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European Union Committee

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Innovation in EU agriculture

Report

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Q refers to a question in oral evidence;
IEUA refers to written evidence as listed in Appendix 2

SUMMARY

Agriculture faces a global challenge. The world's population, now around 7 billion, is expected to grow to 9 billion by 2050. Many food prices have increased and are likely to go on doing so.

In response, agricultural production must increase—to feed these extra mouths, to keep prices down, and to respond to a world-wide demand for better nutrition.

Higher output has to be achieved using finite resources. The world cannot afford to release new land for farming. We need our forests and wilderness to absorb the carbon dioxide we create.

Supplies of fresh water are everywhere under pressure. Projections of climate change show that many areas used for agriculture are under threat, from drought or flooding.

Mitigating climate change also means that farmers must reduce their use of fossil fuels, and change practices that contribute to the emission of greenhouse gases.

The response to this challenge has to start now. Decisions have to be taken, and actions implemented, with urgency.

The UK and the EU are not sheltered from the challenge. Europe must act quickly and coherently to transform EU agriculture, and make it ready for this new era.

Far from limiting production, the trend of the last decade, European Governments must see as the prime focus of agricultural policy the need to raise productivity, while supporting environmental sustainability. Innovation must be at the heart of this effort.

Science is key. In the UK, the Government must maintain the quality of fundamental research but also do more to plug the gaps in applied agricultural research.

Between 2007 and 2013 the Common Agricultural Policy budget is around €400 bn; EU funding for agricultural research is under €2 bn. The European Commission must make a co-ordinated drive to lift agricultural research to a new level, not least through the European Innovation Partnership on sustainable and productive agriculture.

Innovative knowledge must be put into practice. This is not happening systematically across the EU. Member States should improve advice to agriculture; the CAP Farm Advisory System should be extended to stimulate innovative practice.

Regulation should help, not hinder. Politicians and society must not be afraid of new properly tested technologies. These may include the genetic modification of crops, but GM is only one example of a range of possible technologies. Benefits and risks must be clearly articulated, recognising that too precautionary an approach may pose risks to global food security.

This is a challenge that must be addressed across the Government, across the European Commission and across society. Only collaborative working, bringing together scientists, farmers, retailers, and consumers, will enable agriculture to meet the tests of the future.

Innovation in EU Agriculture

CHAPTER 1: INTRODUCTION

> "Sometimes we talk about agriculture as something very old and traditional: it is not competitive and we can forget it. We really don't understand how strategic agriculture will be in the future ... We have left the era of surplus and come to the era of scarcity. We need to refocus what an Innovation Union is. In my mind, agriculture is at the centre of an Innovation Union and the new global challenge."

Mr Paolo de Castro, MEP, Chairman, Agriculture Committee of the European Parliament[1]

1. In the recent past, agriculture in the UK and in the EU has often been seen as one of the less interesting, indeed less important, parts of our economy. The systems of food production, distribution and retailing that have evolved in the Member States of Western and Northern Europe have provided consumers with growing ranges of food products, at cost levels which have been generally affordable.

2. In the last few years, however, a realisation of the threats to this situation has grown. There are significant challenges which must be understood, and tackled urgently, if European agriculture is to keep pace with changing economic and environmental conditions. This includes the ability to play an appropriate role in supporting global food security.

3. In March 2010, we published the report of an inquiry into the adaptation of EU agriculture and forestry to climate change.[2] The impact of likely changes in the climate over the next few decades is one of the major challenges to be faced by farmers in the EU: increasingly severe episodes of extreme weather are projected, including periods of drought alternating with storms and flooding. The implications will vary for the different parts of Europe. Our inquiry identified a number of steps which UK and EU policy-makers should take to strengthen the adaptation process: innovation in agricultural practice is a prerequisite for such steps to succeed.

4. We launched our inquiry into innovation in EU agriculture in July 2010. The debate on reform of the Common Agricultural Policy (CAP) after 2013 was already underway. In November 2010, the European Commission published its Communication on "The CAP Towards 2020: Meeting the food, natural resources and territorial challenges of the future";[3] legislative proposals for the CAP post-2013 are likely to come forward in the second half of 2011. In January of this year, we sent the Commission our comments on the Communication, taking account of concerns that had emerged through evidence received in our inquiry by that stage.[4] In April, we published a

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1 Q 220

2 8th Report (2009–10); HL Paper 91

3 COM(2010)672

4 See: http://www.parliament.uk/documents/lords-committees/eu-sub-com-d/innovation/CAP%20Reform%20260111.pdf

report on the EU financial framework from 2014,[5] in which we also expressed our views on the reforms needed to the CAP.

5. In June 2010, the European Council adopted a new strategy for growth and jobs, the Europe 2020 Strategy, in which innovation is central. The European Council agreed that the CAP must play its part in delivering that strategy. In October 2010, the Commission published a Communication on the "Europe 2020 Flagship Initiative: Innovation Union";[6] the initiative envisaged setting up European Innovation Partnerships, one of which would deal with sustainable and productive agriculture.

6. The Innovation Union initiative is intimately linked with the EU's research efforts, organised through the Seventh Framework Programme (FP7) for the period from 2007 to 2013. FP7 has a total budget of some €53 bn of which just under €2 bn are allocated to food, agriculture and bio-technology. In February 2011, the Commission issued a Green Paper "From Challenges to Opportunities: Towards a Common Strategic Framework for EU Research and Innovation funding",[7] to help shape decisions on the Framework Programme from 2014.

7. We have taken account of other studies in developing our inquiry. In October 2009, the Royal Society published its report "Reaping the benefits: Science and the sustainable intensification of global agriculture".[8] More recently, in January of this year, the report of the Foresight project on "Global Food and Farming Futures" was published,[9] providing a stark exposition of the increasing pressures on the global food system from the projected rise in the world's population from 7 billion now to 9 billion in 2050. Our purpose has been to focus on the implications of these concerns for the future of EU agriculture.

BOX 1

Sustainable Intensification of Agriculture

The concept, which is often used in current debates about agriculture, was summarised by the Royal Society in its report on "*Reaping the benefits*" as meaning the process of increasing agricultural yields without adverse environmental impact and without the cultivation of more land.

