

## **Some contemporary challenges of teaching agriculture at a university- a perspective from Reading, UK.**

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### **Abstract**

Agricultural Higher Education is presently facing many challenges. Whilst many subject areas have attracted increasing numbers of students in the last decade, the overall “pool” of agricultural students is static if not declining. Against this background there are a high number of agriculturally related courses at both colleges and universities. This paper considers Agricultural Higher Education in the UK, focussing at four levels; the provision of courses; the curricula; and the learning experience and the issue of quality in Higher Education. Although it is essential that institutions respond to the rapidly changing agricultural environment, the maintenance and provision of high quality education is essential. In many institutes this may require the increased recognition of good teaching practice as well as research.

### **Introduction**

Formal agricultural research and learning started in Europe around 1786, when the first public experimental farm was established near Braunschweig (Porceddu and Rabbinge 1997). However, the scientific basis of agricultural practices could be argued to have been laid by von Liebig and Mendel with their insights into plant nutrition and genetics. In the UK the first experimental agricultural institute was established at Rothamsted in 1843 by the partnership between Lawes and Gilbert. According to Jenkinson (1991) the Experimental Station itself developed from the field experiments and not the other way around. By the end of the 19<sup>th</sup> century Agricultural colleges had been established at Cambridge, Reading, Bangor, Leeds and several other educational institutions. Now there are 14 institutions offering degrees in agriculture or in agricultural science in the UK (UCAS 1998). – (see Table 1).

### **Table 1 in here**

This proliferation of courses is reflected in the changes that have occurred within agriculture during the 20th century. The rapid technological developments, the reduction in labour required on farms and the increased understanding of the scientific principles underlying agriculture has created a variety of skilled jobs in the sector. Rapid advancements in computer and information technology means that most on-farm workers will come into regular contact with computers, either in the tractor, the milking parlour or the farm office. Farmers and managers have to keep abreast of rapid developments (for instance in pesticides or genetically modified crops) and require the ability to respond quickly to new knowledge and policies. The ability to assimilate, to sift and to filter technical and scientific information and to have good communication skills is essential. The efficient management of farm resources requires individuals with a variety of skills and a sound knowledge of agriculture

which is often gained in institutions of Higher Education. However, the agricultural industry in the UK, in common with most other European countries, is currently suffering one of its most severe depressions this century and is showing its vulnerability to market forces. In the UK this is due to changes in exchange rate and the low price of many commodities at the farm gate. Proposed changes in the support regime under Agenda 2000 hold little prospect of improving farm incomes. Additionally, changes in consumer demand in terms of quality, new food safety legislation and the prospect of environmental cross-compliance may all add to the complexity (and cost) of production.

This clearly has implications for the education of undergraduates following courses in agriculture, particularly in terms of the curricula content. This paper is an initial attempt at examining some of the challenges facing agricultural higher education in the UK in the light of recently occurring changes. The aim is to provide some "pegs" on which ideas can be hung and to debate initiatives among academics and teachers which will help in the education of graduates who are capable of meeting these new challenges. The focus is particularly on four levels; the provision of courses; the curricula; and the learning experience and the issue of quality in Higher Education.

### **Agriculture course provision**

Within the UK, courses in agriculture have been traditionally taught at either the county college level or at universities. The former institutions have, in the past, concentrated mainly on practical training either at Ordinary, or in some cases, Higher National Diploma level. The latter have been concerned almost exclusively on degree level education, the emphasis being on the scientific understanding of agricultural systems and their management. More recently several of the more prominent and larger county colleges have started offering degree courses in agriculture and related subjects, often in association with post-1992 universities. This has led to a greater number of institutions offering agriculturally related higher education and an increase in the diversity of courses being offered. Table 2 provides an overview of the current situation.

