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Forestry at Southern Cross University: fifteen years in review

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SUMMARY

After 15 years, it is timely to review the 4-year bachelor degree in forestry offered by Southern Cross University (SCU), now the only remaining such 4-year degree in Australia. The SCU program is characterised by innovative teaching, a strong fieldwork component, emphasis on research, and strong links with local interest groups (both environmental and industrial). The progressive introduction of two-site delivery and on-line lectures has maintained the viability of the course despite modest student demand.

Keywords: forestry education, bachelor degree course, research

Foresterie à l'université Southern Cross: révision des quinze dernières années

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Après 15 ans, il est temps d'examiner la licence de 4 ans en foresterie offerte par l'université Southern Cross (SCU), à présent le seul diplôme de 4 ans en foresterie en Australie. Le programme SCU est caractérisé par un enseignement innovatif, un élément important sur le terrain, un accent sur la recherche ainsi que des liens solides avec les groupes d'intérêt locaux (environnementaux et industriels). L'introduction progressive de deux sites de cours magistraux, ainsi que de cours par ordinateur ont réussi à maintenir la viabilité du cursus, malgré la demande modeste dont il est témoin.

Ciencias Forestales en la Universidad de Southern Cross: una revisión tras quince años

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Después de 15 años, parece apropiado revisar la licenciatura de 4 años en ciencias forestales ofrecida por la Universidad de Southern Cross (SCU), que es la única que ofrece en Australia dicha titulación con una duración de 4 años. El programa de SCU está caracterizado por una docencia innovadora, un componente de campo sustancial, énfasis en investigación, y lazos estrechos con grupos de interés local (tanto medio-ambientales como industriales). La introducción progresiva de la formación en dos campus y ofrecer clases en línea han mantenido la viabilidad del curso a pesar de una modesta demanda por parte de los estudiantes.

INTRODUCTION

Forestry training and research commenced at Southern Cross University (SCU) in 1996, with the introduction of a 4-year degree of Bachelor of Applied Science (Forestry). In the intervening 15 years, the program has been revised and renamed Bachelor of Forest Science and Management, and supplemented with complementary degrees including a Graduate Diploma of Forestry, and a coursework Master of Forest Science and Management. Although growth has been modest, student numbers at Southern Cross University during these 15 years have run counter to national and international trends of declining enrolments in forestry (Leslie *et al.* 2006, Innes 2010). This paper reviews selected SCU Forestry achievements and identifies aspects that may help strengthen tertiary forestry programs elsewhere.

The history of forestry education in Australia has been documented elsewhere (Carron 1980, Roche and Dargavel 2008, Collett 2010), so it suffices to observe that in recent times, SCU was the third university in Australia to offer a 4-year bachelor degree in forestry, after the University of Melbourne in 1943 and the Australian National University in 1964. Three other Australian universities briefly offered comparable degrees (Vanclay 2005c), but these offerings have been short-lived due to a shortage of students. More recently, both the University of Melbourne and the Australian National University have ceased to offer 4-year forestry degrees, with the University of Melbourne adopting the 'Bologna model' (a generic 3-year bachelor degree followed by a 2-year masters degree in forestry), and the Australian National University switching to a 3-year forestry degree within a broader environmental program. SCU's response to the changing student demography was to establish a satellite program at Mount Gambier in the 'Green Triangle' region of southern Australia (so-named because of the concentration of forest industry). Since 2005, students have been able to study SCU's forestry program in Lismore or in Mount Gambier, with units offered via a combination of online lectures, local tutors and residencials. The Mount Gambier program has been strongly supported by local industry, with companies offering staff study-leave, offering scholarships and vacation employment, and offering employment to graduates.

In response to a recognised shortage of foresters in Australia (Anon 2009), several tertiary and vocational education providers work closely with government and industry to attract more students into forestry-related study within Australia. One of these initiatives is a series of scholarships worth AU\$10,000 sponsored by the Institute of Foresters of Australia and available to students who either enter an undergraduate forestry program in their first year or who transfer into forestry studies in their second or third year.

