Agricultural Education: Social Science in the Curricula

by AM (Tony) Dunn and EC (Ted) Wolfe

Introduction

The goals of agriculture are to manage efficiently the resources (land, water, vegetation, animals, humans and money) used in the production of food and fibre, and to achieve a balance between the production, environmental, economic and social goals of the broader community. The resolution of these imperatives involves complex ideological, monetary and power 'struggles' between:

1. the landowners who make the day to day management decisions and who wear the consequences;
2. people in the community who are concerned about sustainable production and environmental protection/ restoration;
3. research groups that develop approaches to industry problems;
4. public and private stakeholders who develop and provide information packages and marketing services for the industry; and
5. policy makers and managers who develop, manage and apply economic/educational/social services for the industry and its people.

Hence, the education of 'agricultural professionals' - men and women who will work within the web of the industry - is a complex task, one that potentially involves many disciplines and approaches. The first problem for educators is to attract and retain students who are not only interested in rural life but also capable of handling the complexity of modern agriculture. Then the core matter of educating our future agriculturalists involves choices about the mix of topics that could be included in a relevant course, how these topics might be taught and how students might be given an interdisciplinary appreciation of these topics. Finally, there is a need to consider the product - have we produced trained technicians who cling to their educational past, or professionals who continue to learn and adapt flexibly to the changing environment of agribusiness? (P. Candy, 1995)

In this paper, we explore the complexity of agriculture and outline some of the past and current approaches to the education of agricultural professionals. We consider the demand for graduates, the availability of student places within the network of institutions that provide education and training to the industry, and the 'fit' of education supply to industry demand. We proceed on to a discussion of the main principles that underpin the construct of agricultural courses, including our own experiences when teaching 'hard' and 'soft' systems subjects and managing

the Bachelor of Applied Science (Agriculture) course at Charles Sturt University (CSU). Following a consideration of current problems in presenting this course, we indicate a number of issues that may determine the role of universities in agricultural education.

Servicing the education and training needs of agriculture

A dramatic statistic in Australian agriculture is the low proportion of farm operators who have completed a tertiary course (around 20%) compared with the proportion of tertiary-trained people in the workforce (50-60%). Due in part to this low statistic, and to the need for a professional, best-practice approach to sustain agricultural production systems, a high priority must be placed by society on agricultural education. Such education must bridge the continuum from the vocations that service agriculture (skilled farm labour, wool classers, grain handlers, diesel mechanics, accountants) to the practitioners (farm operators, agronomists, livestock managers, marketeers) and the agricultural professionals (scientists, economists, extensionists, consultants, counsellors and rural sociologists).

In NSW, four universities (CSU, the University of New England, the University of Sydney at Sydney and Orange, and the University of Western Sydney) provide degree courses in agriculture and related fields (viticulture, equine studies) to about 4,000 students. A further 13,000 students receive vocational training in agriculture, or in a related field, from TAFE (more than 12,000 students) and from two agricultural colleges (Tocal, Murrumbidgee) run by NSW Agriculture. The annual output of graduates from all of these institutions is 5,000 people per year, which is equivalent to one graduate per 15 farms in NSW. Providing the mix of graduates is right, this number can easily be absorbed into employment on farms and in the industries that provide services to agriculture. Indeed, graduate employment surveys indicate a strong demand from employers for the limited supply of graduates - about 400 per annum in NSW - from degree courses in agriculture and related fields (farm management, agricultural economics, viticulture). It is this pool of graduates, especially, that will determine how well Australian agriculture responds to production, environmental, economic and social imperatives. The focus of the remainder of this paper is on the design of the curricula of agricultural courses to deal with these imperatives.

What is Agriculture?