### **Table 2 in here**

Pearson and Ison (1992) reflect on agricultural education at Australian Universities, suggesting that Australia at the time had one university offering a degree in agriculture per million of population. They compare that with California in the USA where there was approximately one institution for every four million. In the UK at present there are 14 institutions offering BSc Agriculture degrees and 57 closely related courses- (see Table 2. This gives a ratio of one agriculturally related degree course per 800,000 of population, perhaps indicating substantial over-provision of courses. Table 3 provides information on applications and acceptance on agricultural degree courses in the UK over the last four-year period. This illustrates that the numbers of students who opted to study agriculture has remained quite stable over that period.

### **Table 3 in here**

However, this must be considered against the background in which the number of young people entering Higher Education since 1989/90 has doubled from about a sixth to a third of the total. Further, in 1999 many UK universities offering agriculture have faced a decline in applications, some by as much as 25%. In fact many institutions have faced a long-term decline in agricultural student numbers- (see Figure 1). This reduction in demand and the potential over-supply in the provision of courses means that educational establishments offering agriculturally related courses have to market them proactively. Problems are exacerbated further as students do not often view agriculture as a profession in which they are likely to earn high remuneration, despite the generally good employment prospects. Such effects may be intensified by the abolition of maintenance grants and the introduction of tuition fees.

***Figure 1 in here***

The response of many institutions to falling numbers on agricultural courses in recent years has been to look to new alternative markets and opportunities. For instance agricultural departments recognise that there are relatively large numbers of students who take applied biology at university who perhaps have never thought of a degree in agriculture as an option. Similarly, the popularity of environmental sciences and business studies has led some departments to explore degrees in these areas. Blank (1999) notes similar trends in student numbers and diversification in US institutions suggesting that the ultimate outcome is lower budgets and fewer faculty staff. This is likely to make the teaching of a broad-based degree such as agriculture increasingly difficult.

The increase in the diversity of the degrees has been facilitated at many institutions by modularization, whereby a “degree curriculum” can be designed to include a wide range of modules from across different schools or departments within the university. If well planned this can produce a robust cross-disciplinary curricula and provide students with the education and skills required in the jobs market place. However, new courses often place additional administrative and teaching burdens on existing staff, particularly where new resources are not available. It is also important that in the design of new courses and the marketing of agricultural education that “what is best” for the individual student is not overlooked. These considerations include the course of study they follow, where they undertake that course and the likely career prospects once they have completed their higher education. From the employers point of view the “mix and match” approach adopted in the creation of new courses may mean that the graduates they employ are no longer a “standard” recognised “product” having undergone a specific learning experience.

Universities as “knowledge providers” are obliged to respond to these new realities. Professor Howard Newby, vice-chancellor of The University of Southampton, UK, (writing in The Time Higher Education Supplement September 10, 1999) has argued that traditionally university curricula have been designed on the “just in case” principle of learning, whereas the changing realities of the job market require “just for you” philosophical approach to the design of curricula and the provision of the learning environment for undergraduates. However, “what is best” for the individual learner or “just for you” approaches to learning are vexing issues and raise some fundamental questions about both the nature of university level learning and how it

should be structured and delivered. These questions need to be raised and possible answers debated to enable universities to meet new challenges in order to compete successfully with other providers of Higher Education.

## **Course curriculum**

Agriculture covers a wide range of traditional university disciplines and students are often expected to study subjects as diverse as genetics and microbiology, farm machinery and management economics (for example). Such a diversity of subjects forming part of agricultural education leads to the debatable point of whether or not agriculture itself constitutes a ‘discipline’. This issue is important where the contraction of the university sector will inevitably lead to ‘rationalisation’ or ‘down sizing’ resulting in closure of departments. This paper is perhaps not the place to develop a point of view on this issue, but if one were to take Becher’s (1989) argument on academic tribes and territories, then agriculturalists do constitute a “tribe” and they have a clearly defined “territory”. One can tell who is an agriculturalist and who is not and this agriculturalist is recognisable. In this sense agriculture will continue to have a disciplinary perch within universities. Thus, agricultural students will continue to acquire a broad education and will have to develop useful skills in a range of areas. However, several developments may impact on the traditionally rounded curricula:

*Modularization.* The compartmentalisation of the curriculum can have benefits both for the student and the institution running the degrees. However, it can mean that learning becomes a series of discreet mini-curricula with few cross linkages. Further it has been argued that learning becomes determined by the nature of the resource rather than the needs of the student. Modules included in the agriculture curriculum can often reflect the research interests of the staff rather than the requirements of students who are likely to be employed in an industry which is evolving very rapidly. Teachers themselves become attached to their modules which can easily become outdated in the context of the rapid advances in agricultural technology and general environment in which farm businesses operate.