TEACHING FORESTRY AT SCU

The forestry curriculum at SCU is characterised by small classes offered in two locations (Lismore in eastern Australia, and Mt Gambier in southern Australia), supplemented with

FIGURE 1 SCU Forestry field class, 2011



regular field trips (Figure 1), interactive tutorials (e.g., Vanclay *et al.* 2006) and on-line support (reading material and video-recordings of lectures available for download). Students at the Lismore campus have the choice of weekly face to face lectures, or on-line lecture recordings available on demand. The curriculum at both Lismore and Mt Gambier includes tutorials, practicals and field work, which may be conducted weekly or during intensive residential programs. This means that students have a great choice in how to learn – ranging from weekly face-to-face classes to online on-demand with intensive workshops – satisfying diverse student learning styles. Courses are informed by regular internal and external reviews intended to refresh offerings and maintain relevance (Vanclay 2007, Ewan 2009). When appropriate, problem-based learning is favoured (Boyd 2011), and students are assisted to publish findings (e.g., Aenishaenslin *et al.* 2007, Vanclay *et al.* 2011). Students complete sixteen weeks of work experience in approved work placements during their studies (Cullen 2005); these placements foster community engagement, help strengthen the relationship between university and industry, and often lead to offers of employment for the students involved. Several students have used these work placements to gain overseas experience and pave the way to an international career. The Commonwealth agencies Australian Youth Ambassadors in Development (AYAD) and Australian Volunteers International (AVI) also provide opportunities for forestry graduates to gain international experience. In some cases they are specifically nominated to be associated with university-led research projects. The Australian Centre for International Agricultural Research (ACIAR) project on silviculture of the native Vanuatu species Whitewood (*Endospermum medullosum*) recently sponsored two AYAD volunteers, each of whom spent six months on the island of Espiritu Santo Island, Vanuatu. SCU values this international engagement, and has hosted forestry students from Bhutan, China, Germany, Indonesia, Laos, PNG, Solomon Islands, Vanuatu and Vietnam. There is currently an active two-way exchange agreement with Northern Arizona

TABLE 1 Graduate destinations of SCU Forestry graduates

Category	Frequency
Government Forest Services	45%
Private Industrial Forestry Companies	17%
Further Study	6%

University in Flagstaff, Arizona, USA, which enables students to substitute one or two semesters at the exchange institution. These opportunities diversify the experience of all students helping them to become global citizens able to respond to management issues with a diverse knowledge of environmental and cultural issues.

The majority of forestry students at SCU are 'mature-age', defined by Australian authorities as students over 20 years old. Few of the students entering the SCU forestry program are "school-leavers" who have just completed high school, and most have had some years of experience in the workplace. In many cases students are in their thirties or forties and undertake the undergraduate degree to enable a career change. In some cases (Mt Gambier in southern Australia), most of the students have long been employed by the industry and their formal qualifications will facilitate a promotional pathway to professional positions with their current employer. The SCU program recognises prior learning and experience, and the diversity of the curriculum allows independent learning to meet the needs of both younger and mature students within the same unit cohort.

Employer and graduate surveys consistently reveal the need for diverse skills, especially with regard to communication (Vanclay 2007, Jacobsen *et al.* 2008). Thus oral presentation and writing skills are emphasised within SCU's degrees, and students are encouraged to publish research arising from honours (e.g., Pelletier *et al.* 2008), graduate diploma (e.g., Thinley *et al.* 2005) and doctoral programs (Angel *et al.* 2008, Bristow *et al.* 2006, Grant *et al.* 2010, Kariuki *et al.* 2006a,b, Leys and Vanclay 2011a,b).

