INTRODUCTION

While there are certainly significant differences between agriculture and forestry as domains of human endeavour, they also share much in common. Both, after all, are concerned with the utilisation of land resources by purposeful human beings, occurring at what might be referred to as "the interface between people and their bio-physical environments". While each provides the basis for complex and dynamic commercial industries, they both must also concern themselves with meeting certain subsistence, recreational, and even spiritual needs of people in a host of different locations across the face of the earth. Both domains are best characterised as a range of different employment opportunities rather than as discrete professions, and thus neither presents a neat set of competencies required by those who would study to work within them as ‘practitioners’.

Most significantly of all in the present context, both, in a manner of speaking, are currently facing a similar ‘developmental crisis’ which amounts to nothing less than a shift in the entire paradigms undergirding them. Over the past two decades or so, forestry, like agriculture, has been confronted by the need to transform itself within a context of the need to establish and follow strategies of development that are adjudged, by an increasingly critical civil society, as being ‘ecologically sustainable’ (ESD). The difficulty is that no one is quite sure what that means, and that poses problems of a special significance to those concerned with the education of those who will be the practitioners of the future. In times past, curriculum reform within both domains, tended to be a very incremental process represented essentially by the substitution of some courses or subjects for others, in response to the perceived needs of those already 'in the industry', and/or as a reflection of 'academic fashions'. Certainly over time, there has been a trend within both agricultural and forestry educational institutions, for a number of social sciences to be slowly introduced into curricula which traditionally were previously focussed, very singularly, on the natural sciences. Meanwhile, curricular reform in both domains have been long characterised by almost perennial debates about the optimal balance between theory and practice.

The argument to be presented here is that such an incremental basis for curricular reform, while perhaps adequate during times of relative stability, is grossly inadequate at times of acute challenge and change - such as those now being presented in the name of that shift in paradigms that the prevailing clamour for ESD represents.

The current situation within both forestry and agriculture demands concurrent transformation of the domains themselves and reform of the curricula that are designed to both influence and be influenced by such changes. It is a matter of co-development of each with the other that is dictating, in turn, a radical revision of the role of educational and research institutions. This at least is the conclusion that can be drawn from a particular set of initiatives in agricultural education that have extended over nearly three decades at Hawkesbury, in the state of New South Wales, in Australia.

While it is clearly recognised that particular innovations in curriculum are very much functions of specific contexts in place and time, there are invariably some lessons of general applicability that can be learned. Such, it is hoped, is the case with lessons from the Hawkesbury Experience which forms the focus of the narrative that follows. As the author of this paper (who was the designated leader of these initiatives between 1978 and 1993) sees it, there are a number of points of key general significance that can be recognised and that are presented here in the introduction, as a ‘perspective setter’ for the remainder of the text.

The first of these has already been mentioned:

(1) The reform of curriculum in domains such as agriculture and forestry, is an aspect of the larger issue of the transformation of those domains, and it is this ‘larger scale’ transformation that indeed provides both the motivation and perspective for curricular change.

This leads to the obvious implication that:
Institutions involved in education and research in such domains need to be organised in a manner that allows their members to fully participate in both processes.

From this it follows that:

While the organisation of the process of curriculum reform might be vested with a small group or committee, it is essential that it be a matter in which the entire faculty participates, together with representatives from a range of stakeholders including students and alumni, along with members of appropriate commercial organisations, public sector institutions, non-government organisations, and rural community groups.

In addition to exploring the needs of the domain itself, it is important that the discussions also embrace pedagogical principles and practices of education:

Reform of the processes of education, particularly within the context of contemporary views on multiple ways of knowing and of the significance of multiple worldviews on development, is as important as the content, and this dictates the importance of philosophy as well as science as vital aspects of the process of reform.

This is of special significance when it is recognised that:

The essential focus of curriculum reform is the future: Students of today are being educated for the needs of tomorrow.

It should also be appreciated that:

The process of curriculum reform is not a ‘one-off event’, but an on-going process of development that demands continued commitment and effort.

The key understandings that emerge from these observations are that (a) education is a process of human development which (b) provides the foundation for the development of such domains as agriculture and forestry: Where the notion of development implies some form of improvement or another both to circumstances associated with the domain under question, and with the process by which such improvement is identified, ‘owned’, managed, and evaluated.

The Foundations of Hawkesbury’s Reforms

It would have been marvellous if all of these six points had been appreciated at Hawkesbury Agriculture College back in the early nineteen seventies, for had that been the case, the rate of progress in curriculum reform at that institution, and the extent of its role in the process of transformation of Australian agriculture, might have been much less difficult and significantly more effective than it subsequently transpired to be. As it was, they were matters that only evolved as the process of curricular reform and the transformation of the domain of Australian agriculture subsequently unfolded over what has been almost three decades of virtually continuous change in both - with each set of endeavours vitally informing the other. In retrospect, the foundations for this dynamic state of affairs can be seen to have been associated with (a) the appointment of a particularly visionary Principal of the then, small regional College which to that point, had been, from its establishment in 1891, a section within the state Department of Agriculture, (b) the decision of that leader, with others, to facilitate the change of that status to allow the college to become an autonomous institution as one of the Colleges of Advanced Education (CAE) recently established by the Australian Government, and (c) the development of a post graduate diploma program for mid career extension officers that was based explicitly on adult learning principles. In many ways, these changes were as radical as had been the situation some eighty years earlier, when the College was established to bring scientific technologies to the farmers of the land.

Underlying the early 1970s initiatives was a sense, shared by many, that Hawkesbury was failing to meet the challenges of the times as far as Australian agriculture was concerned. These concerns centred around a realisation that the State needed farmers and support professionals, such as extension officers, who were more than just technicians trained in the husbandries of practical agriculture. The essential socio-economic ‘driving forces’ of the day were focussed on the need for significant increases in productivity to counter the constraining effects of terms of trade that had been in a steady decline over the previous two decades. And, it was being argued, such productivity gains could essentially only be achieved through far more efficient use of technologies and more acute understanding of the scientific and economic principles which underpinned them. The quality of education at Hawkesbury would, it was felt, have to increase quite significantly to embrace these ‘change drivers’, especially given the fact that in addition to Hawkesbury Agricultural College, there were, in the state of New South Wales, three universities that were offering four year degrees in agricultural science and two other Colleges of Advanced Education also offering three year diplomas like those being offered at
Hawkesbury.

The initial response to this situation at Hawkesbury, in addition to the introduction of the post graduate diploma, was to reform the undergraduate diploma curriculum through the introduction of much more scientifically rigorous courses, the development of a system of electives and ‘majors’, and a reduction in the emphasis in the ‘technical skills’ aspects of the curriculum. A two year associate diploma program was also introduced concurrently with these reforms, which retained a significant practical focus.

By 1978, by which time Hawkesbury had been an autonomous CAE for nearly three years, the feeling persisted both among the faculty and the administrators, that these reforms were still inadequate, and encouragement was given for further reforms to be undertaken. The author, who was at the time, Dean of one of the university faculties in the State, was appointed as Head of the School of Agriculture at Hawkesbury to initiate further changes in the curriculum, and indeed in the role that the School was playing in the further development of the nation’s agriculture. As was later recorded (Bawden 1985), the essential trigger for the next generation of changes "was an awful sense of unease that pervaded the School about the mismatch between the competencies of our graduates in agriculture and the needs of the industries and professions they were entering". To say nothing of the needs of society at large with respect to matters such as the quality and safety of agricultural produce, and the integrity of the environment from which it was produced.