*Administrative procedures and quality assurance:* There is a danger that administrative procedures rather than the desire to provide a robust curriculum can drive the student learning experience. Certainly, the increasing need to streamline administrative and record keeping activities (often associated with quality assurance packages) can lead to a reduction of in-course flexibility. Credit based systems through which all student activities must be recorded can also lead to the loss of some important learning experiences simply because it is not easy to apportion effort or to accommodate “one-off” undertakings of learning into the framework. Ironically, some of this streamlining is in response to the demands of students themselves who increasingly question curriculum and learning issues. For instance, students are increasingly vociferous if course handbooks are not followed to the letter, when historically they were designed for guidance only.

*Staffing issues:* The disciplinary specialisms of staff also have a large influence on the curriculum content of a course. Few people enjoy teaching outside of their specialism- which means that the curriculum often accommodates the expertise of

staff as much as the current learning needs of students. In large departments or faculties with a wide range of staff interests this may pose no problem. However, as institutions are forced to make savings and staffing is reduced then “holes” can develop in the teaching capacity. Further, lecturing staff are often hired for their income generating or research ability rather than for the contribution they can make to undergraduate teaching.

It is perhaps the last issue which is the greatest (and on-going concern). For instance, Bonnen (1986) criticised American Agricultural Colleges which he believed had become collections of independent disciplinary researchers who are either unwilling or unable to view systems as a whole and thus are unable or unwilling to address effectively the problems facing agriculture in future. Similarly, Jayaraz (1992) argues for more ‘generalists’ in agriculture. The reductionist nature of a great deal of scientific research (increasingly so in the molecular and DNA era) means that some staff members have quite a narrow field of expertise. However, many of the agriculturally related problems in the world (food shortage, food safety, agriculturally caused pollution) are likely to only be tackled by cross-disciplinary research. The gradual switch in European Agriculture from a productionist paradigm to one of resource conservation and environmentalist paradigm has not always been reflected in the curricula content or indeed the staff involved in the delivery of knowledge and teaching. Thus, the research specialisms of many lecturing staff employed in agricultural departments may well be making contributions to the disciplines of plant or animal science but these may be contributing little to the needs of the resource-conserving and environmentally aware agriculturalist. All of these issues have implications for the nature and content of student learning, be that at an agricultural college or a university.

### **The learning experience**

A great deal of debate has focussed on the nature and quality of agricultural learning (Bawden, 1992; Bawden et al 1984; Pearson and Ison 1992), from its philosophical foundations through to the practical management of the actual process itself. The environment in which learning takes place is central to the success of Higher Education and academic staff clearly have a pivotal role in providing the most appropriate environment and tools to aid and guide this learning process. However, the attitude of the student (or learner) is also critical to this learning process and thus the success of the individual [student] with respect to Higher Education. Learning is a complex and a dynamic process, which proceeds by interaction involving the learner, the learning infrastructure, the type of knowledge being sought and the knowledge-providers. The success of this process, in terms of learning outcomes, depends on the aspirations, capacity, commitment and personality of the learner and thus to a large extent the process becomes ‘internalized’ for the individual learner.