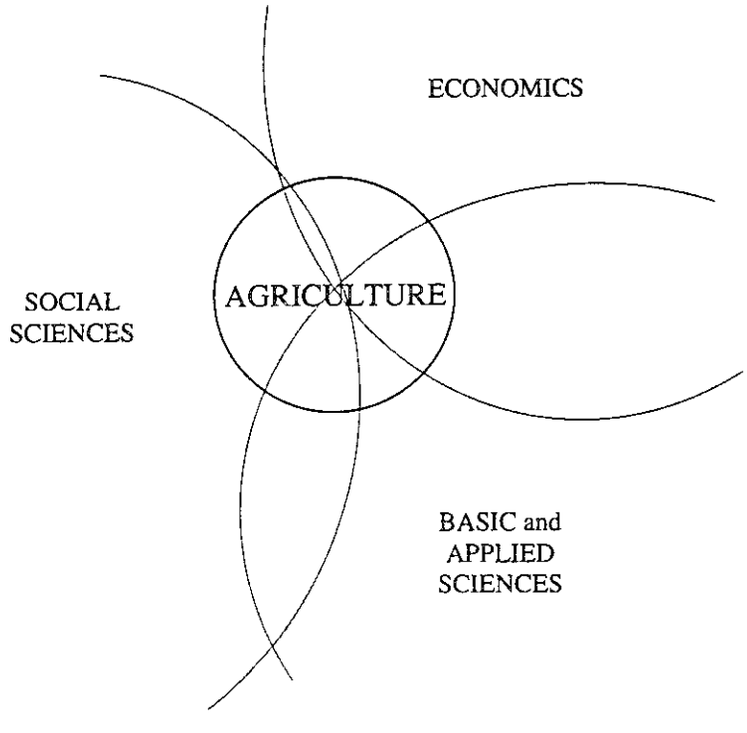
This question is asked so that the design and content of agricultural courses at universities can be understood from an evolutionary perspective. This process of reflection also might usefully embrace a critical analysis of existing programs and suggestions for future needs.

Professor Colin Spedding of the University of Reading was one leader who analysed what agriculture entailed and how it might be taught and studied (C. Spedding, 1988). He acknowledged that agriculture was about people, plants and animals but he also observed that these topics were insufficient to address the real-world role and importance of agriculture. Spedding considered that both management and the environment in which agriculture is embedded are

relevant to understanding the whole, thus justifying the systems approach that Spedding advocated (Spedding, 1988). He saw agriculture as a group of sciences (or parts of them) 'that are most relevant to agriculture or underpinning its processes and operations'. The main disciplines contributing to a study of agriculture are shown in Figure 1.

Spedding also was concerned about who should be trained in agriculture - agriculture's origin (i.e. hunting and gathering) was interesting to him because it introduced the relationship between the people who farm and those who benefit from the development of farming over time. Hence, Spedding asserted that an educated citizen should know about agriculture because agriculture impinges on the environment (it changes the appearance and smell of the countryside) and influences the community (all citizens should be concerned about hungry people). Furthermore he noted that food production had gone from something that most people were concerned about to an activity that has been left as a chore for a minority of people - certainly, in industrialised countries. For a natural scientist this was progressive thinking in a social sense!

Figure 1: Agriculture and the overlap of disicplines



Source: Adapted from Spedding, 1988

Looking at the agriculture-community interaction in reverse, Spedding observed that the 'effects of agriculture on the non-agricultural community were often negative'. These effects included visual amenity, pollution and what he termed 'the structure of the environment' such as the removal of hedges, manure smells, the sound of grass driers and nitrate in watercourses. At a more subtle level, he also saw problems in the interaction between farmers' methods and non-farmers' attitudes - such as those pertaining to the burning of straw and animal welfare matters. Recreational activities and the integration of small farm businesses and tourism were also foreseen. Again, this social appreciation was forward-looking for a book first published over 20 years ago!

Spedding ended his book on a philosophical note by considering the notion of 'agriculture and the citizen'. Here, he drew on the writing of C P Snow and Snow's two cultures resulting from over-specialisation at school in the arts or the sciences. Snow argued:

> *No one could claim to be completely educated unless, as a minimum, he* (sic) *could describe the second law of thermodynamics* (entropy[1]) *and had read a work of Shakespeare.*

Agricultural Curricula in Australia and New Zealand

Australian and New Zealand agriculture was first taught in the agricultural colleges beginning in the early 1880s. The University of Melbourne in 1910 (D. Williams, 1968) and the University of Sydney in 1916 established the first Australian university faculties of agriculture. The evolution of agriculture courses in Australia and New Zealand is described in three papers presented at a research and development conference on higher education in 1985. Matters discussed included new agriculture courses at the Colleges of Advanced Education (CAEs) (T. Dunn, 1985), systems agriculture at the University of Western Sydney - Hawkesbury (UWS) (R. Lundie-Jenkins, 1985) and educational models of discipline structures (R. Gabb, et al, 1985).