The matter of competencies, and the emergence of an educational paradigm that was "competency-based", has been a feature central to the Hawkesbury initiatives throughout. Where the initial impetus for pursuing what was later to be referred to as the development of praxis- theory-informed-practice - was the competency profile of its graduates, faculty soon came to recognise the significance of the need for the development of their own praxis, their own profile of competencies as agricultural practitioners at the dawn of a new era - the age of persistence or sustainability.

The opening gambit of this new round of reforms was thus to attempt to place them within the broad context of the changing nature of Australian agriculture, and to do this in a manner that would attract the majority of the forty plus academics in the School in the endeavour. Many of these were relatively recent appointees, recruited at the time of the transformation of Hawkesbury to CAE status, and most had come there with research degrees from universities, in strong contrast to the more practical profile of the 'oldstagers'.

The starting point was the establishment of open communication across the School and the invitation for each and every member of the academic staff to research into two questions of fundamental importance, and to take every opportunity to share their findings with their colleagues. The aim of this 'community discourse' was to develop collective views and opinions about (a) the present and potential future nature and state of Australian agriculture, and (b) how one learned about that! In essence the two questions addressed by the Hawkesbury community were (a) "what do we mean by agriculture", and (b) "what do we mean by education"?

These were questions that had profound theoretical and philosophical foundations as well as practical implications, and it has to be recorded that the level of commitment that developed among the faculty to embrace these matters too, was astonishingly high, especially given the fact that the vast majority of them had backgrounds in the physical and biological sciences rather than the social sciences or humanities.

The significance of this grand 'participative action research project' and the theoretically and philosophically informed 'rolling discussions' that characterised it, and that indeed persisted for many years within the School, cannot be overestimated. Seminars, presentations, workshops, and a variety of 'in-house' newsmedia became common features of the environment as faculty went about their inquiries into the very purpose and nature of agriculture and of education for it. These initiatives had a number of outcomes, not the least of which was the establishment of an internal culture within the School of what might be termed 'critical discourse'. It was no longer enough for faculty to merely be subject specialists in some aspect or another of the science and/or technology of agriculture, nor to rely solely on conventional lecture/practical educational strategies. It became the norm to develop informed opinions about agriculture as a whole domain, within the even broader context of rural development, as well as to explore developments in educational theories, philosophies and practices, that might have relevance to a new paradigm for agricultural education. For the fact of the matter was that it was very soon recognised that Australian agriculture was in the midst of a what amounted to a critical challenge to its prevailing paradigm: The beliefs, values, and techniques that had for so long underpinned the purposive role of agriculture in Australia's economy since the settlement of Europeans in the late eighteenth century, were, almost two centuries later, under considerable siege from a number of different directions encompassing a number of different agendas.

As confidence in their internal process of 'critical discourse' grew, Hawkesbury faculty started to extend their discussions into more public domains adding their voices to the ever-increasing national debate about the inadequacy of what they termed the production/productivity paradigm. Freed from the constraints of being an
institution within government, and encouraged by the clarity and logic of their own arguments, the faculty began to re-appraise the role of their institution from a much broader perspective. It was becoming apparent that the exercise that had started out as the reform of curriculum within the College, had greatly expanded its focus to embrace the idea of contributing to the national debate about a changing agriculture, and most especially what needed to be changed to improve its persistence as a significant endeavour in the country.

Significantly, the contributions to national debate were not confined solely to agriculture or to the call for paradigmatic change in that domain: For Hawkesbury faculty were also soon to add their voices in critique of the paradigms that were prevailing in higher education in general in Australia at the time, and, more specifically, in the models of pedagogy that were being adopted by most agricultural educators in that country, and beyond.

It was beginning to be appreciated within Hawkesbury, that curriculum reform and the transformation of the domain of agriculture, needed to proceed concurrently in a manner that allowed each to influence, and be influenced by, the other.

The Problematique

The critique that Hawkesbury brought to debates about the state of agriculture in Australia at the end of the nineteen seventies, was notable for its comprehensiveness. In a domain long characterised by compartmentalisation and reductionism, this was a radical departure from the norm; and especially for an historically ‘technically focussed’ essentially ‘teaching’ institution. Where conventional criticisms of agriculture had long tended to reflect the specific disciplinary perspective or worldview of the commentator, be he or she an agronomist, economist, ecologist, sociologist, or political scientist, or producer, community development professional, or politician, the Hawkesbury position was a much more integrated picture. The application of ever-more intensive production technologies in the continuing quest for productivity gains was undoubtedly creating its own problems, and this indicated that there were some very profound issues with respect to the very bio-physical problems of agricultural productivity.

Perhaps the most significant concern at the time was the realisation that many of the problems that were being identified, had their origins with the introduction of technologies and scientific procedures that themselves had been introduced as ‘solutions’ to previous sets of problems. Agricultural technology was clearly beginning to create its own problems, and this indicated that there were some very profound issues with respect to the very way by which agriculture was being conducted in Australia, that needed to be explored. Improvements in agriculture from this deeper perspective set within the broader context of responsible rural development, was clearly a complex, very systemic matter, that needed new approaches to both thinking and action. - theory and practice.

It was one thing to appreciate this point, but quite another to take action to do anything about it. Engaging as many ‘stakeholders’ in critical discourse was an important first step in raising awareness of the nature of the issue, but much more was needed if the situation was to be improved. And herein lay a new ‘problem’: With a focus on increasing production or productivity, the parameters of success were obvious. In the former case it was simply a matter of producing more, in the latter, producing more efficiently. The focus for improvements in agriculture from the much more comprehensive perspective of responsible, ‘sustainable’ rural development, were much less clear.

Who would it be who decided what it was that constituted such improvements? And what criteria would they use? How could decisions, which concurrently addressed food security, export income, farmer well-being, and the integrity of both the physical environment and rural communities and families, be sensibly made? And how could people learn how to make such decisions?

It was this last question in particular that would begin to seriously entertain the minds of the Hawkesbury faculty as their attention was drawn to the need for concrete curriculum proposals to be made. It was obvious that the agriculture of ‘the tomorrow to come’ would need to be very different in kind to that which prevailed at that moment or that had prevailed in times past. It was equally obvious that the ‘new agriculture’ would need new types of professionals to develop it, and that these people would need competencies and capabilities that were yet unknown! There was no doubting the complexity of the task facing educators who were prepared to...
meet this challenge. For, as has already been mentioned, just as the research into the nature and state of Australian agriculture had revealed the multiplicity of its challenging aspects, so too had the same occurred with inquiries into the nature and state of ‘higher education’ in the country. Just as agriculture was seen to have multiple faces, and be purposeful (filled with many different purposes) rather than purposive (or single purpose), so too was education. Of particular importance was the realisation that there were a variety of ways by which people learned about the world around them, and that decisions about ‘improvements’ in domains such as agriculture, involved moral ethical and aesthetic values, and profound beliefs about the nature of reality as well as how one can come to know about it, as well as knowledge gained through scientific reason and technical application. All of these dynamic aspects of human nature come together, it was appreciated, as perspectives or views-of-the-world that varied between different individuals concerned with the same matters, as well as within the same individual, at different times and under different circumstances. The two classical educational approaches of ‘learning by being told (propositional learning)’ and ‘learning by doing’ (practical learning) that had for so long prevailed at Hawkesbury were clearly not adequate for dealing with such a complex decision process that involved highly differentiated worldviews. To be effective as a facilitator of responsible change, it could not just be a matter of learning to know (theory) and learning to do (practice), but of learning to be - learning for praxis.

Through their research, it was becoming abundantly clear to the faculty, that new conceptual models or intellectual maps were needed as theoretical and philosophical frameworks to guide responsible reforms, and these slowly began to emerge as faculty critically searched a very wide spectrum of literature, as learning activities increasingly appreciated by them as being central to the development of their own practice.

