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Will intergenerational succession and our current educational systems be sufficient to provide the next generation of farmers and researchers?

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Abstract. This paper reviews the implications of the age structure in farming and an aging farm population on productivity and innovation. It discusses the factors determining opportunities for new entrants, including those on family farms, and also those affecting outflow and retirement. The implications of recent international trends in agricultural graduate and post-graduate numbers are considered. Finally, issues and recent initiatives needed to address the problems of attracting new blood and expertise to the industry are outlined.

Keywords: New entrants, retirement, higher education, research.

Introduction

It will be evident from the theme of this session and the title of the paper that this contribution will not follow a traditional scientific paper format. Rather it is a broad review of trends in international agricultural education and of the factors contributing to the perceived need for some freshness in approach and reappraisal of the importance of agriculture in higher education if we are to meet the challenges of climate change, sustainability and expected future growth in food demand through population change.

Some pertinent comments are contained below in verbatim extracts taken from the Minutes of Evidence submitted to the Paget Departmental Commission of Enquiry of the Privy Council into agricultural education for the House of Commons (de Silva 2013).

Mr Kempe (Treasury):-“At present are not the sons [of farmers] largely employed on the farms?”

Witness:-“*Yes but there are not so many sons being brought up to farming now as there used to be.*”

Mr Gray (MP):-“*You are probably aware that the Government does expend very large sums for the advancement of science... and so on? ...In your opinion does the agricultural interest get its fair share of this aid..?*”

Witness:-“*I do not think it does.*”

Mr Gray (MP) :-“*You have told us that you think assistance of an important nature may be given to agriculture by encouraging scientific knowledge; would you also ... place importance upon technical instruction..?*”

Witness:-“*Yes*”

It may be somewhat surprising to hear that this dialogue and enquiry was taking place not in the 21st Century, but in the 19th Century, and raises the question as to whether any of those fundamental issues being discussed concerning agricultural research funding, education and recruitment into farming over a century and a quarter ago have really gone away. The Commissioners were critical

both of existing government support and of educational provision, highlighting the national cost of such inadequate provision in agricultural education (HMSO 1888a). When called to give evidence, the Principal of one of the early agricultural colleges clearly was at variance with views held by contemporary university luminaries which he argued promoted only scientific and theoretical instruction at the expense of practical experience, whereas his prime objective was to reinforce theoretical knowledge with the practical experience gained from instruction on working farms, a view the Commission endorsed. He also stressed the importance of educating people, irrespective of their age, now more fashionably referred to as “lifelong learning”. The Commission itself recognised the need to increase the awareness of teachers in schools about agriculture, even incorporating it into the curriculum in primary schools in rural areas, the need for more provision of continuing professional development for existing farmers, and the need to address affordability of agricultural education, including scholarships and exhibitions for students. This paper will return to some of these proposals later as these echoes from the past still have resonance and relevance for the future.

This paper draws not only on academic studies, but also on a diverse range of other sources, some anecdotal, others of which are from the media or farming sector organisations and bodies reporting on the current debate addressing farming futures, skills provision and attracting new entrants. It first examines the age structure of farming in a number of countries, as this lies at the heart of the problem of injecting new blood into the industry. It examines the critical factors which govern inter-generational succession and new entrants into farming, the constraints which hamper succession and the economic consequences of an ageing farming population. It then reviews some global trends in recruitment of agricultural students and graduates in the university sector at both the undergraduate and postgraduate levels, and the implications for future of

the sector's productivity. Finally, the paper considers what actions are required in order to alleviate barriers to new entrants, but also equally important, how to stimulate an increase in the pool of potential new entrants. The paper argues that solutions to the new entrant problem should not solely be focused on measures to attract and assist new entrants, but also on securing the retirement and exit of many incumbents to free up opportunity.

An ageing workforce in the farm sector and its consequences.

A number of studies have highlighted over the past two decades the ageing profile of primary operators in agriculture and its economic consequences. As Figure 1 shows, the median age of UK farmers over the decade since 2000 rose from 56 to 59 years, and the proportion of farmers under 45 years old fell from 23 to 14%, with those under 35 years at 3%, whilst the proportion of farmers over 65 years of age rose from 25 to 32%.

