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CONFERENCE PAPER

HIGHER LEVEL SKILLS FOR FOOD SECURITY: DO WE HAVE THE RIGHT INGREDIENTS?

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This paper reviews what we mean by 'higher level skills' and who is best placed to provide them. It investigates contemporary issues that need to be addressed so that the best possible people can be provided to tackle the agri-food challenges we face in the light of the debate on food security. Finally, the ingredients for success are considered, in the context of collaborative frameworks for agricultural higher education, closer links with industry and international examples of investment in higher level skills.

Key words:
Education, training, skills, agriculture, food security

Introduction: The Role of Higher Level Skills

In the last two years there has been a significant change in the way that agriculture, and closely related land-based sectors, are viewed in terms of their role in food and energy production and the management of natural resources. The Cabinet Office 'Food Matters' report (Cabinet Office, 2008) highlighted the further challenges of the impact of food production techniques on human nutrition and, at an international scale, their contribution to the global challenges of climate change and the alleviation of food poverty. The recognition of these complex interrelationships came at a time when some parts of the world were faced with food shortages and the 'food price spike' seen during 2008, causing agriculture and the issue of food security to be considered as policy priorities.

DEFRA's subsequent strategic review of UK food security (DEFRA, 2009) was, however, surprisingly silent on the human resources required by the agri-food sector to address the challenges identified by the Cabinet Office. The House of Commons Environment, Food and Rural Affairs Committee took up this point in its review of food supply issues in the period to 2050 when it noted that, 'Several submissions expressed concern about the erosion - or even disappearance - of particular skills connected with food. These concerns centred on farming and applied research' (House of Commons, 2009, p50). The report highlighted DEFRA's initial submission on agricultural research which said that:

'We have some concerns that expertise in agricultural sciences, and in specific technical areas (for example, soil science, weed science, 'whole organism' biology, agricultural engineering), are not being replaced; universities are no longer teaching relevant courses, and long term career prospects are limited'

The report went on to note that DEFRA had not provided a plan of action to tackle these concerns and recommended that there was a need for urgency

in addressing, 'potential gaps in food and farming skills' (*ibid*, p51), to the extent of reintroducing a postgraduate studentship scheme to, 'encourage more young people to acquire the skills that will help the UK and the world to produce more food, more sustainably'.

Whilst this recommendation remains to be implemented, substantial progress has been made on highlighting the issue of food security, and, within it, the need for expertise to address the complex environment of food production. A major shift occurred in early 2010 with the publication of the Food 2030 cross-Government strategy for food, (HM Government, 2010) and the associated strategy for food research and innovation (Government Office for Science, 2010a), both of which highlighted the need for skills and expertise to be developed, on the one hand to improve the competitiveness and the resilience of our food chain and, on the other, to ensure that we have the necessary research skills to continue to make advances in food production techniques. These documents established an objective to sustainably increase food production by 50% by 2030 to meet the needs of a growing world population. A subsequent Foresight Panel report on Land Use Futures identified the important role that agriculture and forestry will play in mitigating the effects of climate change, whilst also recognising that more intensive land use will require the adoption of, 'Advanced information, engineering and biological sciences, including technologies such as 'precision farming' and anaerobic digestion,' to, 'help farming reduce its environmental burden' (Government Office for Science, 2010b, p13).

A number of key organisations (see, for example, The Royal Society, 2009; NFU, 2009; BBSRC, 2009) have called for a greater appreciation of the role of science and technology in food production, some with a particular focus on applied research and the translation of research into practice as critical components in this approach (see, for example, Leaver, 2010). Yet others have identified a need for advances in technological capabilities to be balanced by attention on the strategic business skills necessary to create profitable farm operations in a volatile global economic and commodity pricing environment (Rickard, 2010). It is likely that the forthcoming Foresight Panel report on global agriculture, expected in early 2011, will highlight the potential for currently available science, coupled with better educational provision, to improve food productivity. At its interim stage, research commissioned by the Panel (Godfray, *et al*, 2010, p2770) suggested that there were:

'Major opportunities for yield growth through the application of traditional and novel science ….(with)…. significant yield gains that can be obtained by working closely with farmers ….. to deploy existing knowledge and resources through better education and greater social and economic equality—closing the gap between realized and current possible levels of productivity and improving efforts to reduce waste.'