Although the natural sciences and practical agriculture traditionally dominated the curricula of agricultural courses, social science and extension were introduced in the 1960s at the University of Melbourne under the influence of Professor Sam Wadham, who initially appointed a rural sociologist (actually a psychologist, but from a farming background). When agricultural colleges and their courses were upgraded to College of Advanced Education status in the early 1970s, extension and communication studies were introduced.

However, attempts to broaden agricultural science so that graduates can appreciate and deal with social and environmental issues have been fraught with difficulty.
Although Spedding led the thinking about systems agriculture, and Professor G L (Bill) McClymont at the University of New England in Armidale enthusiastically embraced a systemic approach to agriculture, neither was able to introduce a significant content of 'agricultural systems' into their courses. However, the course that McClymont developed (Rural Science at UNE) had an integrated structure and a philosophy of dealing with 'soil-plant-animal interactions'. Both men were interested in the broader issues of

[1] Entropy is a measure of the state of disorder within a system

human existence and the role of educated agriculturalists. McClymont first espoused the 'eternal triangle (soil-plant-animal)'and then the 'perpetual pentogram' that focused on the disciplines of ecology, ethics, economics, evolution and education. He even uttered the word 'culture' but there was little if any of this material in the course (McClymont, 1970). It was left to Professor Richard Bawden, who was influenced by Spedding, to make the big changes to agricultural curricula, which he did in the late 1970s and early 1980s at Hawkesbury CAE (now the University of Western Sydney, Hawkesbury campus) (R. Bawden, 1992). The systems revolution at Hawkesbury - with its emphasis on holism and autonomous learners - signalled a break from the reductionist scientific stranglehold on agricultural curricula.

Rural Sociology

G. Lawrence (1997) summarised the state of the rural sociology discipline in Australian universities. He accurately predicted the need for more research on rural social issues in the wake of the changes in the nature of rural Australia under the pressures of trade, globalisation and economic polarisation. However, his analysis of undergraduate and postgraduate teaching was cursory; he only mentioned action learning at UWS and Gatton. He made no mention either of social science taught within agriculture courses or postgraduate students with rural social projects at institutions such as CSU and the University of Melbourne.

Despite Lawrence's scholarship and influence in raising the awareness of rural social matters, there has been a minimal response in terms of changing the curricula of undergraduate agricultural courses. Extension subjects, where taught, include a smattering of rural sociology - mostly of a social psychological paradigm according to Buttel et al (1990) - thus providing a limited behaviourist view of social change.

However, at the postgraduate level, there has been more cooperation and integration between the social and agricultural disciplines, cooperation that was fruitfully applied to researching and learning about rural problems. This activity got off to a good start in the early 1970s (P. Salmon and H. Hawkins, 1973) only to founder late in the decade when government withdrew support for extension services and tertiary education. However, cooperation has since re-emerged through centres for rural social research at CSU and the University of Central Queensland, where cross-faculty approaches to research, and to the supervision of higher degree candidates, have been successful.

Social and Environmental Matters

Proponents of environmental sociology criticise the practitioners of sociology for neglecting the dependence of humans on their physical environment. R. Dunlap and K. Martin (1983) asserted that sociology had neglected the importance of environmental conditions on social life on the grounds that it was biologically and/or geographically deterministic. They also warned sociologists not to be reductionist because it resulted in them being blind to the knowledge of natural scientists and to the reality of the physical environment. Sociologists were further advised to treat the

physical environment as an important variable rather than as a constant, because they ran the risk of socio-cultural determinism (Dunlap and Martin, 1983).