Figure 2 shows that over many EU countries, the same disparity in the age distribution between the lowest and highest categories has similarly deteriorated since 2000.

The average age of US farm operators rose by 2 years between 2002 and 2007 to 57 years, which was almost 7 years older than in 1978 (Gillespie and Johnson 2010; USDA 2013a). The declining number (and increasing size) of US farms is due more to decreasing rates of farm entry rather than increasing rates of exit. A similar situation exists in Australia, where the Australian Bureau of Statistics in 2012 reported that, the median age of farmers in 2011 was 53 years (albeit younger than in the EU and USA), compared with 40 years for other occupations. Furthermore the median age had risen by 9 years between 1981 and 2011 compared with only 6 years for non-farming sectors. This is partly a reflection of the fact that farmers continue to work far beyond the age at which most other workers retire. In 2011, almost a quarter (23%) of farmers were aged 65 years or over, compared with just 3% of people in other occupations. The tendency of farmers to work beyond the traditional retirement age may well reflect the decline in younger generations taking over family farms as well as farming being a "way of life". This would have been exacerbated by the lack of attractiveness of a career in agriculture to a younger generation in the 1980's and 1990's and early 2000's where profitability was under constant pressure and employment opportunities in agri-business or outside of the sector may have been more remunerative –further echoes of the circumstances in the Paget report of 1887!

Notwithstanding the fact that economics and technology have inexorably driven the enlargement of farm enterprises through the need for greater specialisation to gain scale and size efficiencies since the second half of the 20th Century, with a consequent decline in the number of farms and farmers, nevertheless succession and recruitment of new entrants is of crucial economic importance in ensuring the future competitiveness and capacity of the sector to meet current and future global challenges.

Key issues agriculture faces were outlined by Watson (2012). The global population is projected to rise from 6 billion in 2000 to between 8-9 billion by 2050 an increase

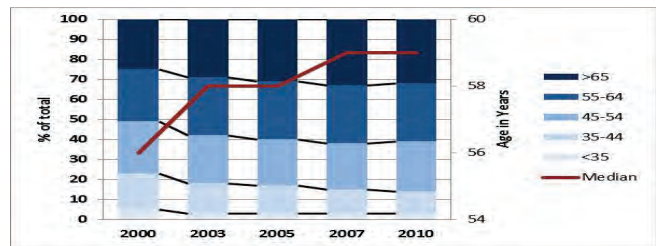


Figure 1. Changes in the age distribution of UK farmers and median age 2000-2010 (HMSO 2011).

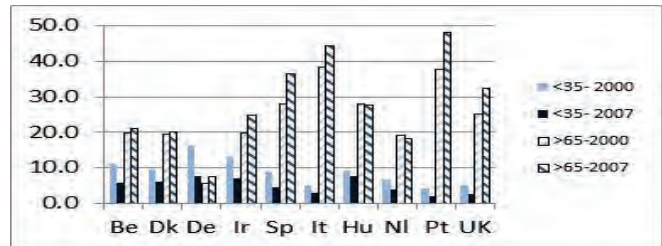


Figure 2. Changes in the age distribution (% total) of EU sole holders in selected countries 2000-2007. (Eurostat 2013).

of between 33-50% from the turn of the century. There will be a consequent increase in global food demand, both in volume, but also qualitatively, with higher demand for protein, especially meat and dairy products, as incomes in many of the emerging economies continue to rise. Climate change through global warming, desertification and soil erosion, competition for land between food and biomass/biofuel renewable energy production, increasing water scarcity in some major population regions of the globe, groundwater pollution, together with the need to reduce the global greenhouse gas emissions from agriculture, will all be key challenges that the farming industry and the research base which underpins its technological advance will have to address. The key will be to achieve sustainable intensification which in turn will rely in part on precision farming, advanced biotechnologies for breed and varietal improvements, pest and disease control; all of which will require adaptation and innovation in farming systems.