8. The OECD-FAO Agricultural Outlook 2010-2019 sets out projections for increases in agricultural production over the next decade in different parts of the world: in Brazil, an increase of more than 40% is expected; in the US, growth of between 15 and 20%; in Europe, the projected increase is about 4%.[10] The starting-points for these increases vary widely between countries, and European agriculture is undoubtedly a mature sector, with historically high levels of productivity, and with standards (for example, of animal welfare) which are not always replicated elsewhere. However, projections of this sort show that there is scope, and need, for the competitiveness of EU

5 13th Report (2010–12): *EU Financial Framework from 2014*; HL Paper 125

6 COM(2010)546

7 COM(2011)48

8 See: http://royalsociety.org/Reapingthebenefits/

9 See:http://www.bis.gov.uk/assets/bispartners/foresight/docs/food-and-farming/11-546-future-of-food-and-farming-report.pdf

10 See: http://stats.oecd.org/Index.aspx?DataSetCode=HIGH_AGLINK_2010 ; and evidence from Mr Jack Bobo, US Department of Agriculture: Q 189

agriculture to be addressed if we wish to avoid the likely diminution of the EU's position as the world's leading trading bloc.

9. The case for driving innovation through EU agriculture is not just about avoiding threats. The UK and the EU are seen as "a powerhouse of creating knowledge"; systematic research and innovation to improve farming will bring economic benefits to Europe, but this will also generate the knowledge to support "much of the innovation that low-income countries are going to require to meet the food challenges ahead".[11] We were heartened by the evidence which we received of high-quality research being conducted at institutes in the UK and elsewhere in the EU; these are highly valuable intellectual resources which must be maintained and exploited with understanding and forethought.

10. This report looks first at the wider context for innovation in EU agriculture, notably the need for a strategic approach to food production, the theory of innovation and examples of agricultural innovation. We then look at the state of agricultural research, and its potential to help meet the challenges from climate change and other environmental pressures which the farming sector will confront in the coming years. We consider the key questions of how innovative knowledge should be transferred to practitioners, in the context of an approach which views the production and distribution of food and food products as a system encompassing farmers, processors and retailers. We deal then with issues of policy-making and regulation in the UK and EU.

11. The members of the Agriculture, Fisheries and Environment Sub-Committee who conducted this inquiry are listed in Appendix 1, showing their declared interests. We are grateful for the written and oral evidence that we received for our inquiry; Appendix 2 lists the witnesses who provided it. We are also grateful to Dr Julian Clark, Lecturer in Human Geography at the University of Birmingham, and Dr Jonny Wentworth, Environment and Energy Adviser in the Parliamentary Office of Science and Technology, who acted as specialist advisers to our inquiry.

12. The Call for Evidence that we issued is shown in Appendix 3. The evidence that we received is available online.

13. We make this report to the House for debate.

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[11] Evidence from Professor Charles Godfray, Head of Department of Zoology, University of Oxford: Q 644

CHAPTER 2: A STRATEGIC APPROACH TO FOOD PRODUCTION

> "Inevitably, food is globalised. The issue is how one can make globalisation work for the betterment of food security ... As climate change inevitably kicks in over the coming decades, one of the ways in which globalisation can work in favour of food security is by having not a single bread basket feeding the region, but a globally inter-connected set of bread baskets so that, when there is a horrific production shock on one area, the food system can adjust to it. As one of the major trading blocs in the world, the EU can have a major effect in promoting this globalised food system that works for food security."

Professor Charles Godfray, Head of Department of Zoology, University of Oxford.[12]

14. In recent years, the recognition has taken hold of the urgent need for policy-makers to respond to the threats to global food security in the period to 2050, when the world's population is projected to reach a maximum of 9 billion. In January of this year, the Government Office for Science published the Foresight report on "Global Food and Farming Futures",[13] which offered an authoritative oversight of the issues. In stressing the importance of shaping policies for the global food system (rather than tackling individual elements in isolation), it highlighted six important drivers of change: global population increases; changes in the size and nature of per capita demand; future governance of the food system; climate change; competition for key resources; and changes in consumers' values.[14]

15. The failure of supply to meet demand will contribute to rising food prices, another major challenge with which the world is already grappling. The OECD-FAO Agricultural Outlook 2011–2020 projected price increases in real terms over that period of 20% for cereals (maize) and 30% for meat (poultry), compared to the last decade. [15]

"Sustainable intensification"

16. The Foresight report reiterated the need to bring about "sustainable intensification". We recommended that the requirements of a sustainable intensification of agriculture should be the defining characteristics of the future CAP in our March 2010 report on "Adapting to climate change: EU agriculture and forestry".[16] In his evidence to this inquiry, Professor Godfray, one of the lead experts for the Foresight report, said that, given the certainty of increasing demand, sustainable intensification was "almost a deduction rather than an argument", and he described innovation as critical to sustainability.[17]

17. Climate change is only one of several challenges to the food system. However, an analysis of future developments in greenhouse gas (GHG) emissions in the EU contained in the Commission's March 2011

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12 Q 643

13 Op. cit.

14 Executive Summary, section 2

15 http://www.oecd.org/dataoecd/13/2/48186214.pdf

16 Op. cit.

17 Q 662

Communication "A Roadmap for moving to a competitive low carbon economy in 2050"[18] makes it clear that EU agriculture may become increasingly important in climate policy. While the significant reduction in the sector's GHG emissions since 1990 may well be extended to 2030, the rate of reductions could then slow down, in part because of increased agricultural production due to the growing global population: "by 2050, [on current trends] agriculture is projected to represent a third of total EU emissions, tripling its share compared to today".[19]

18. The concerns which we expressed in our March 2010 report have been reinforced by other analyses that have come forward since then, notably in the debate about global food security. **We believe that the need for global food security requires a broad, co-ordinated and swift response from Member States and the Commission, which must take account of the different elements of the food system. Improving the productivity of EU agriculture is an important contribution to meeting the challenge. The response also requires innovation, through new products and processes, and through ensuring that farmers make use of best practice methodologies and technologies. Agricultural innovation must achieve "sustainable intensification".**

19. **This means that inputs (fossil fuels, fertilisers, water and pesticides) into agricultural systems will need to be reduced per unit area of land, while outputs are increased and impacts are reduced on the ecological processes on which agriculture depends, particularly on soils, climate, water bodies and biodiversity. In addition to rising demand for food, in the coming decades there is likely to be rising demand for public goods[20] from agricultural ecosystems, such as carbon sequestration and the protection of bio-diversity.**

20. The Foresight report identifies, within the food system, the relevance of waste reduction, and the exchange of knowledge with developing countries, as important elements of the policy response to the challenge of food security. Professor Godfray referred to the report's proposed target of halving the total amount of food waste by 2050. He drew the distinction between high-income countries, where food waste mainly occurred in the home and the food service sector, and low-income countries, where nearly all food waste happens in the farm and the food system. Incentives to modify behaviour, allied with education, or food literacy, were possible responses to the issue in high-income countries; targeting new knowledge, spreading best practice and supporting investment in the agri-food system were appropriate to low-income countries.