So, a theme has emerged – the components of which are an acceptance that food security is a major policy concern, that skills levels need to be improved

to address global challenges in food production and environmental management and that a significant element of skills development should be directed towards a broader understanding of science and technology, in terms of managing farm businesses and in replenishing our scientific capacity. The continuing ability of leading people in the UK agri-food sector to innovate and develop scientific advances, to research, identify and apply novel methods in the management of farm businesses but also to shorten the period between the identification of new techniques and their application in the field, will be fundamental to the success of modern farm businesses. These abilities, coupled with an understanding of the wider social and international impacts of the agri-food sector and the ability to think creatively, could be taken to encapsulate some of the higher level skills provided by a university education.

Given the pressures on meeting the food production objectives set out in Food 2030 there is a need for urgent action to enhance these skills. As Piesse and Thirtle (2010) report:

'The diffusion of both biological and mechanical innovations takes many years, so there is a lag between the R&D expenditures and the productivity gains at the farm level that can be 25 to 40 years. R&D produces yield gains at the trial plot level, which then require expenditures on extension to take them to the farmer. Then, since more educated farmers are generally better at screening and adapting new technologies, farmer education plays a role.'

The acquisition of higher level skills is therefore growing in importance, not only in respect of more quickly encouraging the adoption of innovative techniques, but also as those engaging in learning seek portable accredited qualifications that will serve their needs in the global agricultural employment market. What then for the role of higher education in this rapidly changing environment, where higher level skills could be the key to solving many of the challenges in the food security debate?

The Provision of Higher Level Skills

Those working in the UK farming sector will be well aware of the recent history of publicly funded higher education in agriculture and related subjects, in which there has been considerable rationalisation over the last 20 years. A number of notable mergers (including Seale Hayne College with the University of Plymouth in 1992 and Wye College with Imperial College London in 2000) were a consequence of the perceived vulnerability of smaller scale specialist land-based higher education providers combined with the problems of student recruitment encountered in the 1990s and early 2000s because of the mixed fortunes of the agricultural sector over that period. The outcome of these mergers has generally been the closure of land-based provision, or its integration with related subject areas, leading to a loss of a clear identity for agriculture in the resulting subject base.

Other mergers and university faculty closures have since taken place, leading to a position where the UK now has only 4 specialist higher education colleges providing land-based subjects (Harper Adams University College, the

Royal Agricultural College, the Scottish Agricultural College and Writtle College) and around 10 university faculties with varying degrees of involvement in production agriculture and closely related subjects. In recent months, further rationalisation in applied research expertise has taken place with the transfer of parts of Warwick HRI to a new school of life sciences within the university, and the proposed restructuring of dedicated plant sciences provision at Imperial College London (Morgan, 2010). Proponents of restructuring claim that participation in agriculture and related subjects within higher education remains at a relatively low level, with a total (undergraduate and postgraduate) of only 0.76% of overall higher education provision in the UK (HESA, 2010), or that applied research will not be able to compete in the highly competitive funding environment for research income which continues to be geared towards more basic scientific research.

Whilst both arguments are, in the short term, true, they fail to appreciate that industry demand for graduates in agriculture and related subjects is extremely high (Harper Adams University College and the Royal Agricultural College fall within the top 10 of UK universities on this indicator of performance) and that the weight of evidence suggests that we need to encourage new entrants to agriculture and to agricultural science to meet emerging policy objectives on food security and environmental management. In other words, we are in a position where industry demand for highly qualified people is beginning to outstrip supply.

Recent reports underline this conclusion. A skills assessment by the sector skills council for the environmental and land based sector (LANTRA, 2009) suggested that intergenerational losses and predicted demand meant that the sector would need to attract 60,000 new entrants over the next 10 years. Whilst, overall, jobs with intermediate and low level skills were thought likely to reduce in this period, there were no forecasted losses in high-skilled occupations. Already, 31% of vacancies across agriculture were considered to be 'hard to fill' because of skills shortages, compared to 21% across all sectors, with significant problems for farm managers (70%) and farmers (59%). The Institute of Agricultural Management has recently reported (Crane and Cooksley, 2010) that only 23% of farm managers are under the age of 40, compared to 63% in its first survey in 1969. It noted also that the average salaries of farm managers increased by 14.6% from the last survey in 2007, to £44,655 per annum in 2009, reflecting recruitment difficulties and the need to retain high quality employees in a complex operating environment.