D. Hulme (1990, p326) maintained that Farming Systems Research (FSR) opened up opportunities for sociologists to participate in agricultural research through Rapid Rural Appraisal (RRA) and/or multi-discipline research teams that emphasised both the whole farm as a starting point and the importance of context. However, R. Chambers and J. Jiggins (1987) observed that FSR was plagued by 'normal professionalism' - an over-emphasis of research control by graduates, such as adherence to narrow scientific processes and thinking. However, the FSR/RRA methodologies recently received a positive review by M. Collinson (2000) who described their place in history as a forerunner to participatory models of extension and research - a point also recognised by R. Chambers (1997). Finally we have observed that FSR has made a comeback in Australia with the recent advent of the Australian Farming Systems Association - part of an international body. FSR was also prominent in the program of the 2001 Australian Agronomy Society conference at Hobart where several plenary and research papers were presented. The significance of this recognition is that FSR gives natural scientists a friendly way into participatory methodologies and an opportunity to free themselves from positivist approaches. R. Petheram and R. Clark (1998) discuss the usefulness of FSR to Australia.

Roling and Engels (cited in Hulme, 1990) suggested another improvement to FSR, advocating the use of Checkland's Soft Systems Methodology (SSM). This methodology, they noted, provided a framework for understanding, in an holistic and action research sense, farm problems embracing agricultural technology along with the people who operated these systems. However, SSM was not immune from criticism – M. Jackson (1982) pointed out that SSM was only a small start in relating systems thinking to social theory and being useful in managing human systems.

In summary, the integration of the sociology and agriculture fields to address environmental problems has been a struggle. Hulme (1990) observed that although social research, agricultural research and extension amassed a great deal of knowledge that should be useful to farmers and professionals, in the 1980s there was still no overall theoretical framework. In Australia, progress has been made in recognising farmers' knowledge and encouraging their participation in research, but more work needs to be done by social and agricultural scientists to improve the relevant methodologies (Dunn, 1994; Dunn et al, 1996).

Systems thinking in the agricultural curricula at CSU

Our notion is that the study of agriculture must embrace a combination of natural and social sciences. An agriculture curriculum propelled by science and technology does not provide enough of what J. Farrington and A. Martin (1988) term 'farmers' (subjective) goals and constraints', nor their (objective) indigenous technical knowledge. Tertiary curricula should provide an understanding of agriculture as an activity of people, managing for private production goals as well as meeting the sustainability objectives and other

expectations of the public at large in relation to issues such as biodiversity, animal care and ethics in human research. Only through disciplines like systems and extension are the deficiencies of a technocentric approach counterbalanced.

Twenty years ago, when Hawkesbury Agricultural College introduced systems and human relations into their CAE courses, there was considerable controversy on the extent of the changes involved (see Bawden, 1992, Dunn, 1985, Gabb, et al, 1985 and P. Gregg, et al, 1985). At Wagga Agricultural College/Riverina CAE (later to become CSU), a more conservative pathway was followed. Following course reviews and restructuring, an extension subject was introduced in 1970 and agricultural systems followed after the 1984 course review. The objective was to provide students with skills, knowledge and attitudes to deal with the people element and complex issues in the industry, plus an understanding of the importance in agriculture of social, communication, holistic and environmental matters. In practice, there have been several refinements of the emphasis and content of extension and agricultural systems in the agriculture course in these and other institutions, and the job is ongoing. For example, when teaching the integrating subject AGR301 Agricultural Systems at CSU, we have over the last 10 years included and developed key theories and methodologies such as Checkland's SSM (P. Checkland, 1999), Conway's agroecosystem analysis paradigm (G. Conway, 1994), the farmer-first philosophy (I. Scoones and J. Thompson, 1994), and qualitative social research methods such as rapid rural appraisal and semi-structured interviewing. AGR301 is not necessarily enjoyed by many agricultural students, who clearly are taken out of their comfort zone into the abstract, unpredictable world where decisions depend on the attitudes of the people who are making the decisions. Despite their earlier discomfort, graduates often commented subsequently on how they appreciated what they have learnt in AGR301 after they have spent a couple of years in employment.

Finally, as stressed by C. Pearson and R. Ison (1992), changes in the content of courses must be supported by changes in educational approach, so that graduates acquire generic skills (for example, problem-solving skills, listening skills) and attitudes (for example, creativity, ethics). Once again, in our experience, undergraduate students do not appreciate fully the importance of these skills until they enter the real world of agriculture. Furthermore, many of our scientific colleagues, both inside and outside the university, do not understand fully the importance in the workplace of social and communication training that undergraduates receive during their course. This lack of understanding is apparent during formal reviews of course content, which provide academics with an opportunity to maintain or extend their disciplinary territoriality. In our (selfish?) opinion, the most recent review of the content of the agriculture course at CSU was successful in that, while the number of compulsory (core) subjects was reduced from 21 to 12 to accommodate a number of specialisations, the agricultural systems subjects (3) were retained in the core.