21. In the European Union, the European Commission has recognised the substantial amount of food waste and the untapped environmental and economic potential offered by better management of it. A 2010

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18 COM(2011)112

19 Ibid, section 3—raising land use productivity sustainably

20 A "public good" is an established economic concept. It refers to a good which is valued by society but which will not be delivered by the market because there is little incentive for individuals to either pay for them or supply them. This is partly because, by their nature, the availability of agricultural public goods, such as biodiversity, a landscape or carbon sequestration from that landscape, cannot generally be restricted to one or more individuals willing to pay for access (unless paying for access to a national park, for example). Where the market will not deliver those goods, and there is desire for them, the market failure then needs to be addressed by public policy.

Communication[21] noted that, in the EU, between 110 and 138 million tonnes of bio-waste[22] are produced every year, and this is projected to increase on average by 20% by 2020. The Commission acknowledges that, in the vast majority of Member States "no clear and measurable steps to increase bio-waste prevention have been taken", partly due to perceived sensitivities regarding limitations on consumer choice. Nevertheless, the Commission will produce specific guidance on bio-waste prevention for national waste prevention plans and will propose a set of indicators for prevention measures with a view to targets in the future.

22. **We agree on the vital importance of reducing food waste but are far from convinced that EU Member States are taking the issue seriously. We recommend that the European Union move swiftly towards the adoption of indicators for bio-waste prevention measures and then towards bio-waste prevention targets.**

23. In terms of its international responsibilities, the EU has the opportunity to draw lessons from the sustainable intensification of European agriculture and offer the knowledge gained to help low-income countries improve their own agri-food systems. This must include waste reduction, which in developing countries mostly occurs before and after harvest, especially during storage.

Structure of the agricultural sector

24. A point frequently made to our inquiry was that the agricultural sector, in the UK and in the EU, is very diverse. The written evidence that we received from Defra described UK farming as essentially an industry characterised by a large number of small businesses, although it should be noted that much smaller agricultural businesses are a feature of some other EU countries. In June 2008, there were estimated to be some 328,000 agricultural holdings in the UK, with a very skewed distribution: "A reasonable approximation is that around 20% of registered farm holdings account for about 80% of the output/value added, and that more than half of output/value added is provided by well under 10% of farms."[23]

25. Looking across the EU, Mr Georg Häusler, Head of Cabinet in DG Agriculture, contrasted the advanced nature of much of the UK's agriculture with farming in some of the other EU15 Member States, such as Portugal, Greece, Spain, Austria and the south of Germany, where the sector needed a great deal of development to become efficient. He referred as well to the heterogeneous nature of farming in the newer Member States, pointing to the extent of small-scale farming in countries such as Poland and Romania.[24]

26. Not least because the sector contains a multiplicity of very small businesses, it is clear that the agricultural industry will find it hard to play an effective role in responding to global food security without an overarching food strategy, at either UK or EU level. Professor Peter Lillford, of the Department of Biology at the University of York, contrasted the success of the Netherlands in co-ordinating the efforts of the different parts of the

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21 COM(2010)235

22 Garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises as well as comparable waste from food processing plants.

23 IEUA 25, para. 2(2)

24 Q 511

Dutch agri-food system with the position in the UK. The key to the Netherlands' success was "a national plan. They are a smaller nation than us with less global ambition, but they have decided that they are going to be very good at food and food processing in Europe ... the food industry does not represent such a high priority in our nation as it should".[25]

27. We raised this issue with Mr Jim Paice, MP, Minister of State at Defra. He said that until the start of 2010, when the "Food 2030" strategy was published, "the previous Government had basically set its face against any thought that British agriculture was important"; and he commented that the "Food 2030" strategy was in any case "extremely vague in content and actual proposals".[26] However, he said that the present Government had no plans to publish any new document, and that he did not believe in "some Government-determined plan"; and he saw no conflict between the Government's emphasis on localism and the need to respond to the challenges outlined in the Foresight report.[27]

A strategic approach

28. We are concerned that the Minister's emphasis on "getting on with developing and delivering policies"[28] could lead to Government policy-making which is fragmented, and fails to join up the dots into a coherent whole. If the Government are serious about raising agricultural productivity through sustainable intensification, they need to be clear what this means for farm enterprises of different sizes and in differing agricultural sectors, and how it should be taken forward.

29. Similarly, to ensure that a strategic approach is properly informed, the Government need to be clear how progress towards sustainable intensification should be measured and monitored over time. **We recommend that the Government should define a clear set of widely agreed indicators to measure progress over time towards increased agricultural production and reduced environmental impact. These must be monitored by an independent expert committee.**

30. The view of the Commission was expressed by Mr Häusler. He told us that "if each Member State has its own food strategy, we have completely failed. Many might question whether there is any value added in the European Union, but here there is. We have to develop a strategy; we do not have it yet."[29] We welcome this commitment, though its delivery will depend on the Commission's ability to overcome the lack of coherence which has in the past been demonstrated by different policies affecting the farming sector. **We suggest that, at the EU level, a food strategy should underpin the Common Agricultural Policy.**

31. In our April 2011 report on the "EU Financial Framework from 2014",[30] we looked at the role which the CAP from 2014 might play in delivering the "sustainable growth" policy priority of the Europe 2020 strategy. We

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25 Q 447

26 Q 674

27 Q 675

28 Ibid

29 Q 534

30 Op. cit.

recommended that the CAP's share of the EU budget should be reduced, and part of it transferred to R&D spending, to strengthen the research efforts targeting the new challenges to agriculture: global food security, bio-diversity protection and climate change. We called for the remaining CAP budget to support a CAP that was re-oriented towards meeting these challenges; this would require greater efficiency, and in turn pointed to the need for sustainable innovation to be an essential component running through the CAP. We return to these concerns later in this report.