FORESTRY RESEARCH AT SCU

Research is one of the strengths of the SCU Forestry program, with a steadily increasing output of research findings spanning the breadth of forestry (Table 2). Particular strengths are arboreal fauna (Goldingay 2009), community engagement (Leys and Vanclay 2011a), forest genetics (Shepherd and Raymond 2010), forest health (Lan *et al.* 2011), growth modelling (Weiskittel *et al.* 2011), mangroves (Saenger and Brooks 2008, Stokes *et al.* 2010), mixed species plantings (Nichols *et al.* 2006, Forrester *et al.* 2011), native forest silviculture (Kariuki *et al.* 2006a), plantation management (West 2006), policy (Lloyd 2008, Vanclay and Nichols 2005), and wood science (Raymond *et al.* 2010a). Figure 2 illustrates the co-authorship network amongst the SCU forestry staff, along with key topics identified by the citation analysis package CiteSpaceII (Chen 2006). Figure 2 is a minimum spanning

tree that eliminates redundant links, but the remaining non-redundant links reveals the extent of collaboration reflected as coauthorship of journal articles.

Most forest research at SCU is conducted in partnership with end-users such as land management agencies and forest industries, helping to maintain relevance and prompt uptake of research findings. These client relationships are supplemented with a commitment to publish research findings, and to monitor impacts (Vanclay 2008a,b, 2010a, 2011a).

SCU is a member of the International Union of Forest Research Organizations (IUFRO) and SCU forestry staff are active as IUFRO office-bearers. This relationship with IUFRO facilitates professional networking and fosters specialist mentoring that can otherwise be difficult to arrange within small institutions. SCU participates in other international endeavours including EFIMED (the Mediterranean Regional Office of the European Forestry Institute) and the IUCN (International Union for Conservation of Nature) Commission on Education and Communication.

COMMUNITY ENGAGEMENT

Consistent with SCU's mission to 'be regionally relevant and globally significant', forestry staff and students engage with professional and community groups such as the Institute of Foresters of Australia, Australian Forest Growers (AFG), and the Subtropical Farm Forestry Association (SFFA). The SFFA is a non-governmental organisation involved in promoting on-farm tree planting, particularly in the moist subtropics surrounding Lismore (in eastern Australia), but also in generally advocating farm forestry for the country. University researchers have supported the AFG, SFFA and other interest groups by assisting with field days, conferences and workshops, as well as by contributing current research findings in accessible ways through association newsletters. SCU faculty have also assisted in writing funding proposals and make in-kind contributions of their time and expertise when projects are supported. For example, with SCU support, the SFFA recently received a \$350,000 grant from the national 'Caring for Our Country' scheme that focuses largely on forests for biodiversity and conservation outcomes.

Several SCU Forestry staff have been recognised for their achievements: Dr Ross Goldingay was awarded the 2011 Vice-Chancellors's award for Excellence in Teaching and Learning for "authentic, field-based learning about wildlife conservation that illuminates the nexus between teaching and research". Diana Lloyd is a director of Australian Forest Growers, the national association representing private forestry and commercial tree-growing interests in Australia. Dr Doland Nichols has been recognised as a Fellow of the Institute of Foresters of Australia. Dr Graeme Palmer is secretary of the Australasian Timber Drying Group. Prof Jerry Vanclay is a member of the advisory group to EFIMED (the Mediterranean Regional Office of the European Forestry Institute) and received the 2010 IUFRO Scientific Achievement Award. This recognition reflects both their calibre and commitment.