Conclusions

One of the difficult challenges of the future is to maintain or increase the number of students who are studying rural-focused courses, in the face of the current net migration of young people from the bush to the city. Furthermore, concern has been expressed by some academics about the quality of students entering agricultural course at universities, as measured by the TER/UAI rank of students entering these courses.

There are different views about low UAI cut-offs. The first is that the profession of agricultural science will decline relative to others, unless the most able students can be attracted into agriculture. Those academics and scientists who see the future of agriculture depending on a strong dose of education in the scientific disciplines express this view most often. On the other hand, students in the low cut-off bands (TER = 50 - 65; UAI = 70 - 80) who survive the 'first year experience' have, in our experience, justified the decision of universities to admit them. Within this group there are people who have backgrounds that are full of agricultural experiences, who possess attitudes to country life that are strongly positive, and who see a wide range of career options in agriculture. For them, a 3-year agricultural degree is enough formal agricultural education to seek employment in agriculture. Many might return to university at a later time to undertake postgraduate coursework. Such flexible career pathways are well removed from the honours and higher degree programs that have produced agricultural scientists and academics.

It is important to maintain diversity within the system of tertiary education in agriculture, for there are vocational requirements ranging from scientists to producers, from agricultural economists to small-business managers, and from policy makers to rural counsellors. Agriculture is a profession that requires breadth as well as depth in training and education. The range of factors that affect agriculture are highlighted by the current controversy about genetically modified organisms. Scientists alone will never resolve such issues, since many of them fail to appreciate the importance and role of other players in the agri-food system. In some respects, the strength of agricultural science has been its weakness in that the increasing complexity of the scientific disciplines leads on to a demand for more course space, perhaps reducing the likelihood of including in the curriculum soft sciences such as extension, systems and sociology.

In addition to diversity and flexibility in agricultural curricula, there are other areas in tertiary agricultural education that require improvement through a better focus on the needs of students and agribusiness. One need is to ensure that courses are accessible, by distance education and web delivery, to mature age (>21 years old) people who are already employed. Advanced communication technologies are transforming the way people study at work and at home and it is important that Australia invests in these technologies for rural people. Another equity issue is to ensure that applicants for agricultural courses receive credit for their experience and prior learning (Johnson et al, 1996).

Finally, ongoing adjustments are needed to match the supply of professionals trained in appropriate disciplines and fields for the agri-food industries of the future. We need an appropriate balance of generalists and

specialists. Course rationalisation must be carefully implemented to balance student numbers with the likely demand for graduates, and to preserve a balance of knowledge, skills and attitudes that are sought by employers. Mainstream courses may need to become more flexible to cope with a swing from, say, agronomists to livestock managers, farmers or landcare coordinators. Flexibility is crucial, also, in producing graduates with an appropriate spread of knowledge. At CSU, we believe we have been successful in producing agricultural graduates with some appreciation of the human dynamic. However, there is a case for producing some agricultural graduates with a minor in sociology, or some sociologists with an agricultural minor. To achieve the level of diversity and depth required, our respective course structures need to be flexible. We also need to nurture staff with the ability to teach and research the complex problems of agriculture and the environment - staff with inter-disciplinary capacities and an appreciation of the social aspect of problems.

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As a farmer, teacher and researcher, Tony Dunn is close to rural industries. He has authored 10 papers, 28 conference papers and 3 book chapters. His undergraduate and postgraduate students use qualitative research and soft systems methodologies to investigate agricultural and rural social problems. His current research activities include an action research project with the community in the Coleambally Irrigation Area.

Professor E C (Ted) Wolfe, MScAgr *Syd*, PhD *NE* – Ted Wolfe recently retired from the Chair of Agriculture at Charles Sturt University and is currently Emeritus Professor. From 1990 to 1997, he was the Head, School of Agriculture. He then coordinated CSU's Bachelor of Applied Science (Agriculture) course. In 2001, he chaired a review that produced a successful proposal to incorporate specialisations into that course.
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