The UK is not alone in facing these issues. In the USA there has been considerable concern about its capacity for agricultural research coupled with warnings over the last decade of, 'a growing skills gap resulting from a long-term decline in student interest together with a wave of impending retirements', with the USDA alone estimating that 17,000 of its 100,000 staff will retire in the next five years (Gewin, 2010).

Gewin went on to note recent initiatives, such as the creation in 2009 of the USA National Institute of Food and Agriculture (NIFA) which will tackle US priorities of climate change, nutrition and food safety and has already instigated a significant increase in agricultural research funding with larger

grants over longer time periods to attract new scientific talent. Furthermore, the NIFA Director is reported to have said that, 'at least one third of future Agricultural Food Research Initiative grants will require an extension or education component to help translate research findings to farmers and consumers' and a NIFA Fellows programme will offer at least 50 newly funded pre and post-doctoral fellowships (*ibid*, p.129). Other schemes to help develop agricultural research capabilities in developing countries have been supported by the Gates Foundation, the USDA and the International Rice Research Institute, whilst the UK strategy for Food Research and Innovation (*op cit*, p 51) simply noted the UK's potential for training overseas scientists which would have multiple benefits to agricultural development at home and overseas.

In mid-2009 the BBSRC, responding to the growing emphasis on food security and working with the Government Office for Science Food Research Partnership, which has brought together industry and Government representatives to consider the issue of food security, commissioned two working groups to look at the translation of research into practice and agri-skills development and capacity in the UK. In the latter case the working group found it difficult to identify conclusive data on skills shortages at graduate level but was faced with much anecdotal evidence of the need for investment in skills gaps amongst current employees in the agri-food sector. It concluded that there was a requirement for higher level skills development to be encouraged within industry so that full advantage of scientific and technological advances could be brought to bear on agricultural practice. The BBSRC has since launched a plan to fund a limited number of Advanced Training Partnerships (ATPs) that, importantly, will be focussed on industry requirements and will provide flexible learning opportunities at postgraduate level. Another key feature of the ATP scheme is that of collaboration expected in its delivery, both between universities and between universities and industry. This builds upon the concept of continuing professional development (CPD) that has been a feature of the higher education landscape for many years, but formally extends provision to advanced level skills development, including to doctoral level. It is expected that the successful ATPs will be announced in early 2011, but it is already clear that universities, and industry, have been prepared to engage in the programme, often in novel partnerships spanning the entire food chain, and that it will see advanced level skills provided in a more collaborative environment between higher education providers than may hitherto have been the case.

That is not to say that industry and the university sector have been ploughing their own furrows until now. In 2008 the Labour Government introduced the concept of 'employer engagement' to encourage greater collaboration in higher level skills development, in response to the Leitch Report (HM Treasury, 2006) which recommended that, to remain competitive in the global economy, the proportion of adults qualified to degree level would need to rise from 29% (in 2005) to over 40% by 2020. The report backed the idea that continuing professional development and 'workplace learning' should be used to enable this target to be achieved. In one such example,

Harper Adams University College and the Royal Agricultural College launched the Rural Employer Engagement Development Network (REEDNet) to offer CPD programmes aligned to industry needs. One driver for provision in the early stages was the agreement to accredit, at higher education level, programmes to meet legislative requirements such as the BASIS and FACTS courses in crop production and AMTRA programmes in the dispensing of animal medicines. Since then, using fast-track methods for approval, and with the current benefit of co-funding to help industry meet the cost of providing accredited learning, novel approaches have been adopted, such as the accreditation of in-house industry CPD schemes. Recognition by universities that private sector CPD provision has a place within the broader higher education ecology has helped push back former barriers, enabling industry to achieve its learning objectives, whilst affording participants the opportunity to take advantage of 'bite sized' pieces of higher education that might encourage them to engage in further learning later in their career.

The agri-food sector has demonstrated that it is ready to take advantage of this model. Nationally, in 2009/10, the number of employers providing co-funded contributions to employer engagement learning, in cash or in kind, was 2,706, of which 562 (21%) participated in the REEDNet programme. In the same year, nationally, 1,237 employers were new to co-funded educational work with universities, of which 401 (32%) were with REEDNet. REEDNet accounted for virtually 100% of recruitment in the agriculture and related subjects category, and 25% (by full-time equivalent student) and 43% (by headcount) of recruitment in the wholesale and retail trade subject group.