This is the hub of the matter. There is evidence from studies to show that the technical efficiency of farm operators tends to increase with age, largely due to longer experience of working with current technologies (Huffman *et al.* 2006; Henderson and Kingswell 2002). These studies also suggest that technical efficiency of the farm operator may begin to decline after a certain age, and the increase in technical efficiency is not necessarily paralleled with an increase in economic or allocative efficiency. Figure 3 shows clearly that the farm businesses with larger turn-

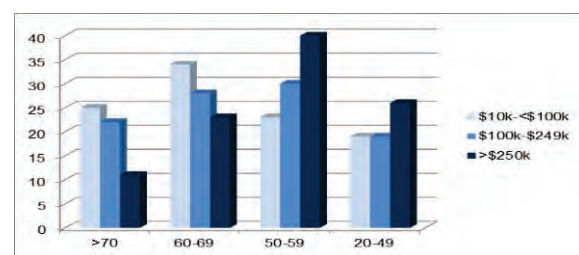


Figure 3. Percentage distribution of principal operator age cohorts by farm receipt categories in Michigan. (From Miller and Coccia 2012).

over in Michigan, USA were more concentrated within the 20-49 and 50-59 year old age cohorts, accounting for 65% of farms with revenues over US\$250,000, whereas almost 60% of operators in the older age cohorts of 60 years and over were in the lowest category of business turnover. More importantly for the future of agriculture is the fact that there is a sound body of evidence which shows that older operators are less likely to innovate or invest (Carboni and Subioli 2008).

A report by OECD (OECD 2005) summarised succinctly why this is the case:- *“The age of a farm operator is an important determinant of willingness to invest in new technologies. Younger farmers have a longer planning horizon and are less reluctant to adopt newer approaches. Youth is an important positive indicator of the production of Non Commodity Outputs and reduction of negative externalities. In these matters, the higher propensity to invest seems to dominate relative lack of experience and potentially higher capital constraints. Farmers that are more educated are more likely to adopt better farm practices, especially when those practices are information-intensive”*. In Canada, there is clear evidence that the younger age groups of farmers (35-44 years) were more likely to have Environmental Farm Plans and to have adopted beneficial management practices including crop and grazing rotation and to have established riparian buffer zones (Agriculture and Agri-food Canada 2012). The willingness to innovate and adopt new technologies or techniques is also a reflection of the fact that the younger generation of farmers and agriculturalists are better educated than the older generation.

Intergenerational succession and new entrants

Intergenerational succession is the linchpin to ensuring the survival of the family farm, and as such farming remains largely an inherited profession, more so than in most other sectors of business, although it is not the only route into farming. Nevertheless, the family farm in the USA, Canada, New Zealand (Luxton 2013) and the EU predominate. Intergenerational transfer can convey benefits of skills transfer to the successor, and potential mentoring if there is a succession plan (unstated but assumed, or formal) in which the successor may have a partial role in management and decision making prior to assuming overall responsibility. Successors may return to the farm, either directly after agricultural training, or perhaps after gaining management or even farm enterprise experience elsewhere. In other words, in terms of age cohorts, the intergenerational succession process may not start via the youngest age cohort shown in Figures 1-3, but may take place in an older age cohort. These routes are clearly exemplified by our own Harper Adams University agricultural graduate destinations for the past 3 years shown in Figure 4 where although 35% return to the home farm, many others seek experience elsewhere in farm management (16%) or farm work (9%). It would not be an untypical pattern for many other HE institutions with specialist agricultural degrees and associated farms.

What are the rigidities and frictions which prevent retirement and impede succession, since the two are intimately interlinked? Lobleby *et al.* (2010) highlight a

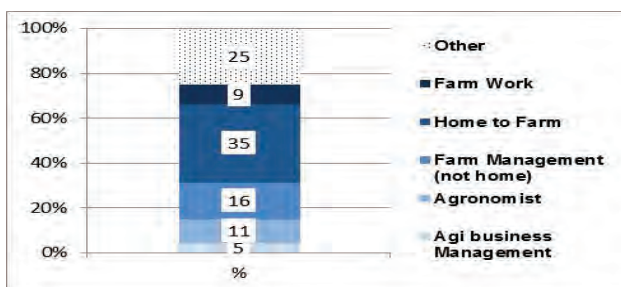


Figure 4. Destination of agricultural graduates from Harper Adams University 2009-2012. Source author.

