DEVELOPING MORE SUSTAINABLE SYSTEMS OF AGRICULTURE AND NATURAL RESOURCE MANAGEMENT

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ABSTRACT

Although the introduction of westernised forms of agriculture to the Australian continent has led to national development and created economic wealth through major export earnings, these gains have been achieved at a huge cost to the Australian environment. The sustainability of agricultural production systems is now becoming a matter of concern.

This paper describes how, in 1992, a postgraduate, distance education program in sustainable agriculture was introduced at Orange Agricultural College to provide educational opportunities for those who wished to develop more sustainable systems of agriculture. The course aims and structure are described. One of the units of study in this program was designed to provide a strategic approach to property planning. This approach, which is being used with farmers and Landcare groups to facilitate the development of more sustainable systems of agriculture, is described. Opportunities for international collaboration are raised.

INTRODUCTION

Agriculture in Australia is only 200 years 'young', yet its impact on the environment has been enormous. European settlement commenced in 1788, with a penal colony at Botany Bay in NSW, where the land was difficult to clear and the soils were of low fertility. The first attempts at wheat growing were a failure and the early colonists nearly died of starvation. However, over the next 200 years, European settlers cleared vast tracts of native forest and woodland for agriculture. Exotic plants and animals were introduced, some of which aided prosperity, whilst others, such as the rabbit, fox and cat, led to a loss of natural biodiversity, either through over grazing by the rabbit or the predation of small marsupials by the fox and feral cat. The establishment of railways, roads, towns and irrigation projects led to the development

of an agricultural industry that now produces about 28 billion dollars worth of products annually (ABARE, 1999). The Australian agricultural sector is highly efficient by world standards and many countries find there is a need to introduce tariffs to protect their local industries from Australian imports. Although Australians can be very proud of their achievements over a relatively short space of time, there is, unfortunately, a cost that is now only just beginning to be recognised. That cost is to the environment and there is an increasing level of concern that agricultural production may not be sustainable.

WHAT IS SUSTAINABLE AGRICULTURE?

There is a wide range of views within the agricultural sector on the meaning of 'sustainability' and an even wider range of views on how sustainability might be attained. For example, in the US, the term Sustainable Agriculture appears to describe what, in Australia, we would refer to as Organic Agriculture. Most Australian farmers say that sustaining the economic viability of their business is a key concern to them, whilst acknowledging that the maintenance of their soil resources is also critically important.

A committee established by the Australian Agricultural Council, to investigate issues related to the sustainability of agriculture in Australia, stated that for agriculture to be sustainable, it should incorporate:

"The use of farming practices and systems which maintain or enhance:

- *the economic viability of agricultural production;*
- *the natural resource base; and*
- *other ecosystems which are influenced by agricultural activities."*

(SCA, 1991)

WHY DO WE NEED TO BE SUSTAINABLE?

The World Commission on the Environment and Development (WCED, 1987), in its report, *Our Common Future*, was of the view that:

"Humanity has the responsibility to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

For those who have difficulty accepting this philosophical and ethical stance, a more economic rationalist argument is offered, that a deterioration in the environment, on which agriculture and life depends, invariably leads to an increase in the costs of production or services, reduced profits and, in the longer term, economic and social poverty.

WHERE DO WE GO FROM HERE?

It could be argued that ecologically sustainable development is one of the greatest intellectual, political and practical challenges of our time. The issues are very broad, extremely complex and seem beyond our control. The problems are invariably the domain of not one, but a range of disciplines, including science, technology, economics, the humanities and natural resource management. Above all, sustainable development requires the acceptance, support and actions of the general population.

If we are to develop more sustainable forms of agriculture, we need to know such things as:

- what impact our agriculture (production, processing and distribution) is having on the environment;
- how efficiently we are using our natural resources, both renewable and unrenewable; and
- how we can change community attitudes so that people accept the need for sustainable development and adopt more sustainable systems of agriculture.

We need to be able to assess the impact of agriculture at a range of levels, from the paddock to the farm, the catchment, the region and the globe. We need to think creatively and holistically. We need to design and develop more ecologically-based production systems and integrate these with social and economic considerations. We need to work collaboratively and foster community based initiatives.