Emerging Conceptual Frameworks

As would be later recorded in a seminal paper published in the international journal *Agricultural Systems* (Bawden et al 1984), the innovations at Hawkesbury were essentially built upon four conceptual foundations: (i) an intellectual map of agriculture, developed by Kenneth Dahlberg (1979), in which he portrayed it as “the basic interface between people and their environments”, a complex situation which other writers, notably Colin Spedding (1975), John Dillon (1976), and Cox and Aitken (1979), believed demanded ‘systems approaches’ for its comprehension and development; (ii) an intellectual map of education for active, life-long learning, which particularly reflected the views of a number of theorists and philosophers of education, including John Dewey (1910), Jerome Bruner (1966), Carl Rogers (1969), Jean Piaget (1970), Paulo Freire (1972), and Malcolm Knowles (1975); (iii) an intellectual map of learning for praxis as ‘experiential problem-solving’, as portrayed by David Kolb (1984), systems thinking and practice for ‘situation improvement’, as seen by Peter Checkland (1981), and as competency development as promoted by George Grant and his colleagues (Grant et al 1979), and supported by Jim Lees and his colleagues (Lees et al 1982) specifically for agricultural education in Australia; and (iv) an intellectual map of the School as an adaptive organisational system in constant interaction with its environments, as conceived and promoted by Russell Ackoff and Fred Emery (1972), and Kast and Rosenzweig (1981).

Put simply, students (and staff) at Hawkesbury, in coming to appreciate the inherent complexity of agriculture as a human activity at the interface between people and their environments, would enthusiastically embrace systems approaches as relevant ways of thinking and acting to deal with them. Such systemic development, would be a participative process through which people affected by the situation, could collectively "learn their way through to improvements". Students would learn how to progress their competencies as learners, as communicators, and as development practitioners, in response to a host of different learning projects deliberately designed to continually challenge their capabilities in a manner akin to the sequential acquisition of levels of proficiency in a second language, or at a new sport, or with an unfamiliar musical instrument etc where these proficiencies expressed one's whole being, rather than mere technical skill and knowledge. Learning to be an accomplished linguist, or sportsperson, or musician - or development practitioner - is clearly much more than merely learning an appropriate body of knowledge and set of practical skills.

Over the ensuing years, the theoretical and philosophical foundations would be greatly extended as can be noted through reference to a sample of a succession of the publications that have emanated from the Hawkesbury team (Bawden et al 1984; Bawden and Valentine 1984; Macadam and Bawden 1985; Bawden 1989; Bawden and Ison 1992; Bawden and Packham 1993; Bawden 1994; Bawden 1996; Kay and Bawden 1996).

As the initiatives have grown and diversified, so there has been a continuing reinforcement of the significance of education as the process of praxis or ‘praxial’ development; of the staff as well as the students, along with a host of other people as ‘learning collaborators’, from rural communities, within farm families, and within agricultural institutions and service organisations. In his reference to competency-based education, Grant argued that it is essentially a ‘staff reform’, or, as the Hawkesbury team came to see it, what might even be considered a ‘total system reform’ - "Competence-based programs go to the root of the relationship between
faculty and students and require faculty members to rethink their role. They must move away from their traditional lecturer role and learn to teach in other settings...they must spend less time performing themselves and more time observing the performance of students" (Grant 1979).

The essence of what might be termed the Hawkesbury approach to education as it has evolved, can be captured by the notion of the facilitation of the process through which learners learn how to be systemic: Learn how to approach and deal practically with complex messy and multi-dimensional issues associated with the responsible, systemic development of agriculture, of rural people, and of the environment in which they live and work. And all the evidence that has been garnered there over the years suggests that this is process that is equivalent to a personal maturation, where such maturity, as has been described by West Churchman (1971) the contemporary American philosopher, is the ability to hold on to different worldviews at one and the same time, and to appreciate (and indeed exploit) the significance of such differences.

Where, at the early stages of the developments, the emphasis at the School was on the study of systems ‘out there’, be they farming systems, organisational systems, educational systems or whatever, the emphasis soon shifted towards the ‘systems within’, or in other words to systems of learning, or learning systems. If things were going to be done differently in rural Australia, then those who would do these different things first needed to have learned how to think differently. Their systems of learning would have had to have changed, and it would be this dimension, of personal change, that would be a primary focus of praxis and thus competency development. At Hawkesbury this sentiment would be reflected in a deliberate shift in emphasis from learning (about) systems to learning systems (Bawden 1990).

It is vital to emphasise that these theoretical insights have grown out of an ever-continuing ‘flux’ between theory and philosophy on the one hand, and practical experience on the other. Those within the School, interacting extensively with those out in the rural sector and within agricultural industries, have ‘learned their own ways forward’ and in so doing, have been on a continuing learning journey of praxial or competency development both as agriculturists and as educators.

It is appropriate at this juncture then to return to an exploration of some of the actual initiatives that provided the focus for the experiences.

**Pilot Experiences**

Convinced of the need for ‘new ways of knowing’ and inspired in particular by those who were involved with the freshly established graduate diploma in extension, the faculty, which included two graduates from that program, decided to explore strategies for experiential learning (‘learning through everyday experience’) as a potential focus for their new curriculum. As it was later to transpire, this decision, and the manifold initiatives that flowed from it, proved to be of fundamental importance to the emergence of what has subsequently come to be called, a ‘critical learning systems approach’ to development, or learning for systemic development. It is true to say that that significance was certainly not fully appreciated at the time.

In 1979, a two year associate diploma in animal production was launched by the School as its first ‘pilot’ initiative in experiential education. For that purpose, experiential learning was accepted as that process through which people transform their everyday concrete experiences into conceptual knowledge which is then, in turn, used to guide actions to change the nature of the experience. From this perspective, experiential education is aimed at the development of each learner as one who is adept at adapting to, and co-adapting with, changes in their surroundings. The key pedagogical element in the process is therefore the provision of opportunities for students to be put into ‘real world’ situations which they must ‘learn their way through’ in order to ‘take appropriate actions’ to create improvements in them. The experiential process therefore involves students in the two primary sets of activities of ‘finding out’ and ‘taking action’ - with the outcomes of each informing the process of the other. As the action involves some form of change to (a) the situation itself, and/or (b) the learner him or herself, and/or (c) the relationship between the two, it gives rise to a new situation which becomes the trigger for another ‘round’ of learning. With encouragement, students can also learn about the process of learning itself, and to improve their capabilities as learners as a result. And so the process proceeds, underlying the fact that, in everyday life, we are continually learning to adapt, and to improve the circumstances around us. Education can be construed as that process that allows us to also learn how to improve how we go about that. Life is a recurrence of learning (to improve matters to hand), and education allows us to learn how to better learn (to improve the way that matters to hand are addressed).

The major experiential vehicle for the animal production program at Hawkesbury (and for the analogue in horticulture that would soon follow) was a number of commercial ‘mini-farms’ that were established on the College estates. The students learned how to collectively manage these enterprises through assuming the responsibilities for just that: Working and studying together in small groups, they learned how to BE managers through the process of managing! During the first year of the two year program, students were ‘apprenticed’, as
under-managers, to their senior (second year) peers who were accountable for the full management of the operations and strategic development of their particular enterprise. Faculty and field staff supported them as they ‘learned their way through’ the process. Learning packages, often combining both propositional and practical components, were developed as vital supplements to the experiential process. Some of these were formally offered as sequenced ‘learning opportunities’ while others were available ‘on call’. A sojourn of several months on a full commercial enterprise, living and working with a farmer and his or her family somewhere ‘off campus’ in the rural areas of the State, was another central experiential vehicle in the program. Faculty in the program would visit their students out on their host family farms on at least two occasions, and this exposure to the everyday issues facing the nations farmers would become a very important aspect of the reorientation, indeed actual transformation, of the School.