critical factor as the ability to finance retirement. This may involve some land sale or other farm assets (more prevalent in Canada –but which in turn might erode the future viability of the farm), social security payments - (more common in France), or from private pension provision (more common in the UK). Stepping back from a way of life can of course also be an impediment, although in family farms this may signal that the primary operator becomes a part time partner. Clearly for both those succeeding to the family farm, or those wishing to start in agriculture without a family farm base, capital for purchase of land, equipment, livestock, facilities and operating capital are essential, but so are a supportive community and family, availability of viable markets, as well as a willingness to work hard and for long hours. Articles such as those in *The Independent* (2012) reveal that over half of the 127,000 UK farmers had no formal succession plan, which may imply that without intergenerational succession, rather than being sold as an entity they may be broken up to enlarge other family/company farms, a situation exacerbated by the current high cost of land. Of course, this is not necessarily detrimental to the future of the sector, but part of the market-driven process by which scale economies can be gained. Conversely Miller and Cocciarelli (2012) point to the fact that aging farmers own much of Michigan farmland, and given that fewer than half are likely to pass this on to their heirs, there is a significant risk of loss of local agricultural and land knowledge. Furthermore, sole proprietors without successors tend to disinvest, which leads to lower productivity and potentially declining standards of land management. It is clear that from a policy perspective, measures to attract and facilitate new entrants to farming also require complementary initiatives to facilitate exit and retirement.

The next generation of farmers and researchers

First, the source of the next generation is likely to be drawn from rural areas, even if not on farms. My own university which is the largest specialist HE agricultural and food institution in the UK draws some 80-84% of its undergraduates from rural areas, and between 50-55% from farming families. Clearly the decline in students studying agriculture during the latter decades of the 20th century is reflected in the small share of farmers in the lower age groups. However there are signs that this decline has tended to stabilise even if not sharply reversed in more recent years. Figure 5 is drawn from an OECD international data comparison of tertiary graduates in agriculture and shows that between 2000 and 2010, there was generally an increase in graduate numbers, though in many of the major

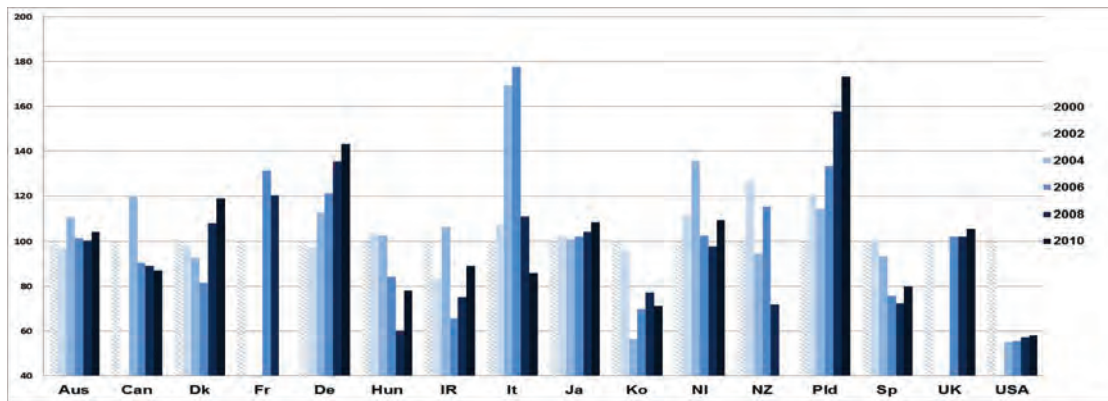


Figure 5. Index of tertiary level education graduates in agriculture by country. 2000=100. (OECD 2013).