32. We have noted the lack of a strategic approach at the EU and UK levels. **We conclude that national and EU level strategies for food production should underpin successful innovation. Without such strategies, conflicting priorities, between national government departments and within the European Commission, will inevitably act as obstacles to effective innovation. Strategies must be sensitive to the diversity of EU farming and food production systems, and should be framed within EU guidelines. They should be developed "bottom-up", not imposed "top-down". Local ownership and implementation are essential.**

CHAPTER 3: INNOVATION—THEORY AND PRACTICE

> "Innovation is not a new phenomenon. Arguably, it is as old as mankind itself. Where would we be without such fundamental innovations as agriculture?"
>
> Jan Fagerberg[31]

33. In this chapter, we explore the theory of innovation and, in particular, its application to the sustainable intensification of agriculture discussed in Chapter 2.

34. Joseph Schumpeter is known as one of the leading thinkers on innovation.[32] He saw innovation as a process over a period of time, involving individuals as entrepreneurs as well as large companies. While he considered it to be creative and beneficial, he also recognised that it could be destructive for some, unleashing the "gales of creative destruction".[33] It is important to note that, while boosting innovation is largely positive, it can have negative consequences, particularly of a social nature. When seeking to stimulate innovation in agriculture, Governments must be alert to this side effect.

Theory

35. There have been major developments recently in understanding agricultural innovation as a process, as outlined in Box 2. These developments are important not least because they provide insights into how agricultural innovation can be enhanced across Europe in the 21st century.

36. For many years, agricultural innovation studies were preoccupied with adoption and diffusion, an approach popularised by Everett Rogers's pioneering work on US farming. Innovations were seen as products developed by scientists, disseminated by advisory bodies and then put into practice by farm businesses.

37. More recently, this view has been challenged by findings that agricultural innovation is heavily influenced by a wide range of local contextual issues, including the management goals of farmers, the type of farm enterprise, and local contacts that farmers may have. This depiction sees agricultural innovation as a social process dependent on farm-level knowledge, rather than the simple adoption of a new product or technique.

38. A third approach treats agricultural innovation as a systemic process, involving not just farmers and scientists, but a range of intermediary organisations and factors (agricultural suppliers, wholesalers and retailers, and advisory bodies) as well as responding to new market demand and changing societal attitudes to innovation. Agricultural innovation from this viewpoint involves coordinating new technology, social attitudes, and R&D and advisory organisation activities, and introducing new policy approaches where needed, through what is termed an "Agricultural Knowledge and Information System". These are increasingly becoming known as Agricultural Knowledge and **Innovation** Systems.

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31 Jan Fagerberg, "The Oxford Handbook of Innovation". Edited by Fagerberg J; Mowery, David C; Nelson, Richard R. Oxford University Press, 2005.

32 Joseph Schumpeter (1883 to 1950) was an economist and political scientist.

33 Dodgson M. and Gann D., "Innovation—A Very Short Introduction", Oxford University Press, 2010.

39. As we explore in Chapter 5, we heard that these approaches are all present to some degree in contemporary European agriculture and are not mutually exclusive.

BOX 2

Three theories of innovation as applied to agriculture

Innovation as a top-down dissemination of new technologies: science and research drive innovation through knowledge transfer to farms (Beal and Rogers 1959;[34] Rogers 1962, 1983[35])

Innovation as a bottom-up process: local context and farm-level networks shape innovation outcomes (Röling 1988;[36] Clark 2005, 2009[37])

Innovation as a socio-technical process: farm businesses, agricultural R&D and advisory organisations, retailers, wholesalers, higher education and regulatory bodies shape innovation as an agricultural knowledge and information system (Röling 1992;[38] Birner *et al.* 2006;[39] Klerkx and Leeuwis 2008[40]).

40. Professor Maurice Moloney, Chief Executive, Rothamsted Research, emphasised the centrality of innovation to agriculture: "the whole history of agriculture has been about innovation".[41] As we were reminded, however, the very factors that have forced agriculture to innovate through the ages—a unique confluence of climate, disease and price volatility—are also responsible for a reluctance to take the bigger risks that drive innovation forward. The National Institute for Farming and Food Investigation and Technology of Spain (INIA) commented that "the sector does not have, of its own, the energy or the resources to drive the changes and innovation that are needed".[42] **We agree that innovation is an intrinsic aspect of agriculture. This does not mean, though, that the industry should be unsupported in its efforts to innovate. Rather, the particular risks that it faces—climate, disease and price volatility—and the small size of the average agricultural business, must be recognised as a basis for helping this industry to innovate.**

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34 Beal G.M. & E.M. Rogers, "The scientist as a referent in the communication of new technology", Public Opinion Quarterly, 22, 555–563 (1959).

35 Rogers, E.M., "Diffusion of innovations", 1st edition. Free Press, New York (1962); Rogers, E.M., "Diffusion of innovations", 3rd edition. Free Press, New York (1983).

36 Röling, N.G., "Extension science: Information systems in agricultural development", Cambridge University Press, Cambridge (1988).

37 Clark, J.R.A., "Examining the New Associationalism in agriculture", Journal of Economic Geography 5(4), 475–498 (2005); Clark, J.R.A., "Entrepreneurship in European agriculture: identifying business enterprise characteristics and change processes", Entrepreneurship and Regional Development 21 2, 213–235 (2009).

38 Röling, N.G., "The emergence of knowledge systems thinking: A changing perception of relationships among innovation, knowledge process and configuration", Knowledge and Policy: The international Journal of Knowledge Transfer and Utilization, 5, 42–64 (1992).

39 Birner, R., K. Davis, J. Pender, E. Nkonya, P. Anandajayasekeram, J. Ekboir, A. Mbabu, D. Spielman, D. Horna, S. Benin, and W. Kisamba-Mugerwa, "From 'best practice' to 'best fit': a framework for designing and analyzing pluralistic agricultural advisory services", International Food Policy Research Institute (2006).

40 Klerkx , L. & C. Leeuwis, "Matching demand and supply in the agricultural knowledge infrastructure. Experiences with innovation intermediaries", Food Policy, 33, 260–276 (2008).

41 Q 114

42 IEUA 12

Practice

41. Agricultural innovation can take many forms: new technologies, such as biotechnology and new machinery; incremental change, such as commercial decisions to plant a new crop or alter a label; and process changes in the ways in which ideas are conceived, developed and deployed. Innovation in agriculture interacts closely with innovation throughout the food chain.