It is well documented that the traditional lecture is a useful method for imparting information but on its own, it is not an effective means of learning. Walsingham and Mayon-White (1982) stress that it is up to the student to reinforce what is being learnt from lectures and tutorials by pursuing areas or topics introduced independently. Many university teachers are aware of the limitations of the traditional lecture but still utilise them as a central part of their teaching strategy as it is an efficient use of a

lecturer's time and it is a cost effective method of delivering knowledge, especially to large groups. This is perhaps slightly perplexing when viewed in the context of a learning and an educational experience, but understandable if the time management of the individual lecturer is considered. For many staff, lectures are bundles of papers, OHP acetates or slides which are drawn out of filing cabinets at the appropriate time of the year, modified if necessary [or if time allows] and presented in front of a group of students. For academic staff who have numerous other commitments this is a 'rational' approach to achieve an effective management of their time.

Preparation of alternative teaching strategies using case studies, groupwork, the internet and tutorials are recognised as deeper learning experiences if utilised well, but are often more time consuming to set-up and run. Similarly, Information Technology has huge potential in teaching and learning but is probably not being utilised to its full simply because teaching staff do not have the time to integrate information technology to its full within the curriculum.

Assessment of the extent to which learning has taken place is another area which is time consuming. Again, traditional methods of assessment may not always be the most appropriate from the point of view of student learning but they are often relatively time efficient. The increasing transparency of the assessment process, whilst understandable, also means that the whole learning process can become more staged and calculated, not undertaken necessarily for its intrinsic worth. Students are now able to select modules not so much because they feel the content will be of particular value to them but because the method of assessment in a given module suits their needs more for accumulating the required credit. In fact one of the key skills that many students appear to learn quickly is to isolate learning which is associated with assessment [and thus "counts"] from that which is recommended but which does not contribute directly to assessment- the latter is often ignored. This is perhaps increasingly understandable, as there is pressure on students to supplement their time at university with incomes from paid employment, which maybe in excess of 20 hours per week.

It is not possible to evaluate the full impact of the abolition of the maintenance grant and the introduction of tuition fees on student learning. At the same time it may mean that the student is keen to supplement his or her income to a greater extent by undertaking some form of paid employment. This clearly has implications for how, when and where the student studies and the way in which the curriculum is presented. Further, as students (and their parents) effectively pay more directly for Higher Education they are likely to want to be assured of its quality. Similarly, government is keen to appraise the value for money of Higher Education. Defining 'quality' is an issue which requires a separate paper for an adequate explanation. Accepting for the time being that this concept is generally understood, some of the issues connected with the quality aspects of university courses are discussed below.

### **The quality of courses and provision**

The quality in Higher Education is under close scrutiny at present and Higher Education institutions are now subjected to Teaching Quality Assessments (TQA) via

the Quality Assurance Agency (QAA). The agency operates under a contractual agreement with the Higher Education Funding Council for England (HEFCE). The main purpose of assessment is to ensure that public funding is supporting education of acceptable quality. Table 4 illustrates the assessment outcome of the agriculturally related provision which suggests that all institutions assessed were meeting the required criteria, with little quantitative difference between them. However, such assessments give little indication of the nature of the provision or whether degree standards are being upheld. Individual institutions (providers) set their own aims and objectives for their subject grouping against which they are assessed. This may, at least in part, explain the small [numerical] differences between institutions. To tackle the question of degree quality the QAA is in the process of setting up benchmarking groups whose task will be to review the degree standards being set in differing subject areas and institutions. It is hoped that the benchmarking group for agriculture will be in place by spring/summer 2000 and that the subject group will be reviewed between 2003 and 2006.

A further issue associated with the quality of learning in Higher Education (HE) is the recent establishment of the Institute for Learning and Teaching (ILT), which was recommended in the Dearing Report (1988). As a professional body associated with learning and teaching in Higher Education the functions of the Institution are to enhance the status of teaching, improve the experience of learning and to support innovation in Higher Education. It is difficult to predict the impact of the ILT on the status and quality of teaching in HE, and its reception amongst academics has been mixed. However, the authors feel that once well established the ILT will have a positive role to play in improving Higher Education provision.