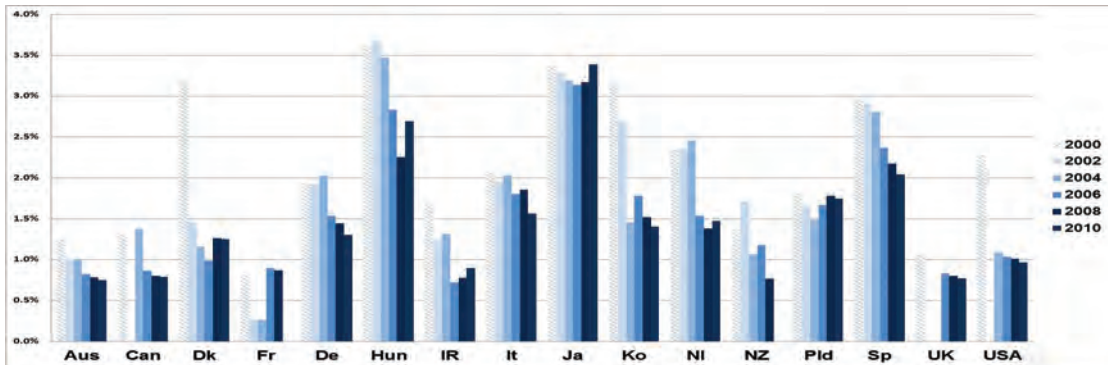


Figure 6. Percentage of all tertiary level graduates graduating in agriculture 2000-2010 (OECD 2013).

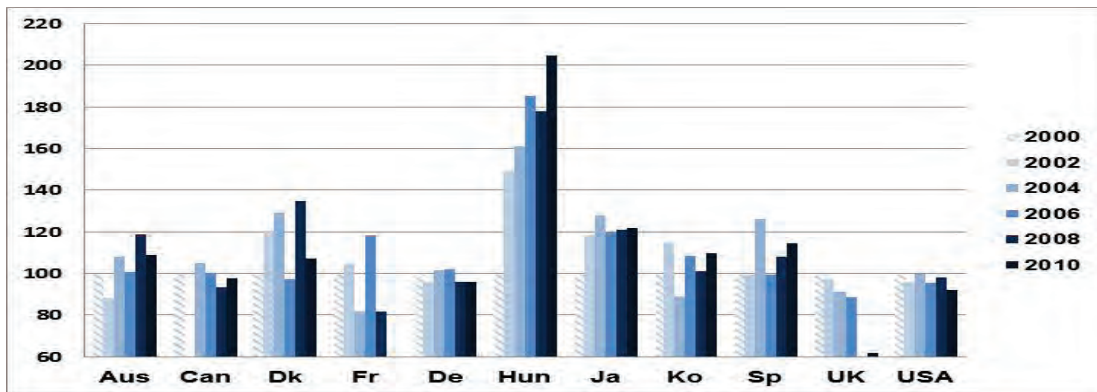


Figure 7. Index of numbers of Advanced Research Graduates in Agriculture 2000=100 (OECD).

agricultural exporting countries such as Australia, New Zealand and Canada these were still lower relative to the year 2000. Furthermore, in many developed nations there has also been an expansion in university and college education over this period. Indeed, as Figure 6 reveals, the proportion of total graduates studying agriculture in the major agricultural nations of OECD has continued to fall since the year 2000 and for major agricultural countries, is less than 1 percent of graduates. In the world's most populous nation, the share of graduates studying agriculture fell from 3.2% to 1.8% between 2000 and 2011 (NBSC 2013).

Figure 7 presents the trends over the first decade of the new millennium for advanced research student graduate numbers in agriculture. The picture is somewhat more mixed with an increase in Australia and Denmark relative to 2000, but declines in Canada, France, Germany, UK and USA. Virtually without exception the share of total research graduates studying in agriculture fell (graph not

shown). In China, the share of advanced research graduates (MSc and PhD) fell from 3.6 to 3.0% between 2007 and 2011.

These trends are of some concern given that the share of total graduates in agriculture (in many cases less than 1 percent) is lower than agriculture's share of GDP in many of the countries shown, China included. It is significantly lower than the contribution to GDP that the agri-food supply chain makes in these countries. The data suggest that the intellectual capital required to sustain let alone increase the productivity and GDP share from agriculture and its related sectors is not being maintained.