Furthermore, the industry has been active in providing technical and managerial level skills development in its own company-based or externally managed programmes. One example is the Kite Consulting Dairy Managers Training Scheme, a two-year programme for college leavers intended to develop practical and business skills to produce high quality herdsmen (Harris, 2010). Whilst not always accredited for further or higher education qualifications these activities are no less beneficial in improving skills to enhance business efficiency, profitability and staff engagement. These outcomes feature in the cross-sector AgriSkills Strategy launched with Government support in February 2010 (AgriSkills Forum, 2010). The Strategy acknowledges the, 'central role that investment in personal and continual professional development plays in the improvement of business performance, competitiveness and sustainability' (p1). It also notes that there is an opportunity to use, 'proof of competence as a mechanism for risk-based implementation of regulation' by Government (p7) and that CPD has a significant role to play:

'Too often a career in agriculture is deemed to be more suitable for those who are amongst the lower academic achievers. To tackle such false perceptions industry must seize the initiative and demonstrate the professional, highly technical, innovative and fulfilling nature of what it does, to those who influence career choices.' (p9)

By matching the need for higher level skills set out in recent policy statements with flexible provision across different types of educational provider and delivery models and developing a cross-sector statement of intent in the form of the AgriSkills Strategy, the agri-food industries have sought to improve their ability to attract and retain high-performing staff, and create an attractive prospect for younger generations to forge a professional career. However, whilst these initiatives have been helpful a number of challenges remain.

Higher Level Skills: Future Challenges

The Political Environment

The notion that the existence of the AgriSkills Strategy and the continuing efforts of educational providers and industry to develop appropriate learning opportunities would be enough to encourage other bodies to see it as a suitable career choice was short lived. In March 2010, the UK Commission for Employment and Skills (UKCES) published an influential national strategic skills audit, aimed at identifying priority areas for investment in future skills development (UKCES, 2010). Whilst acknowledging that agriculture was amongst the industries with the greatest skills shortages, because of its relatively small size to other sectors, now and even more so in the future, the report ranked agriculture 25th out of 27 industry groups in terms of future overall economic significance. Perhaps more surprisingly, food and drink manufacturing was ranked 20th on the same basis. Commentators suggested that the report failed to see the integrated nature of the agri-food sector, its strategic economic and social role and the fact that, overall, it constitutes the largest manufacturing sector in the UK, contributing some 6.7% of GVA. Yet the core message from the UKCES report is that the disaggregation of the food chain is likely to cause serious problems in future skills policy development and that a concerted effort needs to be maintained to convince Government, and its advisory bodies, of the larger scale economic and social impact of the agri-food sector, as well as the increasingly technical environment in which it operates.

That work needs to cover all of the bases. Whilst DEFRA has been supportive of the AgriSkills Strategy, the results of the UKCES study could divert the attention of the Department for Business, Innovation and Skills (BIS) towards other subject areas where it is perceived that greater economic returns are possible from public sector investment. The importance of developing the higher level skills base of the agri-food sector to public sector policy outcomes in health, energy production, primary and secondary education, science and business development in the wider economy need to be stressed. Recent medical research has developed an understanding of the links between climate change and human health (Costello, *et al*, 2009), placing water and future food supplies right in the middle of this debate. Industry groups, alongside the initiatives already taken by the sector's representative bodies, such as the NFU's 'Why Farming Matters' campaign (*op cit*, 2010) must continue to make clear the wider implications of securing the capacity

and capability of the next generation of leaders in the sector, not simply to tackle the issue of food production, but to emphasise the wider benefits to society of farming in what will be a markedly changed environment.

Motivating Younger People

There are a number of recent examples of the way in which the agri-food sector has recognised, and taken steps to meet, the challenge of raising awareness of the industry and the career options within it. The Farming and Countryside Education (FACE) programme, has sought to address this issue with younger children, the land-based educational sector, with FACE and others, is working with teachers to improve their understanding of modern farming practices, the sector skills councils are promoting career choices at a variety of levels and the RASE has reviewed the methods for improving the attractiveness of farming as a career option (Spedding, 2009). More general awareness raising, from the Open Farm Sunday movement to television programmes on farming and food production, together with direct branding by food producers and retailers and the debate on local sourcing of food are beginning to impact on the long held belief that food consumers are disconnected from the source of their food.