Potential strategies are likely to include a greater diversity of enterprises on farms, a greater integration of native flora and fauna into agriculture, closer links between agriculture and forestry, the inclusion of aquaculture into agricultural activities and multiple land use systems that provide for a wide range of community needs. We need to reconsider how agriculture might provide renewable energy sources as well as producing food and fibre. Education is an essential component of the process of critically appraising what we currently do and creatively designing new agricultural systems that are sustainable.

THE SUSTAINABLE AGRICULTURE PROGRAM AT ORANGE AGRICULTURAL COLLEGE

In Australia, our university education is generally discipline-based. We produce graduates in areas such as Agricultural Science, Agricultural Economics and Environmental Science. An outcome of a review of agricultural education (DEET, 1991) was a recommendation that agricultural courses should include studies on the environment. At Orange Agricultural College, we recognised a need to integrate studies in agricultural production systems with those in human resources, business and natural resource management, within a framework that is influenced by social, economic and political forces, figure 1.

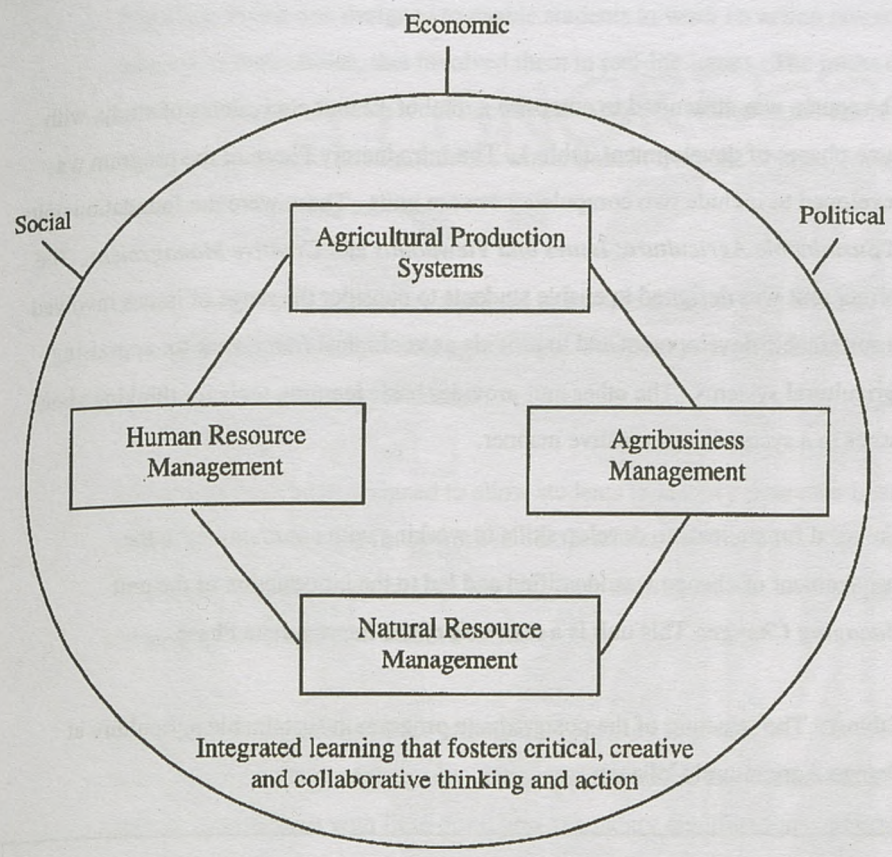

Figure 1. A conceptual model of the postgraduate program at Orange Agricultural College, showing the integration of discipline areas.

In 1991, the College received a grant to design and develop distance education materials in sustainable agriculture. A postgraduate program in Sustainable Agriculture was developed, principally to provide educational opportunities for those who wished to provide leadership in the development of more sustainable systems of agriculture, with a focus on management (Baldwin, 1991).