Over the first two years of their conduct, much of what was learned from the associate diploma programs, was used to inform the extended discussions that were ensuing at the same time, about the nature of reforms that should be made to the central program of the School, that was, at the time, a six semester diploma program in applied science. Faculty had gained confidence in facilitating experiential learning, had gained experience in managing ‘self-directed’ learners, had established innovative assessment protocols, and had learned a great deal about the complex state of the nation’s agriculture as well as about the equally complex processes of learning and education.

They had also learned much about themselves as learners, and had begun to conceive of the School as an extended community - or at least network - of learners that included themselves and the farmers with whom the students were studying, as well, of course, as the students themselves.

It might be said that there were five particular sets of lessons that were learned from those early ‘pilot’ experiences with the associate diploma program, and this included many challenges and weaknesses as well as successes and strengths of the approach:

(1) **Learning to Manage**

It was certainly true that students could learn how to manage through the act of managing, although much depended on their motivation and continuing commitment to a process with which few of them were familiar prior to their enrolment in the course. Motivation varied enormously among different students, and was also particularly affected by the specific mini-farm enterprises to which the students were allocated. With the limited resources that were available on the College estate, it was just not possible to meet the particular wishes of every student for the enterprise of their choice. Furthermore, there were significant variations in the management demands between, for instance, an intensive piggery or poultry broiler shed on the one hand, and the much more extensive beef cattle or sheep enterprises on the other. The same was also somewhat true for vegetables and nursery production for the horticulture students in comparison to the orchard. Problems were also encountered from time to time with the assurance of the quality of the produce (which was sold through commercial markets), as there was, occasionally, with relationships between the student managers and under managers, and the College field staff who worked in the enterprises.

A really significant strength of the approach was the linkage that the students quickly made between the management of the enterprise and the management of themselves - both as individuals and as groups.

(2) **Learning to Collaborate**

A further very important issue that the students tended to have to learn quite quickly was how to collaborate (a) with each other, (b) with the College staff, (c) with faculty, and (d) with those with whom they worked while on their ‘off campus experience’. While there was clearly very strong incentives for the students to learn how to cooperate in these ways, the attempts were not always successful, and under these latter circumstances, were the source of considerable tension from time to time.

The benefits of faculty learning to collaborate within this complex learning community, must also not be overlooked, as each was expected to extend themselves considerably beyond their traditional roles as ‘subject experts’ and conventional ‘teachers’. These transitions in roles were also the source of considerable tensions within the School from time to time, and were most apparent between those faculty who were in the associate diploma team, and the rest of the faculty in the School, who were having to continue, by and large with the ‘business as usual’ of the on-going three year applied science undergraduate diploma program.

(3) **Learning to Communicate**

An essential aspect of experiential education is the communication capabilities of the learners. It is a vital
aspect of both learning to manage and learning to collaborate, and indeed is central to any activity that involves people working and learning together. Communication was recognised as a crucially important competency at a very early stage in the development of the program, and it became a vital dimension of the assessment process. There was typically a wide variation in the communication capabilities of students as they entered the program, and this too was a source of tension from time to time.

(4) **Learning to Learn**

Underpinning the entire program, of course, was the absolute necessity for all involved with it, to appreciate the significance of the processes of learning and how one could actually learn how to learn. Considerable explicit emphasis was placed on learning as a competency itself, with students expected to understand the nature of, and relationships between various learning activities associated with ‘finding out’ and ‘taking action’, such as observing and thinking, and planning and acting, and with critical reflections on all of that. The processes of problem solving and of decision making were explicitly recognised and promoted as processes of experiential learning, and accepted and assessed as expressions of learning competencies.

The nature of, and connections between, propositional, practical, and experiential learning modes, were also considered to be an essential aspect of learning competency. Emphasis was also placed on the need for students to assume increasing responsibilities for their own learning as self-directed learners, and on the benefits of social or collective learning.

Students did not always appreciate the significance of learning about the process of learning as a crucial complement to learning about the content of their particular area of interest, in animal production or horticulture (or crop production or horse management when the associate diploma program was extended to embrace these too).

(5) **Learning to Facilitate**

The particular challenge for the faculty, although not excluded from the capabilities needed also by the collaborating farmers as well as the students themselves, was learning how to facilitate experiential learning. As has been mentioned, explicit attention was paid to learning processes throughout the program, with students being allocated in groups to a particular faculty ‘learning facilitator’ who would meet regularly with them both in the group and as individuals, to focus on their development as learners. The emphasis was also very much on encouraging students to accept responsibility for their own learning. Faculty were expected to learn how to change their previous practices as ‘instructors’ to embrace the far more demanding role of ‘facilitator’. They were also expected to translate much of their theoretical and practical ‘subject expertise’, into readily accessible ‘learning packages’. These were far from simple matters, which often involved profound challenges to long held beliefs about education as well as to long established habits and behaviours. It needs to be stated that the faculty involved in these early reformations in the School were all volunteers. Later in the developments, all faculty would be expected to shift from ‘instructor mode’ to ‘facilitator mode’, and this proved to be a much more difficult proposition!

**The Systems Initiative**

Buoyed by the early successful outcomes of the ‘pilot experiences’ with the newly introduced associate diploma programs, and motivated for further reforms by the results of their extensive research and discourse about the state of the nation’s agriculture, faculty decided to replace the existing six semester, conventionally taught, diploma program in applied science with an essentially experiential seven semester undergraduate degree, in what was to be termed systems agriculture. It was agreed that while there would be some similarities with the four semester associate diploma program, there would also be some very marked differences. The emphasis would not be on the management of enterprises, but on the development of broader aspects of agriculture, and while experiential strategies and self-directed studies would also form the foundations of the pedagogy, they would be introduced more slowly and be accompanied by more theoretically rigorous scholarship presented through both propositional and practical educational strategies. These latter would concentrate particularly on theories and practices drawn from systems approaches being developed for other disciplines at that time, such as ecology, engineering, geography, and economics.

The logic for this emphasis on systems approaches, lay with their potential utility in helping people learn how to deal with complexity, and it was certainly complexity that the Hawkesbury faculty were determining was characteristic of the situation prevailing in Australian agriculture at that time. It was envisioned that graduates from a degree program that had its foundations in experiential learning on the one hand, while embracing systems perspectives on agricultural development (and indeed the broader matter of rural development) on the other, would have unique competencies appropriate to meet the emerging challenges of what was beginning to be referred to as sustainable development. This would be an education for agricultural and rural development
for tomorrow. The graduates, it was reasoned, would enter the same employment avenues essentially in the service aspects of the agricultural industries as Hawkesbury diplomates had traditionally entered, but bring to them new ‘transforming’ competencies.

In the event, not only did this occur, but it also contributed to the development of new employment opportunities within agriculture and rural development in Australia, in the facilitation of national and state supported initiatives in landcare, total catchment management, and rural community development.

This would be the supreme example of dynamic interrelationships between reforms in curriculum and transformations in the broader domain. Over upcoming years, Hawkesbury students, faculty, graduates, collaborating farmers, and others in the extended learning network, would come to play clearly acknowledged roles in the transformation of the prevailing perspective or predominant worldview of Australian agriculture from an essentially production and productivity-focussed enterprise to a sustainable human activity. Equally, as this transformation progressed, so too was the curriculum of the degree program influenced, and both initiatives were also informed by the growing scholarship of the Hawkesbury faculty, especially with respect to the advances that they would make, in collaboration with colleagues in various parts of the world, in the theories and practices of systems approaches to development.