42. In the course of our evidence, we heard of many examples of innovation in the agricultural sector. Hugh Crabtree, Director of Farm Energy and Control Services Ltd informed us about the PIVIT (Pig Improvement Via Information Technology) initiative. Still in development, this initiative between producers, academics and suppliers aims to "have most professional UK pig production sites on line and subscribing to data analysis, interpretation and knowledge transfer services within 10 years". The new IT tool will allow utility and water use, feed intake, environment and growth to be measured in real time. It is an example of both technological and process innovation.[43]

43. Mr de Castro explained that "quality is one of the main issues to make European food production more competitive", particularly as "the consumer today is interested in knowing more about food".[44] The EU has three agricultural product quality schemes,[45] allowing protection for a particular term on grounds of geography and techniques or tradition. Examples include: "Balsamic Vinegar from Modena", "Camembert from Normandy" and "Traditional Bramley Apple Pie Filling". These schemes allow producers to add value to their products through marketing; the Country Land and Business Association (CLA) told us that farmers were doing this "in a far more innovative way than they were even 10 years ago".[46]

44. A recurrent innovation in our evidence was precision farming. The machinery manufacturer, John Deere, explained that GPS[47] technology is now fitted to approximately 20% of new farm tractors and 50% of new combine harvesters. Such systems "reduce the overlap in field work allowing work to be completed in fewer passes across the field, with savings in fuel, time and other inputs such as fertiliser or spray chemicals".[48] Mr Mark James, product line manager for the company, said that savings on these inputs, which improve the economic viability of a farm, are in the region of 10%.[49] Professor John Oldham, of the Scottish Agricultural College (SAC), regretted that GPS technology had not been adopted more widely, which he attributed to the high cost and slow return on investment.[50]

45. A number of witnesses made reference to the potential of genetically modified crops, views which we highlight in Chapter 6. One particular example brought to our attention was that of genetically modified grapevines

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43 IEUA 7

44 Q 218

45 Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Speciality Guaranteed (TSG). The European Commission recently proposed a simplification of the system (COM(2010)733).

46 Q 147

47 Global Positioning System—a satellite navigation system

48 IEUA 45

49 Q 712

50 Q 338: but see Q 716 for detailed information about the economic case for precision farming technology.

in France. Some work has taken place in order to establish whether genetically modified rootstocks could tackle, or at least delay, the onset of a severe disease, grapevine fanleaf virus (GFLV).[51]

46. Witnesses also emphasised that genetic modification was only one form of biotechnology available to the plant breeding sector. The use of genomics, such as genetic markers (see Box 3), was one such example.[52]

BOX 3

Genetic markers

Plants have been bred for over 100 years to resist pest and disease, traditionally through a trial-and-error approach in which large numbers of crosses are made from many sources of possible resistance, such as wild relatives of the crop species. Progenies are evaluated for characters of direct economic interest (for example, grain yield and grain quality) in target environments. Good performing crosses and progenies are selected for further use or testing.

This approach has been highly successful in many crop species and numerous breeding programmes, with cereal, potato and oilseed crops benefiting from the development of resistant varieties with improved yields that form the mainstay of food production. However, such conventional breeding approaches can take 5 to 10 years to create required plant varieties.

During the past two decades, molecular tools have resulted in the identification, mapping, and isolation of genes in a wide range of crop species. A genetic marker is a sequence of DNA or protein that can be screened to reveal genetic variation in a crop species, which may arise due to mutation or alteration in the relevant specific region of the plant genome.

Genetic markers occur in the nuclear and organelle (chloroplast and mitochondria) genomes. These three genomes differ in their evolutionary characteristics, for example, inheritance and sequence and structural mutation rates, which determine the types of genetic issues that they are used to study. In Marker Assisted Selection (MAS), plant DNA is screened to detect any genetic variation that may underlie a desired trait such as disease resistance. Several traits and hundreds of plant varieties can be simultaneously analysed. MAS has had a significant impact on several major crops, including maize and sugar beet. Despite its potential, the cost of the technology has limited its impact on the UK's major cereal crops thus far. MAS works most efficiently where there is a substantial genetic knowledge base, but in less well studied species this may not be available, and may be expensive to develop.

47. Professor Oldham referred to the use of genomics as a form of innovation in the livestock sector. Genomic selection, he explained, can be used to improve traits to do with health in particular, where different individuals may be more or less susceptible to different diseases.[53] His SAC colleague, Professor Geoff Simm, suggested that genomic selection in livestock is an area "of major opportunity for Europe ... because of the costs of the technologies and the

51 Q 430, IEUA 37

52 QQ 80, 306

53 Q 351

need to share skills and create joint approaches to exploiting them."[54] This might be within the context of a network such as SAC's involvement in an Animal Task Force with Dutch and French colleagues (see Chapter 4). It will of course be important to bear in mind the animal welfare implications of genomics as such technologies are developed.

48. EU agricultural production is not restricted to food, and includes outputs such as cotton and wool for use in clothing. The innovative development of crops for industrial application, such as hemp for housing insulation, was mentioned by both Incrops[55] and the CLA. Another crop with industrial application was willow. Professor Moloney described it as "a very good example of a reproducible biomass which could become part of a supply chain to power stations". He added that technology in the form of such crops also provides refuge for wildlife, and sequesters a substantial amount of carbon, thus helping to reduce the carbon footprint of agriculture.[56] InCrops also gave us evidence about the innovative use of algae (see Box 4).

BOX 4

Innovation in use of algae[57]

Algae and their products have the potential to contribute to a wide variety of sectors, including energy, food, feed, and fertilisers. In addition, algae can play an important role in providing "bio-remediation" services: for example, they can scrub CO_2 and NO_x out of flue gases, and remove nitrates, phosphates and certain heavy metals out of waste water.

Generation of relevant expertise is accelerating; encouraging examples are given, amongst others, by two companies. Scottish Bioenergy Ltd collaborates with whisky distilleries and several research institutes. The liquid residue after distilling is rich in nutrients, but also contaminated with copper. Traditionally the distilleries have paid farmers to spread this on fields which, due to copper accumulation, then need to be set aside. Algae remove the copper and nutrients from the liquid residue (simultaneously using CO_2 from the brewing process). The algal biomass may be used to generate energy, or to feed pigs or cattle (for which copper is a valuable micronutrient).