The program of studies was designed to produce graduates who were multiskilled, could integrate information from a wide range of sources, and who were collaborative learners with others in the rural community, using an action research/action learning approach to improve the sustainability of agriculture.

The course was structured to comprise a total of 12 unit equivalents of study, with three phases of development, table 1. The Introductory Phase of the program was developed to include two compulsory or core units. These were the foundation units of *Sustainable Agriculture: Issues and Viewpoints* and *Creative Management*. The former unit was designed to enable students to consider the range of issues involved in sustainable development and to provide an ecological framework for appraising agricultural systems. The other unit provides basic learning tools for thinking about issues in a systemic and creative manner.

The need for students to develop skills in working with communities in the management of change was identified and led to the introduction of the unit *Managing Change*. This unit is a core unit of the Intermediate Phase.

Table 1: The structure of the postgraduate program in sustainable agriculture at Orange Agricultural College.

Units of Study	
Introductory Phase	
Sustainable Agriculture: Issues and Viewpoints (Core)	
Creative Management (Core)	
Two Elective Units	
Intermediate Phase	
Managing Change (Core)	
Three Elective Units	
Final Phase	
Research Project (Core equivalent to four units)	
Elective Units	
Alternative Agriculture	Integrated Plant and Animal Protection
Agricultural Risk Management	Sustainable Farming Systems
Farm Business Management	Sustainable Soil Management
Foundations of Marketing	Whole Farm and Catchment Planning

The Final Phase was designed to enable students to work on action research-type projects of their choice, that involved them in real-life issues. The intent of this was to ensure that the students would obtain learning that related to the real world, and also that individuals or communities would benefit from the course, through the collaborative learning process.

A range of elective units were designed to complement the core units by expanding on a range of facets of sustainable agriculture. Students select these according to their learning needs and areas of interest.

Most units have been designed to allow students to identify their own learning requirements within the framework of competencies for that unit. They negotiate a Learning Contract, in which they identify their learning needs, set learning goals and prepare an action plan to achieve them.

Entry into the course has been principally restricted to graduates. These have been from any previous discipline area. However, the course has been made available to mature age students with little or no post-secondary qualifications but who demonstrated a capacity to work at the postgraduate level and had relevant experience in agriculture.

The course commenced in 1992 using print based learning resources. The internet is now being used to enhance communication between students and teaching staff.

WHOLE FARM AND CATCHMENT PLANNING

One of the units of study in the sustainable agriculture program is Whole Farm and Catchment Planning. This unit endeavours to provide students with the skill of appraising how the natural resources of farms are utilised, the impact of agriculture on those resources and how the property might be managed and developed in a more sustainable manner.

A strategic approach is used, figure 2, in which students work with land owners to identify the owners' business and philosophical goals. The natural resources, historical and cultural aspects of the property, current infrastructure and management systems are appraised. This process has been used by students in their project work with individual farmers as well as by the author when working with community Landcare groups.

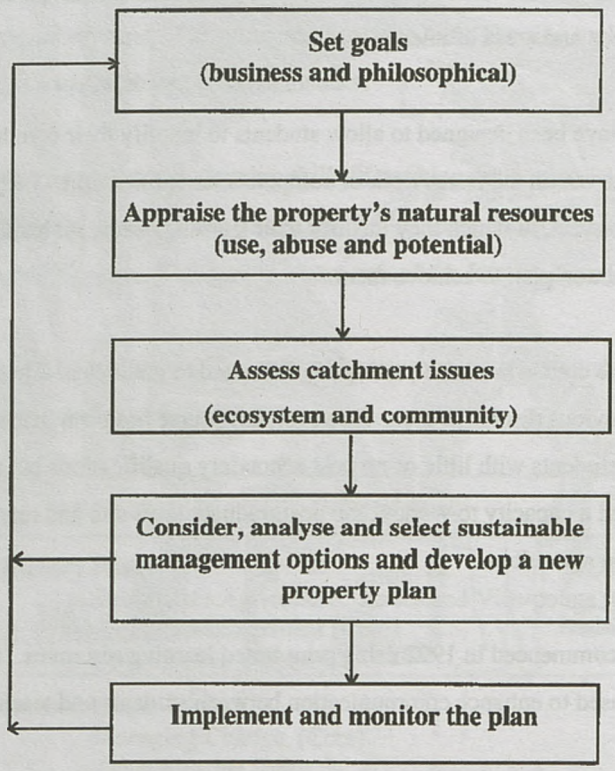

Figure 2. The process of property planning for sustainable agriculture.