As it has been through the advancement and application of systems ideas, principles, theories, and philosophies that the Hawkesbury ‘learning community’ has had its greatest influence on both curricular reform and domain transformation, it is on this particular aspect of the developments there that the rest of this narrative will concentrate. In retrospect it might be argued that these ‘systems’ or ‘systemic developments’ at Hawkesbury have progressed through three inter-related phases or ‘waves’ over the past two decades or so, with each phase change resulting from the experiential learning of those involved as active participants in projects across the extended network.

The process started with the incorporation of the ‘systems idea’ into the original undergraduate degree curriculum that enrolled its first students in 1981.

Learning about Systems

Taking the lead from a number of initiatives already launched by other institutions educational and research institutions concerned with agriculture both within Australia and overseas, the two Hawkesbury faculty teams charged respectively with the design and introduction of the degree program, adopted as the foundations for their approach, a conceptual map that represented agriculture as the basic interface between ‘nature and society’. Or in ‘systems’ terms, agricultural systems (= agroecosystems) develop at the interface between natural ecosystems and social systems.

The logic here was that students would learn how to deal with the complexity of agriculture, in all of its natural and social aspects, by thinking about it from a systems perspective. From such a perspective, farms could be envisaged as if they were whole entities - or systems - that were composed of ‘smaller’ sub-systems, while themselves being sub-systems embedded within ‘larger’ social and natural ‘suprasystems’. In this manner, farms, nature and society, could all be studied through the same pattern of thought or construct or worldview: All could be considered as if they existed as a hierarchy of systems, with each level of system organisation having its own boundary, collection of sub-systems, its own inputs, outputs, and throughputs, and its own characteristic properties, with each, however intimately related to all of the others. In this way a change at any one level of the system hierarchy, or within any system or subsystem, could be considered to have an impact on all of the other systems and subsystems with which it was interconnected. From such logic, farms could be deliberately designed as ‘farming systems’ and managed in such a manner that they mimicked the flows and cycles and other characteristics that both natural ecosystems and social systems were assumed to possess. These included ideas about productivity, stability, sustainability, and equitability, while they also embraced formal systems principles such as ‘requisite variety’ and ‘redundancy’, as well as ‘equifinality’.

A curriculum was accordingly designed in which students would be presented with the ‘systems logic’ through a number of propositional educational episodes, and encouraged to explore ‘real world’ issues in agriculture using particular forms of systems analysis, especially those being specifically developed for agroecosystem analysis. They would be also be exposed to the ‘nature of ecosystems’ and ‘social systems’. The idea was that they would initially ‘learn’ about systems and apply its principles in practice through the exploration of complex ‘real world’ situations presented to them by the faculty and/or extracted from studies of the farms on the College estates (excluding the mini farms) or of local commercial farms in the vicinity of the campus and/or from reports in the media. As the students progressed in their studies, so they would assume increasing responsibility for designing their own experiential systems studies beyond the campus and immediate vicinity, which would include, as with the associate diploma students but extending for a full semester, an off-campus experience on a commercial farm situated ‘deep’ within rural Australia. It was envisioned that during their
senior years, students would advance to using sophisticated tools of systems research and analysis including simulation modelling and operations research techniques.

Where the emphasis for the associate diploma students was on the management of enterprises, and the focus of the curriculum was \textit{learning to manage}, the emphasis for the undergraduate degree students was on the development of farming systems and other more comprehensive agricultural situations with a focus on \textit{learning to develop}. Common to both programs was the emphasis on learning to learn, increasing self-direction, and the acquisition of competencies including communication, collaboration, and ‘problem solving’. The rigorous focus on \textit{learning about systems} was however, confined essentially to the degree students.

In the event, this first wave of development of systems approaches at Hawkesbury was very short lived, and indeed was superseded by the time the first intake of students had reached the third year of their studies. Considerable doubt existed among the faculty about the adequacy of introducing students to ‘systems ideas’ through ‘learning about systems’, while the contradiction between an espoused philosophy of experiential education and the actual propositional strategies being used was apparent for all to see! Inspired particularly by work being conducted at the University of Lancaster in England, a number of key members of the Hawkesbury faculty proposed a radical reform of the already radical curriculum by introducing the idea of shifting the systems idea away from the study of ‘reality out there’ and onto the process of learning, or inquiry into complex issues ‘out there’ - with an eye to learning how to improve them!

(2) \textit{Learning through Systems Methodologies}

A major conceptual advance made at Hawkesbury was that a number of systems methodologies, including the newly emerging ‘soft’ variety, were essentially different variations on the process of experiential learning. With that in mind, it quickly became apparent that students would be far better off learning how to use a number of different systems methodologies on ‘real world projects’, than they would be by being taught ‘about systems’. In other words, presenting systems methodologies as special forms of experiential learning, would allow students to build systems competencies through experiential exposure. It would not be farming or other agricultural entities that would be the focus of the systems study, but the process of learning itself. The systemicity, as it were, would be shifted from the concrete into the abstract: Systems models would no longer be representations of reality but abstract conceptualisations of patterns of thought. Systems, including the system of learning itself, would be regarded as conceptual human activities rather than as real things. The same systems principles applied, but they would now be recognised not as ‘true’ descriptions of the world out there, but as intellectual assumptions, in the same manner as economists or sociologists use assumptions about ‘ideal’ human behaviour as their conceptual frameworks of analysis.

For those who have not experienced this shift in mental models or constructs, it is difficult to imagine its significance. It is made that much more difficult by the realisation that learning to think and act in systemic ways through learning through systems methodologies, demands profound challenges to the very beliefs and values that we typically hold as techno-scientists. Central to the systems idea is the profound ‘holistic’ belief that whole entities express properties that are unpredictable, and indeed essentially unknowable through studies of their component parts (or subsystems). Whole systems are different from the sum of their parts, with unique properties emerging at, and becoming characteristic of different ‘levels’ within any hierarchy of systems. This is a philosophical position that is very difficult for many to accept. Without an acceptance of it however, it is impossible for a systems approach to truly be adopted.

Experience at Hawkesbury, that subsequently gained considerable support from theories developed elsewhere, have long suggested that the ability to adopt systems perspectives, the acquisition of systemic competencies if you will, is a function of the development of particular states of cognition, by individual learners. Systemic or holistic agricultural and rural development is essentially a function of the learning development of those who work within the domains. If one wants to achieve systemic (comprehensive) sustainable human activities, one needs to facilitate the development of systemic learning capabilities!

It was this key realisation that provided the core rationale for the fresh set of curriculum reforms at Hawkesbury that were introduced so soon after the undergraduate degree was launched. Experiential strategies were restored to the same primacy as they enjoyed, and had been shown to be successful, in the associate diploma programs, and the entire first year of the program was quickly redesigned to accommodate them.

The logic would now be that instead of being taught about systems and learning to apply the principles through their application in agroecosystem analysis, students would now learn how to use different systems methodologies as they went about the task of dealing with ‘real world’ farming and broader agricultural and rural issues in which they could engage themselves from the very start of their program. Working essentially in small groups, students would be exposed through the first year of their program, to a number of projects of ever increasing complexity, and for which they had to seek improvements. Starting typically with a relatively
simple technical issue from one of the College farms, the students would work up, over the first two semesters of their programs, to their engagement in a complex and ‘messy’ development project of their own choice in a rural community somewhere within the state. They would learn to learn differently, to adopt systems perspectives, through their use in such situations, of specific systems methodologies to which they were formally exposed in ‘propositional’ sessions. Students had little difficulty in understanding the significance of these activities, once they had appreciated the importance of an understanding of the process of experiential learning. The co-involvement of faculty in experiential systemic projects with their students across the ever-expanding network of collaborators within rural Australia (and sometimes beyond) was a crucial aspect of the program. Faculty were seen as role model ‘systems learners’ by the students, and the involvement of collaborators from agricultural industries and rural communities in these co-learning ‘situation improving’ projects, was a vital reinforcement.