***Table 4 in here***

**Concluding remarks**

At a national level, in the UK, there is an increasing emphasis placed on the value of higher education to the economic development of the country in addition to the experience of the individual involved in the process. A recent article (CVCP 1999) suggests that both male and female students benefit from degrees in terms of earning power by the time they reach the age of 30. At this age male graduates earn 30% more and females 46% more on average than those who went from school straight into a job.

This paper has attempted to address a number of current issues facing agricultural higher education in the UK. It has not been put forward as a definitive statement on the subject- but as an attempt which will hopefully initiate and stimulate debate. A question which is often voiced but seldom vocalised is the question of whether agriculture ought to be taught to undergraduates at universities. The authors of this paper firmly believe that there is a place for agriculture in Higher Education and that a well designed curriculum provides a robust cross-disciplinary learning experience. However, there are several issues that require thought and discussion:

*The number of courses :* It is likely that the number and diversity of courses that are offered in the UK is excessive in relation to the potential student population.

Eventually market forces will lead to an equilibrium, no doubt. However, in the meantime a considerable amount of educational resource is currently being used (wasted?) in marketing and competition when it may be better used to enhance the student learning experience. The recent ELITE group which has been established by four Agricultural Colleges may provide a model for reducing such competition and channelling resources more effectively into student learning.

*The nature of provision of courses:* The agricultural industry as a whole requires a range of employees from highly skilled farm workers and technicians through to advisors, researchers and decision makers capable of thinking about and helping to guide the industry into the future. At present there appears to be some confusion within some agriculturally oriented education establishments about what exactly they are trying to provide and for what purpose. Although marketing is a word which is now often used in an educational context it is the educational needs of students - as opposed to the need to keep a given institution functioning - which should determine provision of agricultural courses. The time that many young adults spend at college or university is an important period of academic and personal development in preparation for a subsequent career. The role of course Admissions Tutor is certainly one of guidance and advice to potential entrants to universities but the task of "selling" specific courses to students does not seem appropriate in an educational context. Similarly students should be made aware of the job prospects in such a vocationally oriented subject as agriculture.

*The nature of the student:* Many agricultural courses, because of their cross-disciplinary nature, and the skills they engender can provide students with an excellent platform from which to launch their careers. However, the broad nature of the subject means that the student needs to be willing to embrace learning and to explore new avenues. Often students of agriculture arrive at a college or a university with considerable farming experience and preconceptions. Many are entrenched in certain modes of thought which it is difficult even for the most experienced teachers to overcome. Thus, a key question for many agricultural teachers is how to encourage students to think more openly and critically and to address the issues of agriculture, land use and environment from a number of perspectives?

*The nature of the staff:* The ability and quality of teaching staff clearly has a significant role to play in the learning process. The majority of university lecturers are self-taught teachers, often with a limited number of strategies, developed mostly through 'trial and error'. The introduction of the ILT may help considerably in the field of staff development and thus ultimately enhancing the student learning experience. However, whilst teaching activities carry such a low profile in terms of recognition and career development, particularly in traditional universities, it is likely that individuals will continue to find it difficult to devote the deserved amount of time to [improving] student learning.

The agricultural industry itself and the agricultural higher education sector associated with it are having to face up to many changes and challenges. The impact of information technology and distance learning is, and will continue to have, a considerable impact on the potential for learning. Although it is essential that institutions respond to the rapidly changing agricultural environment, the maintenance

and provision of high quality education is essential. In many institutes this may require the increased recognition of good teaching practice as well as research.