The Welsh company Merlin Biodevelopments Ltd has patented a process to turn the liquid residue from on-farm anaerobic digestion (AD) into algal biomass. This turns a bottle-neck in the expansion of AD—the storage of liquid digestate until it can be spread on the fields—into an opportunity for generating added value. In the simplest model, the algal biomass could be fed into the AD plant, leading to a closed loop for production of biomethane, but Merlin Biodevelopments use the biomass for higher value purposes, including animal feed. High performance fertiliser with low carbon footprint is another possible application. One particular benefit of this technology is that it can recover, and recycle, most of the water used in beef production, which is a highly water intensive industry.[58]

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54 Q 640

55 IEUA 21, Q 147

56 Q 110

57 Algae are unicellular or multicellular organisms which occur in fresh or salt water, that have chlorophyll and other pigments but lack true stems, roots and leaves. They include seaweed.

58 Based on information provided by InCrops

Along similar lines, the National Farmers' Union (NFU) added that "farmers are installing on-farm bioenergy equipment such as biomass boilers, combined heat and power units, anaerobic digesters as well as photovoltaic cells and wind turbines on their land and buildings".[59] There is clearly scope for the industrial application of agricultural innovation to make a significant contribution to job creation.

49. **It is clear to us that the farming industry and scientific community are contributing to agricultural innovation in a large variety of ways. But the reach of innovation in EU agriculture must be extended, if substantial future risks to European food security are to be avoided, and to respond to the need for sustainable intensification of agriculture. Member States and the Commission should both play a role in shaping the framework to strengthen this process.** We look in detail at that role in the following chapters.

[59] IEUA 14

CHAPTER 4: AGRICULTURAL RESEARCH AND INNOVATION

> "... we need to develop sustainability in relation to the kind of pressures we know are going to happen on a worldwide basis. We are looking at 2050 and saying that this is a time when we know our agricultural output will have to have reached a level that is probably 70–100% greater than it is right now, on a worldwide basis. If we were to use only conventional approaches now, we would have a lot of problems with sustainability … The sorts of things that we believe are very important are to integrate the scientific knowledge that has been generated from a lot of diverse areas."

Professor Maurice Moloney, Chief Executive, Rothamsted Research[60]

50. The Royal Society report on "Reaping the Benefits" made it clear that the key objective for agriculture in the first half of the current century was to achieve sustainable intensification. Output has to be increased significantly, as the world's population rises from 7 to up to 9 billion by 2050. Sustainable intensification requires that, as output increases, resource inputs into agriculture per unit area of land are held steady or reduced. This applies to water, oil and derivative products, and fertilisers. All are finite resources, and cutting back on the consumption of oil and fertiliser will be important to reducing greenhouse gas emissions from agriculture. Waste in food systems must be reduced (see paragraphs 20–23), and dietary choices in more prosperous societies steered towards less resource-intensive products; but there will be an inescapable demand for more food.

51. Past developments in innovative technologies are already helping farmers move in this direction. Precision farming is an example, allowing tractors or sprayers fitted with GPS technology to make significant savings in the use of fuel, fertiliser and chemicals (see Chapter 3).

52. Innovative research also underpins commercial success. In evidence which we received about the Dutch Agricultural Innovation System (DAISY), we were given the example of the so-called "Wasserbomben" (water bombs) affair in the early 1990s, when there was a crisis in the market for Dutch tomatoes in Germany as consumers reacted against products that had been bred for colour and texture, but not for taste. Through combined working between research institutes, breeders and distributors in the Netherlands, cherry tomatoes were developed and launched on the market. "When you buy those small tomatoes in a shop, you do not see the huge knowledge behind them—knowledge about breeding, logistics, disease management, product development and marketing. A whole chain of innovative concepts lies behind the cherry tomato."[61]

Research in the UK

53. We discuss the EU approach to research later in this chapter. In the UK, the quality of basic agricultural research continues to be of very high quality. Professor Douglas Kell, Chief Executive Officer of the Biotechnology and Biological Research Council (BBSRC), said that the BBSRC spends around

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60 Q 112

61 Evidence from Mr Peter Keet, Senior Policy Officer, Dutch Ministry of Economic Affairs, Agriculture and Innovation: Q 595

£470 million a year on research in biotechnology and biological sciences; and that the UK is number one in the world in biology, and this includes "eminence in farming".[62] This view was echoed by other witnesses. Professor Moloney described the research efforts being taken forward by the John Innes Centre (JIC) and Rothamsted Research as a "powerhouse of discovery";[63] he said that the UK had world leadership in aspects of genetics and genomics, and that it could build on this by working on bio-informatics, on photosynthesis and the use of nutrients and water in crops.[64] Both Professor Moloney and Professor Godfray[65] said that there was a need to boost soil science which had been neglected in recent decades.

BOX 5

Research categories

Research has traditionally been split into two categories—basic, and applied. More recently, understanding of research has included a third category, translational research.

Basic (or fundamental) research: experimental or theoretical work done to generate new knowledge in a particular discipline, without any specific application in view.

Applied research: also original investigation done to acquire new knowledge, but directed primarily towards a specific practical aim.

Translational research: both basic and applied research is typically taken forward within single disciplines within the research community. Translational research is characterised by multi-disciplinary approaches, and by interaction between academic research and industry practice.

54. Conversely, Professor Moloney said that, alongside the closure in recent years of 11 agricultural research institutes, a gap had opened up in translational research.[66] Several other witnesses commented on this problem.[67] We received detailed evidence from Professor David Leaver, Professor Emeritus at the Royal Agricultural College.[68] Professor Leaver talked of the research pipeline, which ensured that innovation flowed from the laboratory to the farm, and information from agricultural practice was transmitted back to researchers. He described the current position in medical research, where applied research supported by public charity funding connected to pharmaceutical companies and was put into practical use, and contrasted that with agricultural research: "We have this gap in the middle where applied research could at one end be taking from the basic science of the research push, but could also be looking at things happening on farms

62 Q 416

63 Q 116

64 Q 108

65 Q 644

66 Q 116

67 For example: Dr Mike Storey, AHDB, Q 56; Professor Giles Oldroyd, JIC, Q 93; Professor Allan Buckwell, CLA, Q 163; Mr Tony Pexton, Dr Tina Barsby, NIAB, Q 285