As the years progressed, the nature and extent of these ‘situation improving projects’ developed to a degree unimaginable at the start of the second wave of reform. Hardly an institution or association or community across the state of New South Wales remained unengaged with the process, as each year saw literally hundreds of projects involving Hawkesbury students, faculty and collaborators, underway. By the late nineteen eighties, the voice of Hawkesbury was among the loudest in the land for the continuing systemic transformation of agriculture, and certainly among the other institutions responsible for education and research. Graduates of its programs were spread across a wide range of occupations within the domain, and many were beginning to assume positions of leadership within their respective niches. One of the most influential roles that these graduates were playing, was within the emerging career areas associated with land conservation and catchment management where the call was for facilitators of the process of changing worldviews among ‘grass roots’ farmers and other rural workers from an exclusive focus on production and productivity, to sustainable, environmentally responsible practices.

In this manner of participatory inquiries featuring the use of systemic methodologies, the process and outcomes of the curriculum reform process contributed most significantly to the process of the transformation of Australian agriculture, and vice versa. Changes in worldview perspectives and agricultural and rural development practices were able to be easily communicated back to the institution and easily embraced within the dynamic learning environment that the community within Hawkesbury were nurturing.

During this period, the notion of competency or capability came to be accepted as a very crucial aspect of the Hawkesbury reforms. Students would not essentially study in order to learn new theories and practices, important though this was, but to gain ever increasing levels of competency as (a) autonomous learners, (b) effective communicators, and (c) effective ‘systems agriculturists’, where this meant the capacity to facilitate ‘improvements in complex agricultural and rural situations’ through the application of systems methodologies. Students aimed to progress through demonstrating successively ‘higher levels’ of competency development. Of particular importance to this focus on capability or competency was the manner by which students learned to relate theory to practice as well as to generate theory from their practice - the praxial relationship. As time progressed, more complex matters relating to the philosophical nature of theory and of practice, and of ethical, moral and aesthetic aspects of judgement were also embraced, to further extend this critical notion of praxis.

It was not at all surprising that many of the activities in which members of the Hawkesbury extended learning community involved themselves, did not find favour among the ‘establishment’ in agricultural research, education, industry associations, or policy making bureaucracies across the country, and Hawkesbury faculty and their graduates were frequently found at the centre of controversy. One of the most difficult aspects of the curricular reforms, was its conceptual focus, which translated well into methodological practices, but less well into obvious concrete strategies for change. Critical discourse was not, even as it still remains, a recognised approach to ‘problem solving’ while the notion of ‘situation improving’ and the development of praxis as the focus of student development, continues to frustrate those who are used to the ‘instant fix’ approach of technoscience with clear ‘solutions’ to ‘simple problems’. The matter of the assessment of the agricultural students was a matter of particular concern within the institution. There were continuing tensions between the faculty in agriculture and those within the rest of the institution, where conventional didactic teaching and ‘objective’ examination practices continued to prevail. Those long imbued with a ‘grading’ culture and with systematic procedures, found it very difficult to understand let alone accept, the rigour or even logic of competency acquisition, evaluated through systemic procedures.

Ironically, it was the pressure from the ‘conventional’ majority of the Hawkesbury faculty that led to further refinement of the profile of competencies within (what had become by the late 1980s) the Faculty of Agriculture and Rural Development. In response to the demands of various examiners boards within the institution for their Faculty to adopt the ‘standardised’ grades through a ‘grade point average’ system used across the rest of the institution, the agriculture (and rural development) academics turned their attention to developing a much more comprehensive statement of competencies than hitherto they had used. The resulting profile included seven levels of potential attainment across six competency areas (Appendix 1), with students being expected to attain particular levels across all six domains at particular points in their program. Significantly, the profile could now
also be used to express student performance in quantitative terms, through a simple arithmetic conversion of
the profile into a matrix. The challenges of the ‘conventionalists’ had been met, and honour was thus satisfied.

In 1989, the Faculty of Agriculture and Rural Development faced an internal change of considerable scale
when the College was merged with two other Colleges of Advanced Education in the outer Sydney region to
form the University of Western Sydney. This internal transformation, was to bring new forces to bear on to the
process of curriculum reform with, in the event, both positive and negative outcomes for the radical systems
approach that had been flourishing for almost a decade to that point. While the undergraduate and associate
diploma programs were both to be subjected to very significant changes in response to both internal university
and external government policies, such ‘forces’ would also allow new opportunities to be pursued, especially in
post graduate education and research and consulting activities.

Throughout the eighties, the Faculty had to continuously adjust the way that it did things in order to adjust to
ever- declining allocations of funding. Some of these adjustments were to have very considerable impacts,
such as the abandonment, on financial grounds, of the mini-farms in the associate diploma program, and the
reduction of the degree program from seven semesters to six. The extent of the visits by the faculty to their
students during the off campus stage of the programs, had also to be severely reduced. Incorporation as a
university actually exacerbated the financial pressures, and this, along with the enactment of curriculum
policies designed to ‘standardise’ courses across the different Faculties of the University, started to very
markedly influence the nature of the agricultural courses. A very significant reduction in the experiential
aspects of the programs started to occur soon after incorporation, and indeed has continued to the present
time. Further instabilities have been introduced into Hawkesbury through a number of imposed organisational
restructurings - indeed there have been four major changes in organisational structures involving the
agricultural faculty, over the past six years.

While in some ways the next wave of developments, especially in the undergraduate curricula reflected a
return to ‘learning about systems’, from another perspective, the systems initiatives would change again into
something even more innovative and fresh.

(3) Critical Learning Systems

One of the most important outcomes associated with the transformation of the domain of Australian agriculture
that occurred during the eighties and into the early nineties, was the growth and development of what might be
termed ‘social learning’, or better yet, ‘social praxis’. Farmers and others in rural Australia learned the
advantages of coming together as active participants in the national ‘landcare movement’, the organisation of
which was based essentially on small ‘work groups’, with the land conservation activities in which they became
engaged, clearly reflecting ‘collective learning for change’. A vital ‘systemic insight’ into this phenomenon that
emerged at Hawkesbury, was that such working groups of collaborating learners could be conceived as
‘learning systems’: coherent groups of people that, as ‘whole entities with their environments’, could be
envisaged as ‘self-organising systems’ that ‘learned their way into improving’ the quality of (a) the
environments about them, (b) their own farming systems, (c) the commodities that they produced, (d) their own
well-being as rural people, (e) activities that they could pursue beyond farming, and most significantly of all (f)
the inter-relationships between all of these factors.

Such learning systems are as critically involved in appreciating the significance of spiritual values concerned
with ethics and aesthetics as they are with concrete events and abstract understandings, and with emotion and
feelings as well as with objective reason. Perhaps most significantly, they appreciate and indeed continually
seek, the emergent properties of innovation and creativity that their own diversity and variety potentially allows.

The systemic development of rural Australia would thus come to be recognised fundamentally as the systemic
self-development of its people, in collaboration with others who were committed to helping in that task.