Spedding (*ibid*, p6) recognised that this was a multidimensional issue, noting that educationalists, careers advisors, industry leaders and other representative organisations should act coherently to promote careers options to the future generations of young people, and that there must be a means to, 'ensure that the message is taken to urban and rural schools, dispelling the myth that the only entry into farming and related sectors is through inherited wealth'. Other myths are equally difficult to shed, but must be taken on if the sector is to recruit successfully. These include the issues of long working hours, low pay, working conditions and the opinions of careers advisors and teachers about the prospects for a career in the agri-food sector, which may be informed only by out-of-date or underdeveloped knowledge of sophisticated farming techniques and food production methods.

Whilst acknowledging that the agri-food sector is not without its problems, including, in some cases, those identified above, it will be necessary for the sector to continue to make the case to attract young entrants by highlighting the global challenges to which those seeking a career in the sector could contribute. Furthermore, despite recent reports of graduate unemployment being at a 17-year high in the UK (Garner, 2010), there remains intense competition within the agri-food sector for good graduates, as evidenced by graduate employability rates in two of the specialist land-based higher education colleges. To secure new talent, companies and organisations must seek to replicate the approach they have taken to the primary and secondary educational system, to raise awareness of the full range of farming and food career options amongst those currently undergoing their undergraduate education, and to support undergraduate students through their university career.

Engaging Future Employees

There are many examples of approaches where industry representatives are encouraged to engage in curriculum design, conduct advisory work, external examining and the teaching or provide placement opportunities for students, all of which make invaluable contributions to the 'real world' dimension of higher education. But, recognising the current imbalance between supply and demand for highly educated people in the agri-food sector, the industry is thinking in new ways. Some sectors understand the growing cost of higher education and have been prepared to help defray those costs with scholarship support, combined with industrial placements which can provide an ideal opportunity for a long-term relationship with a prospective employee. In some cases the development of 'packages' of support has moved beyond individual companies into a sector-based approach.

One such example is the poultry sector, which has recently launched a cross-industry initiative that includes scholarships and industrial placements. This is a pre-competitive model, where, currently, 9 companies are working under the umbrella of the British Poultry Council, even though they are offering support arrangements for their own organisation. The benefits of this method are threefold. In the first instance it generates a critical mass of interest amongst students so that more are encouraged to attend scholarship events where all of the companies are represented, to see more of what the industry has to offer in a short amount of time for both prospective employer and employee. The second benefit is that each company knows the terms being offered for scholarships so that there is a level playing field when companies gather to meet students. The third benefit is that it accepts that to recruit the best possible people the company has to work hard to ensure that its placement and employment terms are competitive. Backed up with specific company presentations and other methods to raise awareness of career prospects within the sector, this approach, whilst at an early stage, has raised interest amongst a significant number of students.

This is only one example of new approaches to seeking out fresh talent, and it may not be appropriate for all parts of the industry. Yet it does point the way to a need to think critically about how young people make career choices, what they really understand about life in the sector in which an employer is seeking new entrants, and about the need to invest early in influencing career choices for recruitment to be successful.

Common Understanding

To enable these connections to take place, we must have a common understanding, and hence a common language, of what we mean by 'higher level skills' and of the granularity of levels within the framework for such skills. The university sector can be called to task for not getting its message across clearly about the products of its educational process, but industry must also ensure that it has greater clarity about its requirements and the time to understand the modern educational environment. Given that the industry view of graduate level skills is currently a subject of debate within Government, and employer organisations such as the CBI, it is incumbent on the agri-food sector to address this issue soon, to enable it to be in a better position to

reinforce its case for public sector investment in skills development when the economy recovers from its current difficulties.

Although the AgriSkills strategy attempted a holistic approach to this issue it suffered from the mixing of terminology in what is, admittedly, a complex environment. One such example relates to Continuing Professional Development (CPD) which can range from a training course at technical level, to an advanced level programme accredited towards a higher education qualification. The complexity of the educational framework is compounded by the complexity of provision. The post-16 land-based educational sector is probably unique in the UK in that 40% of higher education provision is offered by further education colleges (HEFCE, 2007), with the consequence that skills levels and progression routes can be blurred and the higher-level skills base produced by different providers may have a range of exposure to, for example, cutting edge research. On the other hand, the LANTRA work on future skills needs talks of a requirement for 'higher-level' skills but focuses on a distinction between generic business abilities (such as communication, problem solving, management and teamwork) whilst separating them from technical abilities (such as operating machinery, animal husbandry and mechanical engineering) (*op cit*, pp36-37).