TABLE 2 Selected research outputs from SCU Forestry

Topic	Planted and natural <i>Eucalyptus</i> forest	<i>Pinus</i> and other conifers	Mixed and indigenous plantings	Mangroves	Rainforests	Environmental services and non-wood products
Genetics and tree breeding	Hamilton et al 2008, 2009, Jones et al 2001, 2006, Le et al 2009, Ochieng et al 2007a,b, 2008, 2010, Sexton et al 2010, Shepherd & Raymond 2010, Shepherd et al 2005, 2010.	Elliott et al 2005, Raymond 2011, Raymond & Henson 2009, Raymond et al 2009, 2010b, Scott et al 2005, Shepherd & Williams 2008, Shepherd et al 2002a,b, 2003a,b, Wielinga et al 2009a	Shepherd et al 2006, 2007b, 2008a,b, 2011,	Arnaud-Haond et al 2006, Maguire & Saenger 2000, Maguire et al 2000a,b, 2002, Sheue et al 2009	Shepherd et al 2007a	Jones et al 2008
Forest dynamics, modelling, physiology	Bristow et al 2006, Listyanto et al 2010, Grant et al 2010, West et al 2008a,b	Palmer & Vanclyay 2009, Skovsgaard & Vanclyay 2008, Vanclyay 2009a, 2010a, Vanclyay & Sands 2009	Bosu et al 2006, Forrester et al 2006, 2011, Grant et al 2006, Kelly et al 2009, Nichols & Carpenter 2006, Nichols et al 1999a, Vanclyay 2006a,b	Iftekhar & Saenger 2008, Saenger & Brooks 2008, Youssef & Saenger 1998, Stokes et al 2010	Kariuki et al 2006a,b, Nebel et al 2001a,b, Sheil et al 2006, Smith et al 2005	Rose et al 2010, Specht & West 2003, Vanclyay et al 2008a, West 2009, 2011
Silviculture, Forest health, Wood science	Angel et al 2008, Lan et al 2011, Murphy et al 2005, Pelletier et al 2008, Raymond et al 2010a, Shepherd et al 2000, Stone et al 2010, Thinley et al 2005, Vanclyay et al 2008b	Chan et al 2010, 2011, Raymond & Joe 2007, Raymond et al 2007, 2008, 2009, Toulmin & Raymond 2007, Wielinga et al 2009b	Hanson et al 2005, Nichols et al 1999b, Nichols et al 2001, Specht & Turner 2006, Streed et al 2006,	Saenger et al 2008	Nebel et al 2001c,d, Smith & Nichols 2005	Vanclyay 2009b
Forest fauna	Ball & Goldingay 2008, Ball et al 2011, Beyer & Goldingay 2006, Beyer et al 2008, Eyre & Goldingay 2005, Goldingay et al 2007, Harris et al 2007, Lloyd et al 2006, Sharpe & Goldingay 2007, 2010	Goldingay et al 2010	Christidis et al 2008, Goldingay 2009, Goldingay & Stevens 2009, Goldingay & Taylor 2009, Taylor & Goldingay 2010	Eyre & Maher 2011	Goldingay et al 1996	Goldingay & Whelan 1997, Goldingay et al 2011, Hayes & Goldingay 2009
Other: Policy, Socio-economics, History	Barbour et al 2008, Leys & Vanclyay 2010, 2011a,b, Nichols et al 2010,	Johnson et al 2006, Vanclyay 2005b, West 2006	Jago & Boyd 2003, Mertens et al 2004, Nichols et al 2006, Pearce et al 2003, Prastyono et al 2011, Vanclyay 2001, Vanclyay 2006c,	Saunders and Taffs 2009	Jago & Boyd 2005, Torrence et al 2009	Lloyd et al 2005, 2010, Munyasi & Nichols 2007, Putz et al 2008, Stubbs 2008, Vanclyay 2005a, 2010b, 2011b, Vanclyay & Nichols 2005

FIGURE 2 Minimum spanning tree of co-authorship, showing key researchers and activity, computed by CiteSpaceII (Chen 2006) with data from Web of Science. Colour spectrum indicates date of collaboration (blue=1996, red=2011)



CONCLUSIONS

SCU, like most educational institutions, seeks to create a quality learning experience for students, and it is our view that success in inspiring students to become self-motivated life-long learners will also lead to success for the host institution. Even though funding limitations may constrain the available resources, our experience is that a quality experience can be provided through innovative teaching informed by current research and illustrated with field trips and other hands-on experiences. Our experience also reveals that strong community engagement is mutually beneficial and produces graduates who are global citizens well-equipped to become forestry leaders.

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