The goal setting process entails discussing current practices with the land owners and the implications of their actions. It is often necessary to work towards an acceptance that change is necessary, involving the setting of new or changed directions and farm management practices. This is an interactive process, as it involves reviewing goals and aspirations, after appraising the farm's current management systems and natural resources. The appraisal of the farm's natural resources is both a spatial and temporal

exercise. Aerial photographs are a key tool for the mapping of resources, combined with field assessment. The temporal aspects require the land managers to talk of their experiences in managing their properties and to provide information from farm records.

The long-term implications of current farm management practices on the environment and other ecosystems are not always recognised by the land managers.

Assessments are made of the:

- geomorphology
- soils
- catchment hydrology
- water resources
- climate
- flora and fauna
- infrastructure (operational effectiveness and safety)
- cultural/heritage assets

Students are taught techniques for conducting this appraisal and learn how to interpret their findings.

Our students assess the effects of current management practices and also evaluate the effects of potential perturbations to the system from events such as fire, drought, floods and storms. The impacts of current and potential activities beyond the farm boundary are considered from biophysical and social contexts.

Having completed the appraisal, students need to take a creative role in designing a new farm system and property layout that addresses the issues and opportunities identified, whilst taking the goals and aspirations of the owners into account.

This whole process requires an enquiring mind, research skills, creative thinking and a collaborative approach to develop a more sustainable plan—that is, to develop a plan

that enhances productivity, profitability, and operational efficiency, whilst preserving the natural resource base, other ecosystems and heritage assets.

DEVELOPMENTS USING THE INTERNET

In 1999, a grant was obtained through the University's Strategic Development Funds to develop a system in which the internet could be used to enhance student communication and learning. A WebWISE platform has been developed for all units in the sustainable agriculture program. This site enhances student communication by providing opportunities for direct e-mail, open forum discussion, live chat as well as the presentation of course notes, case studies, and a link to the University library. WebWISE is entered via the College Home Page, http://www.oac.usyd.edu.au

The web based learning package for the unit *Whole Farm and Catchment Planning*, leads students through the process of property planning, using a case-study farm. This unit is now available on the internet, making it possible for students in all parts of Australia and other countries to enrol as a cross-course or cross institutional unit of study. It may also be made available and marketed as a CD-ROM learning package.

The web-based case study for *Whole Farm and Catchment Planning* links to literature sources that are particularly appropriate for the Australian situation, but it is considered the overall process has application globally.

INTERNATIONAL EDUCATIONAL OPPORTUNITIES IN SUSTAINABLE AGRICULTURE

Orange Agricultural College offers its course in sustainable agriculture by distance education to students throughout Australia as well as overseas. Learning packages which include comprehensive printed materials are dispatched by post to students for each unit of study. By utilising the internet the College is now better able to support student learning at a distance, particularly internationally, through the ease and speed of this on-line technology; which streamlines two-way communication, delivery of

learning materials as well as enabling students to dispatch assignments and projects to the College.

The learning materials include principles, concepts and learning challenges, with case study examples that demonstrate the application of theory in practice, thus giving the course potential for universal application. It should be possible for other educational providers to work with Orange to develop examples or case studies for their local situation, that building on the existing principles, as well as providing tools that might be needed for their particular situation.

There is potential for other Universities to collaborate in the development of the course into a conjoint international Masters program, with a combination of course work and action research that is conducted by the students in their local community. The network of universities offering this conjoint course in sustainable agriculture would collaborate in developing their own understanding of sustainable agriculture, thus enriching the whole process of course development and delivery, as well as providing opportunities for collaborative research.

Providers of agricultural education across the world are invited to collaborate with Orange Agricultural College in the development of programs in sustainable agriculture.

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