68 In November 2010, Professor Leaver produced a report on "Support for Agricultural R&D", for the All Party Parliamentary Group on Science and Technology in Agriculture. A copy can be seen at: http://www.appg-agscience.org.uk/linkedfiles/APPGSTA%20-%20David%20Leaver%20report%20Nov%202010.pdf

and the way that things are developing."[69] Professor Peter Lillford, Visiting Professor, Department of Biology, University of York, told us that the UK had "nowhere near enough" transfer of innovation knowledge, and, with the UK's competitive position in mind, he added a warning that "other states in Europe do".[70]

55. Professor Oldham agreed that the research culture of UK universities contained no strong incentives to encourage translational research. The Research Assessment Exercise (RAE), which was the basis for decisions on funding university research, steered researchers towards high-impact papers to be assessed by other scientists: "We have created a culture where we have some absolutely brilliant science going on … in its own world, and it's being assessed by other researchers in terms of quality, but the value of that, in terms of translation value into practice, is diminished."[71] He voiced the hope, however, that the move over the next couple of years from the RAE to the Research Excellence Framework (REF) would strengthen the recognition of practical impact within the research culture.[72]

56. Professor Kell also told us that the BBSRC had a new and specific policy to encourage knowledge exchange and commercialisation; that the Council supported Industrial Partnership Awards, bringing together researchers and industrial partners from the outset; and that it had recently initiated the Advanced Training Partnerships, to support training through collaborations between user groups and research providers.[73]

57. We attach great importance to maintaining and strengthening the UK's base for agricultural research, through the funding provided by the Government and the BBSRC in particular. We have a particular concern about the decline in UK research into soil science; if recruitment into the discipline does not improve, the UK risks losing that capability. **We consider that sustainable intensification of agriculture must be a determining feature of agriculture's future and of innovation within the industry; we urge those with national funding responsibility to prioritise support for further work on nutrient efficiency, water efficiency, genomics and soil science, as key elements of the UK's approach to sustainable intensification.**

58. There is a wide consensus that the potential practical impact of much research is being missed because of gaps in the research pipeline. Mr Paice told us that in 2010 the UK Government published a food research and innovation strategy, providing a "coherent framework to support and enhance the research capability and the translation of its research into use".[74] Given the concerns expressed to us by witnesses such as Professor Leaver and Professor Lillford, we are concerned that this is inadequate. **We consider that the Government, and those with funding responsibilities, must look more urgently at how research aimed at translating scientific findings into practice can be revived and enhanced, building on initiatives already under way.**

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69 Q 305

70 Q 446

71 Q 339

72 Q 340

73 Q 424

74 Q 700

59. It is self-evident that research will be carried out only if there are researchers to do it. The evidence that we heard from Professor Giles Oldroyd, JIC, highlighted the fact that the teaching of feeder subjects at A-level tended to be of such poor quality that students saw plant sciences as "rather old-fashioned" and took the view that "the future is all in the medical sciences".[75] Professor Oldroyd commented that there was a growing recognition that agricultural science was important, given its role in meeting the challenges posed by a growing world population, but more needed to be done to attract students into relevant undergraduate courses.[76]

60. We agree that, at school level, the attraction of agriculture and plant science as areas of study and as a profession can be enhanced by emphasising their relevance to climate change and food security. The same message would be reinforced by re-orientating agricultural teaching in universities towards the future needs of sustainable intensification of agriculture, both as regards recruitment of researchers and education of farmers.[77] Lifelong learning among the agricultural community, food processors and retailers might be another helpful avenue to explore in terms of education as agricultural innovation is linked strongly to building the capacities of the workforce.

61. When we put this concern to Mr Paice, he agreed that there was a need to make the food and farming industry an attractive industry, but saw the Government's role as to ensure that the industry could "deliver a satisfactory income and terms and conditions ..."[78] We see this as necessary, but not sufficient. **We recommend that the Government, with other key educational bodies, should review the content and presentation of agricultural studies and plant science from school level, through further and higher education, to adult re-training programmes: studying agriculture should be seen as a frontline activity of central importance to ensure that its relevance to the challenges of food security and sustainable intensification is clear.**

Research in the EU—the Framework Programme

62. The EU's Framework Programme for Research is the world's largest research programme. The current Programme (FP7) has a budget of €53.2 bn for the period from 2007 to 2013. Within FP7, the Cooperation programme (representing two-thirds of the overall budget) fosters collaborative research across Europe and other partner countries through projects by transnational consortia of industry and academia. Research is carried out in ten key thematic areas;[79] funding of €1.9 bn is earmarked for the area of food, agriculture and biotechnology. It is notable that, while just under 2% of the EU research budget is allocated to agricultural research, the CAP itself currently accounts for just over 40% of the EU's total budget.

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75 Q 86

76 Q 87

77 For example, the University of East Anglia offers an MSc in Sustainable Agriculture and Food Security.

78 Q 702

79 In full, the ten thematic areas for FP7 are: health; food, agriculture and fisheries, and biotechnology; information and communication technologies; nanosciences, nanotechnologies, materials and new production technologies; energy; environment (including climate change); transport (including aeronautics); socio-economic sciences and the humanities; space; and security. The allocation to the largest area financed (ICT) is €9.1 bn, followed by health (€6.1 bn).

63. We heard support for FP7 from some of our witnesses. For the CLA, Professor Buckwell commented that it was important collaborative international research of high quality.[80] Professor Kell said that there was a "complementarity" between research funding by the EU and by Member States nationally, and that Europe has been in the lead in promoting the concept of the "knowledge-based bio-economy".[81]

64. Conversely, Professor Oldroyd was critical of much of the procedure attached to FP7 funding, citing "endless reporting, endless auditing … an incredibly bureaucratic process" which also lacked the flexibility to adjust to changing priorities.[82] Dr Tina Barsby, NIAB, made similar comments on the bureaucratic aspects of FP7 funding.[83]

65. Against this background, we were interested to hear from Madame Marion Guillou, CEO of the French National Institute for Agricultural Research (INRA), and Professor Kell about the research Joint Programming Initiative (JPI) on agriculture, food security and climate change, which their respective organisations (INRA and BBSRC) are leading. Madame Guillou explained that the impetus for this research project had come from discussions in 2008 under the French Presidency of the EU, and that the work was being taken forward outside FP7, with the participation of 20 countries within and outside the EU, and with the knowledge, though not direction, of the European Commission. During 2011, work would be done on the risk assessment of climate change for European agriculture.[84]

