

Key Issues in Agricultural Science

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The Frank Parkinson Lecture, Oxford Farming Conference, 5th January 2010.

There is an intrinsic link between the challenge we face to ensure food security through the 21st century and other global issues, most notably climate change, population growth and the need to sustainably manage the world's rapidly growing demand for energy and water. It is predicted that by 2030 world demand for food and energy will rise by around 50%, and for fresh water by 50%, all of which must be managed whilst mitigating and adapting to climate change. This threatens to create a 'perfect storm' of global events.

Science and technology can help by providing practical solutions. Securing this contribution requires that high priority be attached both to research and to facilitating the real world deployment of existing and emergent technologies.

For the UK, climate changes are likely to mean altered farming patterns, with summer drought and winter floods. The agriculture sector will need to reduce its share of greenhouse gas emissions while safeguarding soil through improved land management practices. There are three ways of increasing agricultural output – expanding acreage, improving yields or increasing frequency of cropping. Over the last 50 years improving yields has been most important, accounting for 75% of increase in output. However yield growth rates are now slowing.

We need a new and “greener revolution”, improving production and efficiency through the food chain within environmental and other constraints. Techniques and technologies from many disciplines, ranging from biotechnology and engineering to newer fields such as nanotechnology, will be needed.

The Foresight Global Food and Farming Futures Project, due to report in October 2010, is looking at the challenge of how a global population of 9 billion can all be fed healthily and sustainably. Examining the food system, including issues of demand, production and supply, it aims to strengthen understanding of global uncertainties and interdependencies and assess the potential impact of future scientific and technological developments. It will consider the implications for policy and research in the UK, as well as internationally.

The challenge set by the Cabinet Office *Food Matters* report in 2008 was for Government to join up its efforts on food policy looking at health, food safety, the economy and the environment. As part of the response, I have worked with public funders across the UK, including the Devolved Administrations, to develop a new cross-government strategy for food research and innovation. A key aim is to promote a more joined up approach on research, centred on the Government's vision for safe, healthy, affordable and sustainable food, in the UK and globally, and a thriving UK agri-food sector. I have welcomed inputs to the strategy on key research issues and priorities from many funders and users of research, from both public and private sectors..

The UK has world-class facilities and resources which underpin agri-food research, and which bring benefits not only to the UK but internationally in addressing food

security challenges. Major facilities and centres of expertise at Research Council, Government and Devolved Administration institutes are key parts of the national capability, as are strengths in the university sector and private sector. Actions outlined in the strategy provide important mechanisms for strengthening existing initiatives and adding new approaches for promoting a more collaborative and strategic approach between research funders and providers to ensure long-term sustainability of national research capacity.

As part of this work, I have established the Food Research Partnership to bring together funders and users of research from across the food chain and public and private sectors, to strengthen cross-sector dialogue and examination of key issues. For example, recent work has looked at skills and capacity problems and what further measures could address these and promote more positive attitudes to the agri-food sector. Other work is looking at how the translation and exploitation of food research can be improved, and the balance of roles between public and private sectors. The Partnership will next examine the UK's international food research engagement, identifying key issues, priorities and opportunities to strengthen the UK's current approach and impact.

The issue of perceived skills shortages is complex, with global supply being sufficient to meet current demand, but niche skills in short supply, and cannot be addressed by any single research funder or approach. It is important that food research funders work together with other relevant bodies in a systematic approach to monitor and maintain the health of the UK research and development community. This includes identifying where niche skills will be needed, and stimulating industry to seek appropriate high-level skills and continual professionalisation of the sector.

Deploying new technologies, processes and knowledge that make our agri-businesses more sustainable and efficient will be critical in meeting our economic, environmental and social goals, including promotion of a thriving food sector. The timescales to impact for research vary from the (almost) immediate to the long term (years) depending on the area of work funded and the complexity of the issue being addressed. The uptake of both biological and mechanical innovations in agriculture can take many years, with a long lag of perhaps 10 - 15 years between research expenditures and widespread implementation at farm level. Once benefits have been demonstrated in trials, farmers need to be able to find and use these innovations effectively. Thus it is vital to take a long term, strategic view and to conduct research now to meet the future challenges, as well as developing approaches to facilitate the timely transfer of new knowledge and technologies into practical application.

The issues surrounding food are frequently complex, inter-connected and multi-faceted. Often they extend across organisational responsibilities. Solutions must take account of this complexity to be coherent, and if they are to succeed need to draw on the breadth of knowledge and understanding that is available from many disciplines, organisations and sectors.

In the last 20 years, technological advances in research have progressed rapidly; as evidenced for example by the revolution in understanding of biosciences and plant genomics. A challenge for any research programme will be to build on new and

existing technologies and underpinning knowledge, to understand the food chain issues being addressed in a comprehensive, multi-disciplinary way.

Some research challenges will be long-term and high-risk/reward: so called “grand challenges”. These are likely to be global in nature and give the UK research base an opportunity to engage in cutting edge research with other key global players. Ambitious goals might include e.g. nitrogen fixation or increased photosynthetic potential of crops, or new vaccines for key livestock diseases. Clearly such ambitious targets will require sustained investments in research over a number of years, in coordination or partnership with other global stakeholders to maximise efficiency and the chances of success.