With an appreciation of this, and some exposure to the ‘systems’ and ‘learning’ ideas behind it, such ‘learning
systems’ could learn how to improve their own quality of learning through an on-going process of self-critique
and subsequent ‘systemic development’! From this logic it follows that the essential competency of graduates
and faculty alike, would therefore be the facilitation of participative and collaborative processes that lead to the
creation, maintenance, and development of ‘critical learning systems’ (groups of systemic learners) across
rural Australia.

With this aim becoming increasingly difficult to achieve through the undergraduate curriculum, it has been
through the post graduate programs that this notion has been actively explored, with some considerable
success. Many of the those enrolled in postgraduate diploma and degree courses at Hawkesbury (coursework
graduate diplomas and masters degrees, and research masters and PhDs) are part time students. This allows
them to integrate their growing appreciations of the nature and dynamics of ‘critical learning systems’ with
opportunities to facilitate their creation and development, during the course of their everyday professional activities.

In recent years too, this ‘critical learning systems’ focus has been further extended, through the significantly increased consulting activities of a number of faculty, into private sector corporations, public service institutions, and rural communities - both within Australia and abroad.

It is particularly through both the postgraduate and consulting endeavours that the ‘systems momentum’ that was first established at Hawkesbury more than two decades ago, continues to advance. Vital insights continue to emerge through the experiential learning and ‘systemic development’ activities of the host of people who continue to be associated with the extended (and now critical) learning community across an ever-burgeoning network at home and abroad.

Nodes in this ‘critical systems learning’ network are beginning to appear in countries as widely dispersed as India, the United States of America, South Africa, Denmark, and Papua New Guinea, with sponsors of relevant endeavours that include the Asian Development Bank and the World Bank, as well as the Ford and Kellogg Foundations.

Through all of this, the significance of particular contexts for curricular reform are never forgotten, and each circumstance is regarded as unique. This is not to state however, that nothing that has been learned over nearly thirty years of endeavours at Hawkesbury is applicable in general. The following statement, in conclusion, perhaps best illustrates the scope of lessons that can be learned. It represents a ‘look back’ at the essential characteristics of the transformation of four different aspects of the Hawkesbury Experience with curriculum reform being but part of a much more comprehensive transformational strategy:

- vision, mission and strategic management
- role and network linkages
- organisational structure
- curriculum and educational strategies (pedagogies).

In Conclusion

Looking back, it is possible to illustrate the changes that have occurred over almost three decades of transformation and reform at Hawkesbury, by offering a set of points of comparison between what characterised the institution during the early nineteen seventies with respect to its endeavours in agricultural education, and what tends to characterise it currently. As the account above emphasises, these developments have been very dynamic and often complex and ‘messy’ matters, and not the simple changes that the account below might suggest. The most important point to be re-emphasised is that the process of development is ever-ongoing, demanding of us all a sustained, and hopefully sustainable commitment to ‘learning our way into better futures’.

The changes that have occurred at Hawkesbury have seen the following transformations:

In Vision, mission, and strategic management

FROM the prevailing worldview of developments in agriculture as essentially growth in production and productivity TO the view of agriculture as a vehicle for people in rural communities to improve the quality of both their lives and the environment in which they work and live, through learning.

FROM a mission essentially to provide trained technicians to fill public service positions in production agriculture

TO direct involvement in an extensive network of rural communities as well as agricultural institutions and associations committed to responsible development through ‘critical learning’.

FROM management strategies designed to maintain the stability of the institution

TO development strategies deliberately focussed, in the face of turbulent environments, on the need for continual improvement in the institution through the collective ‘critical learning’ of its ‘members’.
In *Role and Network Linkages*

**FROM** a teaching institution essentially providing diplomas for unspecified jobs within the domain of agriculture

**TO** a ‘critical learning system’ committed to bringing the ways of systemic development to help people in rural communities and agricultural industries with the development of innovative and responsible ways of dealing with complex, problematic situations in rural Australia and beyond.

**FROM** an institution solely dependent on government funding to educate students to meet national manpower needs

**TO** an entrepreneurial, internationally-focused institution attracting additional funds through project work as an agency of rural development, both at home and abroad.

**FROM** a public service institution linked in linear fashion to only a few other organisations within agriculture

**TO** an autonomous institution deeply embedded in extensive networks of people and institutions from both private and public sectors within Australia as well as internationally who all shared a concern with the process of responsible and potentially sustainable development.

In *Organisational Structure*

**FROM** an essentially bureaucratic institution structured around inflexible, discipline-based Departments (and confined essentially to the bio-physical sciences)

**TO** a collegial, self-organising, self-managing and self-critical learning system in which the predominate management structures are highly flexible ‘task forces’ composed of a mixed population of people which includes those with backgrounds in the social, ecological and systems sciences as well as in the bio-physical sciences.

**FROM** a relatively closed teaching institution accessible essentially only to students enrolled in three year full-time diploma programs in production agriculture and horticulture

**TO** an increasingly open learning organisation accessible to a wide range of people interested in learning, through a variety of modes (including distance, “virtual”, and other external part-time learning strategies as well as the full time offerings), about a range of ‘development domains’ including landscape and conservation management, environmental health, environmental management, rural community development, and agribusiness, in addition to agriculture *per se*.

In *Curriculum and Educational Strategies*

**FROM** a curriculum focussed on the students’ acquisition of scientific knowledge and technical skills that they expect to bring into practice only following graduation and their entry into the ‘workforce’

**TO** one that focuses on the continual development of a personal praxis as a lifelong capability acquired through involvement in ‘real world’ projects during their ‘formal studies’.

**FROM** systematic (building-block) curricula where are students are taught theoretical and applied practical content material in a set sequence designed by their teachers

**TO** systemic (integrated) curricula where students learn how to learn how to deal with “real world” issues through their direct involvement in them and especially in collaboration with others who are similarly involved.

**FROM** a situation where faculty assumed the role of purveyors of that “expert” propositional knowledge and/or those practical skills which it was considered they were formally qualified to teach because of their knowledge and skills

**TO** a situation where faculty considered themselves to be both facilitators of experiential learning as well as experienced, knowledgeable and skilful resource people with particular beliefs and values.
FROM pedagogies based on classroom teaching (and propositional knowledge) and practical field demonstrations (and practical knowledge) and a focus on knowledge and skill acquisition

TO pedagogies based on the co-involvement of students with their facilitators and other collaborators, in “real world” projects where the aim was for outcomes that were considered to be improvements by all involved, and a focus on the development of competency and praxis.

FROM a single predominant worldview on production, techno-scientific agriculture as the focus for education

TO an appreciation of multiple worldviews on the systemic and responsible development of rural people and the environments in which they live and work.

FROM a highly structured educational environment in which the progress of each individual student is assessed by his or her ability to pass prescribed examinations in theory and practicals

TO an environment that is characterised by relative uncertainty and complexity and where the progress of the students is assessed as expressions of their developing capabilities across a profile of competencies emphasising learning autonomy, effective communication, and ‘situation improving’ in ‘real world’ projects.

It is to be hoped that these features do contain some insights that those contemplating curriculum reform in forestry might find useful to their deliberations.

Acknowledgments

As always, it is with a very great pleasure and a deep sense of honour that I acknowledge the contributions, to the matters referred to above, of my many colleagues and friends at Hawkesbury, who, as I personally leave it for pastures new, remain currently engaged in profound debates about their next steps - in the face of further major organisational restructures of the University!

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APPENDIX ONE

Competency One – Effective Communication (Presentational)

Level 1: Writing: (a) technical reports in clear and unambiguous English, and illustrating description, and interpretations of the relatively non-complex problematic situations they have experienced, and (b) reflective observations of their own learning gained through these experiences.