This approach runs the risk, at least in vocational educational setting, of the categorisation of business skills requirements as 'higher level' whilst technical abilities may be seen as the product of more 'hands-on' further education or apprenticeship. In making this distinction there is the possibility of disservice to the agri-food sector which needs elements of both, as well as, through training in research techniques, an understanding of the latest scientific and technological advances in its higher education provision.

We must ensure that future managers and leaders in the sector are able to run effective businesses such that they are not divorced from the technical abilities, and research environment, required to understand the wider sector in which they operate. To achieve this objective the higher education sector must encourage industry to share its views on skills needs but be clear that it must also share the task of continuing to develop its staff by investing in them through later stages in their career.

Re-engaging Current Employees

It is widely accepted that higher education is a process in which independence of thought and learning must be developed, yet this objective clashes with the proper desire of subject specialists to cover as much as they can in a crowded curriculum full of the latest scientific innovations as well as more fundamental knowledge necessary to make sense of new discoveries. In other words, the graduates of today face an enormous challenge in being all things to all people when they emerge from university and enter employment. This may be a contributing factor to some of the less positive feedback from employers on the abilities of some graduates in, for example, basic management skills, but it is also a condition that is likely to be exacerbated by the current economic climate and its consequences on the structure of higher education provision. The focus may move towards faster provision, such as

two-year degrees, with fewer breaks that provide students with periods of reflection, learning and even employment to generate practical skills in the workplace and the financial resources to pursue their education. It will also be obvious to those working in the crop sciences, for example, that it will be difficult to meet industry needs when graduates may not have been able to conduct basic research projects in a full crop cycle, so this model of provision has particular issues when applied to land-based subjects.

At the other extreme, there is a need to ensure that models are provided that enable graduates to gain further, industry specific, expertise before, or shortly after, they enter the world of work. In such cases, short courses and CPD have provided the means to deliver the necessary knowledge and practical skills, either through graduate entry programmes run by the company or externally organised activities such as those provided by, or in conjunction with, the higher education sector. In yet other cases, graduates may have sought to differentiate themselves by pursuing a postgraduate qualification, although the time and financial commitment associated with this route may prove more difficult in the current financial environment.

There may be room, however, for different approaches to be explored. One such method would be to shorten and re-phase the timing of first stage graduate-level CPD so that it is delivered, in conjunction with workplace learning, in a short and intensive 'learning package' immediately following graduation rather than several months, or even years, beyond this point. In this way, companies would benefit from tailored graduate level CPD programmes either provided or accredited by a university partner, whilst the employee would be better placed to meet the full requirements of the employer earlier on in their career. Universities would need to be open to delivering such programmes in a flexible and relevant way, along the lines of the REEDNet programme described earlier, and at times when research activities might normally be expected to take precedence.

Furthermore, 'learning packages' of this nature could provide the building blocks for further engagement in learning and, if appropriately accredited, towards advanced level (postgraduate) qualifications. As collaborative means of provision are developed with the BBSRC's Advanced Training Partnerships it is likely that progression routes of this nature will be developed, requiring industry involvement to ensure that coherent programmes of accredited learning are provided.

The need for such investment in staff development, from private and public sources, will be critical in the medium to longer term, as international scientific innovations introduce new agricultural practices and techniques and the UK is required to make similar advances to remain at the forefront of economically viable production methods. Examples of large-scale investments in Brazil have recently been reported in a US$2bn programme to improve 15 million hectares of degraded pasture over the next decade, and in the use of climate zoning techniques to increase crop productivity by 20% (Tollefsun, 2010). At the same time, Gilbert (2010) reports that Monsanto's annual research budget is US$1.2bn, 'just topping the US federal government's total spend on agricultural science of $1.1bn in 2007'.

The BBSRC, and Government, are concerned to ensure that the UK science base in agriculture is not lost (see, for example, Taylor, 2010) and that a means is found to encourage young and mature entrants into research and development careers. It is thought in some quarters of the UK that these scientists may not require a background in agricultural production, yet the lessons from the US suggest (Gewin, 2010, p130) that:

'Simply luring non-agricultural scientists into agricultural research, without a concomitant increase in traditional plant breeders, agronomists, crop physiologists, plant pathologists and entomologists, could hamper progress towards agricultural productivity and sustainability'

Gewin went on to quote Achim Dobermann, of the International Rice Research Institute who said that, 'We need more people who can think and act in a systems framework, putting all the good science together into practical solutions for farmers'. Notwithstanding this ambition, the current economic climate could limit the ability of Government to invest heavily in developing the science base in agriculture and is serving to impose a new and challenging environment on education providers that may reduce participation in higher education and, hence, make the recruitment environment for industry, and science, even more competitive.