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**Table 1 : Institutions offering BSc Agriculture [science] for university entry in 1998. (Source : UCAS handbook 1997)**

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Aberdeen  
University of Wales, Aberystwyth  
University of Central Lancashire (at Myerscough College)  
De Montfort University (Lincolnshire campus)  
University of Edinburgh  
Harper Adams Agricultural College  
University of Newcastle Upon Tyne  
University of Nottingham  
University of Plymouth  
Queens University, Belfast  
University of Reading  
Royal Agricultural College, Cirencester  
Writtle College (in conjunction with University of Essex)  
Wye College, London

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**Table 2 : Number of institutions offering higher degrees and diplomas in agriculturally related subjects in the UK 1998 (UCAS 1998).**

Courses offered	Degree	HND
Agriculture		
Agricultural science	14	13
Ag Biochemistry	1	0
Ag Biology	2	0
Ag Biotechnology	1	0
Ag Botany	2	0
Ag Business	3	3
Ag Business Administration	0	1
Ag Business Management	5	1
Ag Chemistry	1	0
Ag Ecology	1	0
Ag Economics	9	0
Ag and Environment	3	0
Ag and Food Marketing	5	2
Ag Management	6	2
Ag Mechanisation	0	1
Ag Microbiology	1	0
Ag Production	0	1
Ag Technology	3	0
Organic Ag	0	1
World Ag	1	0
Agronomy	1	0
Animal Science/farming	12	8
<b>SUB-TOTAL</b>	<b>71</b>	<b>33</b>
<i>Farm animal related</i>	7	7
<i>Crop studies</i>	10	7
<i>Farm studies</i>	5	3
<i>Rural studies</i>	23	5
<b>OVERALL TOTAL</b>	<b>94</b>	<b>38</b>

*Note: This list does not include subjects such as countryside management, applied biology, environmental science or horticulture which at some institutions can have varying amounts of agriculture included in the curriculum.*

**Table 3: Agricultural degree applications and acceptances 1995-1998**  
**Source: UCAS annual reports**

	Applications	Acceptances
1995	2794	1463
1996	2794	1482
1997	2998	1487
1998	2872	1462

**Table 4 : Teaching quality assessment for Institutions Assessed In Agriculture, Forestry and Agricultural Sciences** (Source :Quality Assurance Agency report QO 9/98)

Institution	Curriculum Design, Content and Organisation	Teaching, Learning and Assessment	Student Progression and Achievement	Student Support and Guidance	Learning Resources	Quality Assurance and Enhancement	Assessment Outcome	Quality Assessment Report
Askham Bryan College	4	4	3	4	3	3	Quality Approved	Q19/98
Bournemouth University	3	3	3	4	3	4	Quality Approved	Q57/98
Buckinghamshire College of Higher Education	3	3	4	4	4	2	Quality Approved	Q245/98
Cranfield University	4	3	4	4	4	3	Quality Approved	Q119/97
De Montfort University	2	3	2	4	3	2	Quality Approved	Q211/97
Harper Adams Agricultural College *1 *2	4	4	3	4	4	4	Quality Approved	Q154/98
Pershore and Hindlip College	3	3	3	4	3	3	Quality Approved	Q187/98
Sparsholt College	4	3	3	4	3	3	Quality Approved	Q295/98
The Queen's University of Belfast	3	3	3	4	4	4	Quality Approved	Q192/98
University of Central Lancashire	2	3	3	4	3	3	Quality Approved	Q198/98
University of Leeds	3	2	4	4	4	3	Quality Approved	Q14/98
University of Lincolnshire and Humberside	3	3	3	4	3	3	Quality Approved	Q32/98
University of Newcastle upon Tyne	4	3	4	4	4	3	Quality Approved	Q271/98
University of Nottingham *1	4	3	4	4	4	4	Quality Approved	Q177/97
University of Plymouth *2	3	3	4	4	4	4	Quality Approved	Q56/98
University of Reading	3	3	4	4	4	3	Quality Approved	Q12/98
University of the West of England, Bristol	3	3	4	3	3	4	Quality Approved	Q270/98
Writtle College *3	4	3	3	3	4	2	Quality Approved	Q107/97
Wye College, University of London	4	3	4	4	4	3	Quality Approved	Q189/98

\* Denotes assessment with other units; see key:

Key

\*1 Food Science

\*2 Land and Property Management

\*3 Mechanical, Aeronautical and Manufacturing Engineering

**Figure 1 : Number of students undertaking the BSc Agriculture Course at the University of Reading, 1975 to date**

