and entertain thoughts of an interesting career in the sheep industry. There will be employment opportunities in a wide range of disciplines.

The Australian wool industry contributes over \$3 billion per year to Australian exports. Lamb production is worth about \$1.5 billion, and lamb exports worth \$600 million. A program to improve resources for the education and training of the future workforce in these industries and their service industries has obvious national benefits.

The cross-sectoral and cross-disciplinary partnership is unique to industry-focussed education in Australia. The integrated approach to school, VET and university education is working to increase the participation rate and improve quality of education and training for the sheep industry by:

- developing a comprehensive suite of industry-specific multi-media e-learning content for delivery in blended learning programs;
- developing common course content to more clearly support articulation and strengthen credit transfer between providers of both competency- and subject-based education in schools, the VET sector and universities;
- implementing a 'distributed' delivery model for undergraduate teaching in Australian universities where there is inadequate demand to sustain multiple providers of sheep- and wool-specific subjects;
- strengthening links between industry and education providers at all three levels;
- simultaneously implementing complimentary initiatives targeting schools, VET providers and universities;
- supporting industry education in key international markets relevant to the processing of Australian wool.

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