Funding for Higher Education: Some New Challenges

In October 2010, a major review of the higher education sector was published that set out a radical new funding approach (Browne, 2010). It was proposed that the financial cost of higher education should be transferred largely from direct payments by Government to higher education institutions, to students, who would, as a consequence, pay significantly higher tuition fees. The basis of the proposal has been accepted by Government, though the terms of its implementation have been altered from the initial recommendations, to impose a fee cap of £9,000 per annum on the charges that can be levied by universities and higher education colleges. A much reduced amount of Government funding for teaching will remain, directed towards a range, as yet undefined, of science and engineering-based subjects. It is widely suggested that other subjects (mainly the arts, humanities and social sciences) will receive no public funding at all.

Four other points are important. The first is that, at the time of writing, the Coalition Government faces a difficult political position in introducing the concept of higher tuition fees. The second point, assuming that first can be addressed, is that student loans and, for lower income households, an element of grant support, will be maintained so that higher education remains free at the point of entry. Loans will be repaid after graduation, as in the current system. This approach will be extended to part-time undergraduates (over a certain threshold of part-time study) but not to postgraduate students, thereby making shorter postgraduate 'learning packages' possibly more acceptable in the face of increased graduate debt. The third point is that the higher fees are unlikely to add to institutional income. The Government's recent Spending

Review signalled significant funding cuts in teaching of at least 40% to be introduced over three years from 2011/12, and starting even before the higher rates of fee become payable by first year students in 2012. The fourth point is that this major shift in funding policy will open up greater competition for the provision of higher education in low cost subject areas and significant challenges for subject areas that are unable to compete for students.

It seems likely that a number of factors, in addition to course pricing, will become increasingly important. The quality of educational provision, specialisation in provision (to be distinctive in the new marketplace for students), student retention, graduate success and employability are all critical factors. In this respect, specialist land-based higher education providers may be thought to have little to fear from these developments if they continue to meet the above criteria. A distinctive feature of these institutions, however, is their connection with industry and the emphasis that this brings to a relevant vocational education that leads to strong performance in graduate employment and, at present, solid demand for graduates from land-based disciplines.

Yet this is a period of considerable uncertainty for higher education providers, future students and their parents, just at the point when the agri-food sector needs an increase in staff with higher-level skills. We will need to act together to ensure that future students are not put off a leadership career in our sector because of increased graduate debt; that industry is able to navigate its way more easily through educational systems to secure future talent; that we have the means to continue to develop scientific and technological expertise amongst staff already in the sector; and that we can provide the next generation of scientists able to compete at an international level in agricultural and related sciences. As a first step it will be important for remaining public sector investment in higher education teaching to be directed towards industries where a combination of economic and social benefit can be demonstrated, rather than simply a reliance on a simple economic return on investment. Food and land-based energy production, together with the sustainable management of our natural resources, are key sectors where this argument must be won.

Conclusion

This paper has sought to make the case, in terms of policy imperatives and meeting current and future industry demand, for ensuring that there is an appreciation of the need for higher level skills in the agri-food sector to address the challenges we face over the next few decades in maintaining food security. Recent studies have identified an impending shortfall, over the same period, in people equipped with the necessary skills to effectively manage increasingly complex and volatile business environments, whilst also being able to successfully implement agri-food scientific and technological advances. Other countries are investing in these developments, and so must we. Yet all of this also comes at a time of uncertainty over a rapidly changing funding climate for higher education, from which the majority of the higher level skills base serving the needs of the agri-food sector in the UK is provided.

The need for educational providers and industry to act in concert has been established as part of the argument for securing new talent for the agri-food sector, and a number of new initiatives that demonstrate this approach have been explored. Greater and more innovative collaboration will be needed, to break down barriers to learning, invest in CPD for current employees and ensure that industry can encourage current students to pursue a career within the sector and not to leave it on graduation.

Finally, as in any recipe, all of the ingredients must be of the highest possible quality if the resulting product is to stand up to critical judgement. In this respect, the need to understand our respective operating environments, and support each other, will be even greater as higher education moves towards a more market-based model of operation over the next few years.

About the author

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