Level 2: Presenting grammatically acceptable formative and summative reports which integrate technical outputs with personal (learning) outcomes, in a manner which also integrates written, graphic and oral components.

Level 3: Preparing comprehensive reports of relatively complex problematic situations, which illustrate abilities to analyse and interpret data, information, experience and interpretation of bio-physical, financial, social and environmental aspects of farming systems, in an integrated manner.

Level 4: Presenting comprehensive and co-coordinated reports involving the description, analysis, interpretation, and proposed plans for action for change in farming systems, to different audiences, including peers, clients and faculty staff.
Level 5: Preparing comprehensive designs, management plans, progressive conduct, and learning outputs and outcomes of systemic learning projects and presenting them to different audiences of peers, clients, appropriate authorities in the technical areas involved, and faculty staff.

Level 6: Presenting comprehensive and co-ordinated reports, using multi-media technologies, which illustrate the integration of learning from projects conducted both within the year and across years, in a systemic fashion.

Level 7: Presenting comprehensive and co-ordinated project reports integrating plans, management, outputs and learning outcomes, and/or documents of critical reflections and scholarship, to pre-publication standards.

Competency Two – Effective Communication (Inter-Personal)

Level 1: Identifying personal strengths and weaknesses of inter-personal communication, identifying the same in others, and designing strategies of self-improvement incorporating both theory and practice.

Level 2: Working effectively in groups, and especially project teams, which illustrating basic conceptual understanding of inter-personal communication, as well as commitment and obligation to others in the conduct and management of the tasks of the group.

Level 3: Designing and conducting interviews as effective conversations of inquiry, and validating the outcomes of those conversations with those who participated in them, as well as with peers and faculty staff.

Level 4: Discussing and debating data and interpretations from learning projects, with peers, clients, authorities in the field of the investigation, and faculty staff.

Level 5: Negotiating with potential clients, collaborators and facilitators, around the planning and design of learning projects, enabling their participation in the conduct of those projects, where appropriate.

Level 6: Facilitating creative and effective working relationships between the collaborators in participative learning projects, paying particular attention to the quality of inter-personal communication, especially where the situation involves conflict and the tensions of difference.

Level 7: Engaging in critical dialogue in open forum, and facilitating conversation around complex problematic situations involving participants representing a spectrum of different worldviews on the position.

Competency Three – Effective Learning (Self-Management)

Level 1: Taking personal responsibility for planning, managing, evaluating and reporting self-initiated project tasks.

Level 2: Contributing in effective and ethically defensible ways, to collaborative learning projects, and providing functional leadership to such occasions whenever appropriate.

Level 3: Organising schedules of work and learning during off-campus client-based projects in ways which allows effective performance in, and indeed integration of, both, and in a manner which is consistent with the position negotiated with both the client and the facilitator.

Level 4: Planning, organising, resourcing, conducting and validating client-based learning projects, with a clear emphasis on the integration of knowledge gained propositionally, practically and experientially.

Level 5: Organising and managing a profile of different learning projects, in a manner which clearly exemplifies attention to the integration of the differing priorities, needs and commitments of all who care participants in the projects, including self, clients, sponsors, other collaborators and faculty staff.

Level 6: Exemplifying the significance of self-management in the organisation of learning projects, to others, so providing leadership through the facilitation of organisational practice.

Level 7: Taking enterprising and innovative initiatives involving the improvement of complex and problematic situations, in a manner which illustrates self-confidence born of effective self-management.

Competency Four - Effective Learning (Methodologies)

Level 1: Identifying basic processes, types and styles of learning in self and others, and applying such knowledge to learning situations involving relatively non-complex problem-solving projects.

Level 2: Discriminating between propositional, practical and experiential learning, and designing and conducting strategies
for generating and integrating all three forms of knowledge in specific problem-solving situations.

**Level 3:** Relating basic principles of the experiential learning process to methodologies of inquiry, discriminating between different methodologies, both non-systemic and systemic, and illustrating the appropriate use of each in practical, problem-solving/situation improving situations.

**Level 4:** Selecting methodologies of inquiry appropriate to particular problematic situations, and using them individually as well as in concert, to address problematic situations of different complexities.

**Level 5:** Identifying elements and processes of higher orders of learning (meta- and epistemic-), and using knowledge of those in collaborative learning project situations to identify the significance of, and interconnections between (a) different methods of knowledge creation, and (b) different values, beliefs and worldviews as contexts to the situation.

**Level 6:** Designing, creating and managing critical learning systems (of integrated learning levels) which involve numbers of participants collaborating together in learning projects in which particularly complex problematic situations are being addressed.

**Level 7:** Creating innovative methods of inquiry and incorporating these explicitly into collaborative learning systems directed at the search for improvements to complex problematic situations.

**Competency Five - Effective Professional Development (Problem-Solving)**

**Level 1:** Identifying the elements of relatively non-complex technical problems in agriculture, and using basic researching/learning techniques, to find out about them, and take action to solve them.

**Level 2:** Using the basic elements of systems observation, analysis, design and testing, to diagnose the limitations to productivity of particular agricultural enterprises from systems perspectives, and to suggest possible strategies for their improvement.

**Level 3:** Collaborating with others, and in particular with the host client, to design and conduct descriptions, analyses, and interpretations of the dynamics of a particular farming system, and to identify problematic situations which may be influential in affecting those dynamics.

**Level 4:** Collaborating with others, and in particular with the host client, in the design, conduct and evaluation of strategies to improve relatively complex problematic issues in farming, other agricultural and/or rural community and environment situations, in a systemic manner.

**Level 5:** Collaborating with others, and in particular through triangular relationships between self, clients, and faculty advisers, in the design, conduct and evaluation of learning projects involving complex problematic situations, from the perspective of facilitating improvements through co-learning.

**Level 6:** Using systemic methods of inquiry to explicitly explore the significance of differing worldviews and core competencies (= paradigms) in conflict-laden development projects, and to design strategies for facilitating improvements through systemic learning.

**Level 7:** Using critical learning systems specifically created for the purpose, to design, conduct and evaluate, participative development projects designed to facilitate desirable and feasible developments in agricultural organisations and/or rural communities.

**Competency Six – Effective Professional Development (Professional Praxis)**

**Level 1:** Identifying the spectrum of employment opportunities and career domains in agriculture and related endeavours, and exploring and developing profiles of particular competencies relevant to personal career ambitions and expectations.

**Level 2:** Designing preliminary learning strategies to align with the competencies required for the particular professional praxis which coincides with personal career ambitions and expectations, and identified needs and/or demands of industry, the sector and the community.

**Level 3:** Designing learning experiences with allow direct inter-action with current professionals and involvement in their day-to-day professional activities.

**Level 4:** Developing comprehensive profiles of actual or predicted career domains in agriculture or related endeavours, designing strategies to facilitate the development of competencies appropriate to professionals within those domains, and incorporating these aspects into the design of learning projects.

**Level 5:** Conducting and evaluating participative learning projects from the perspective of particular career domains and
associated professional praxis, and illustrating development of competencies and integrated praxis, appropriate to these ends.

**Level 6**: Providing evidence for, and critically debating issues about, the need for competencies beyond those conventionally concerned with particular career domains in agriculture and related endeavours.

**Level 7**: Designing and initiating moves to create new employment opportunities or career paths in agriculture or related endeavours using evidence accumulated during learning projects, and/or critical reviews of existing circumstances in agricultural industries and organisations, or other rural industries, or rural communities, or rural environments, and/or insights into the potential application of innovative technologies or management practices in situations where currently they are not applied.