More recent data emerging suggests that there has been some resurgence in student interest in studying agriculture over the past two years. Applications to study agriculture in Australia are reported to have increased by 15% this year (The Australian 2013); enrolment continued to rise in the USA (FAEIS 2013). Anecdotally, at the time of writing

applicants to Harper Adams University for academic year 2013-2014 are some 15% higher than at the same time last year. The greater exposure of this younger generation to the challenges of inter alia, global food security, food safety, climate change and environmental sustainability have clearly awakened greater interest in more recent years in studying agriculture and related subjects, in comparison with the very negative images of the industry portrayed in the media in the past (Carruthers *et al.* 2013). However, we cannot be complacent and there is still ground to be made up.

Conclusions: how do we engage the next generation of agricultural practitioners and researchers?

As Lobley *et al.* commented in 2010:-

“the attraction of agriculture as a career is crucial to continued motivation of potential successors ...and a redoubling of effort is required to convey the message that sustainable agriculture has a key role to play in a future of ... food security and climate change . [That] rewarding career opportunities will continue to develop in these areas...Such messages need to be conveyed convincingly by government, educational institutions and farming organisations. Resources should also be made available to deal with training and education in what must be seen as a renaissance of the farming industry”.

This message was reiterated recently in a Guardian article about how to make farming a career choice to appeal to the younger generation (The Guardian 2013). In part it is about re-connecting the agricultural industry with consumers and society, a message emphasised by the Hon John Luxton at the last Oxford Farming conference (Luxton 2013).

First, we need to ensure that schoolchildren understand better and appreciate where their food comes from, and how it is produced. There is clearly still a strong rural-urban divide in this respect. Yet in the UK, it is interesting to note that the Schools Farm Network has recently launched its 100th school in the UK (Schools Farm Network 2013), bringing children into closer contact with growing their own food and experiencing animal rearing. Universities such as my own and others also invest in school and community events to promote an understanding of agriculture and farming.

There is a need to ensure teachers and careers advisers are also more aware of career opportunities in farming, agricultural industries and agricultural research. Post university agricultural graduate employment rates are some of the highest of all subjects in the UK (that at my university over the past three years has averaged over 95%). Yet too often farming is portrayed as an occupation for unskilled, manual and seasonal labour. Modern agriculture could not be further from that reality, and the technological and scientific understanding and expertise levels required of farm managers, and even those in a supervisory capacity, range from graduate to vocational skills. However, for many, there is still not a clear career path that new recruits might perceive within farming. Furthermore, the relative decline in postgraduate researchers in agriculture is testimony to government policies which reduced postgraduate

scholarships and public research funding in agriculture in the past (USDA 2013b).

In the UK, this is being addressed through a number of initiatives such as the Agri-Skills Strategy which has been drawn up by the Agri skills Forum, a body drawn from all parts of the agri-food sector including government (NFU 2011). It is a strategy designed to recognise and promote the development of skills and professionalism within the sector, to promote the industry as a progressive place to work, and to work with government in meeting future challenges. At a more advanced level, the Biotechnology and Biological Research Council which funds agricultural research, has recognised the need for more applied research and knowledge transfer, and has awarded Advanced Training Partnerships to a number of leading agricultural research institutes and universities in consortia to provide accessible and short-course postgraduate level training to employees within the agri-food sector, of which the Agri-Food Advanced Training Partnership between Harper Adams, Cranfield and Nottingham Universities and Rothamstead Research is in the vanguard (ATP 2013).

Of course, there is a future recruitment gap to be filled, but in a short labour supply market, wage rates and salaries should be competitive. The presentation by Thorley (2013) underlines the need for agriculture to catch up with other sectors in providing career structures, fringe benefits etc., and contrasts quite clearly the difference in appeal between job adverts for trainee managers in agri-business with salary rates of £25-£30,000 to those in agriculture – “*wanted trainee farm manager; salary £10,000*”!

Finally, the UK farming minister launched a new initiative to get more young people working in the sector (Farmers’ Guardian 2013), following on the heels of a parallel initiative in Scotland (Lochhead 2012). The Future of Farming Group is charged with examining the future workforce and skills needs, different entry routes into farming including apprenticeships, graduate schemes in science, engineering and research, challenges facing new entrants and those facing employers, including recruitment and public image of the industry. Schools, grants, practical farming and apprenticeships –all sound familiar. Did the Paget enquiry in 1887 not propose many of these solutions?

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