66. We consider this a very important research project; and its emergence and implementation after the setting of FP7 funding for the period 2007–2013 highlights the lack of flexibility inherent in the EU's approach to allocating funding and priorities for its major research programme. While we acknowledge the progress made by the EU's ERA-NET co-operation scheme (see Box 6), we are also clear that other projects encouraging collaboration between EU Member States have proved successful. **We recommend that the Commission should play a full role in encouraging such collaboration, and should consider including possible financing under the next Framework Programme, in addition to the existing ERA-NET co-operation scheme.**

67. We discussed these issues with Ms Patricia Reilly, agriculture adviser in the cabinet of Research and Innovation Commissioner Geoghegan-Quinn, and Ms Maive Rute, Director, Biotechnologies, Agriculture and Food, Research and Innovation Directorate-General. Ms Reilly said that the Commissioner and her officials were aware of the bureaucratic burden attached to applications for funding; the Commissioner was "determined to put in place a simplified system that allows researchers to get out of the office and back to their labs …"[85] Ms Reilly also referred to the consultation which was under way ahead of decisions on the next Framework Programme, which reflected an intention to simplify and rationalise the EU's approach to research funding. **We strongly welcome the Commission's acknowledgement of**

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80 Q 169

81 Q 420

82 Q 91

83 Q 294

84 QQ 417, 418

85 Q 576

the need to make research funding less bureaucratic; we consider that the UK Government should support this intention; and we urge the Commission to make rapid progress with the reforms which it has outlined.

68. **We also consider that the EU's future Research Framework Programme should be organised more flexibly and in response to tackling grand challenges, rather than following the current approach which tends to brigade research according to rigid themes.** Such a re-orientation would allow it to respond more effectively to the particular challenges of climate change and food security, to which increased agricultural and agricultural ecosystems research can play a key role. We return to this issue at the end of this chapter.

Research in the EU—networks

69. Several of our witnesses spoke positively about the impetus to co-operation among researchers in different countries which the EU provided, both through the mechanisms of the Framework Programme and also outside them. Madame Guillou, said that the Framework Programmes had promoted networks between research teams throughout Europe.[86] Professor Oldroyd said that collaboration through the ERA-NET scheme had proved very successful and adaptable.[87] For DG Research and Innovation, Ms Rute made the same point, and said that EU research co-ordination helped create stronger co-ordination within some Member States, and had also raised the scientific level of research in them.[88]

BOX 6

ERA-NET—networking of research programmes in the European Research Area

The objective of the ERA-NET scheme is to develop and strengthen the coordination of national and regional research programmes. It allows those implementing public research programmes to coordinate their activities, for example, by mutually supporting joint calls for trans-national proposals. In some cases, additional EU financial support may be available to facilitate joint calls for proposals.

70. Professor Oldham, SAC, also commented that EU research funding had been very useful in encouraging networks across Europe. His own institute worked with a number of other research institutions, technology platforms and elements of industry in a grouping called the Animal Task Force (see Box 7), to share views on the priorities for livestock science research.[89] We took evidence jointly from Professor Oldham and his SAC colleague, Professor Geoff Simm; from Dr Paul Vriesekoop, of Wageningen URC in the Netherlands; and from Dr John Williams, of INRA in France. A common commitment among the participating organisations was the wish to strengthen links between researchers and industry, and to see research outcomes translated into practice.[90] Reflecting their experience,

86 Q 420
87 Q 91
88 Q 575
89 Q 329
90 Q 632

Dr Vriesekoop thought that it would be beneficial to the EU if Member States put more effort into pooling their research resources to bring institutions together to work on the same projects: "I see it coming up now, but it can be done much better, much more and much more efficiently in total. Across Europe, a lot of research is being duplicated ..."[91]

BOX 7

Animal Task Force

The Animal Task Force (ATF) was initiated in 2008-09 by INRA, SAC, Wageningen URC and the University of Bonn, in Germany. In 2010, it was expanded to include Teagasc, Ireland's Agriculture and Food Development Authority; MTT, in Finland; the University of Aarhus, in Denmark; and the University of Uppsala, in Sweden.

The ATF's mission is to develop a network for providing opinions and outlooks on animal research and implementation, and the knowledge needed for tomorrow's technologies and systems; to support and strengthen the work of the European Technology Platforms on breeding, feeding, health etc including especially cross cutting issues; to communicate with relevant authorities and actors; to mobilise resources for animal research and innovation; and to promote knowledge exchange between research base and end users.

71. The same concern was expressed to us by Ms Marie Francis, Chair of the InCrops Enterprise Hub, and Dr John French, Managing Director, InCrops, a UK organisation established to promote the commercial exploitation of research into innovative crop uses. Dr French said that many countries in the EU were tackling issues related to agriculture and technology in isolation from each other, and InCrops saw the need to put in place a structure that would provide better links between Member States in relation to technology transfer and translation.[92] Dr French and his colleagues have subsequently submitted their proposals for a European Innovation Network for Agriculture (reprinted at Appendix 6 to this report); we commend this submission, for its analysis of the issues to be tackled, and for its blueprint for a structure to do so. We refer to InCrops' submission again in our consideration of the Commission's proposal for a European Innovation Partnership on agriculture (see paragraph 73 below).

72. We note that start-up finance for InCrops' activities was in part received from the East of England Regional Development Agency (RDA), which provided matching funding for support from the European Regional Development Fund (ERDF), an obvious potential source of support for such a network. This illustrates the important role of the public sector in providing incentives to encourage private sector investment in research; EU funding (ERDF) has been used to support innovative agricultural projects in the UK. In June 2010, the Government confirmed its intention to abolish the RDAs. **We urge the Government to ensure that, with the abolition of the RDAs, successor arrangements enable ERDF support to be accessed easily, and without interruption, by appropriate projects in the UK**.[93]

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91 Q 636

92 Q 24

93 The website of the Department for Communities and Local Government (DCLG) states that RDAs will be abolished at the end of March 2012, subject to approval of the Public Bodies Bill; that from the beginning of July 2011 management of the ERDF programmes, with the exception of the London programme, is to become the sole responsibility of DCLG; and that the existing ERDF functions in the RDAs will be transferred wholesale into DCLG.

European Innovation Partnership on agricultural productivity and sustainability

73. In June 2010, the European Council adopted the Europe 2020 Strategy, to which innovation is central. In October of the same year, the Commission published a Communication on the Innovation Union,[94] which is one of the flagship initiatives for Europe 2020. A key element of the Innovation Union is the concept of European Innovation Partnerships (EIPs). Box 8 sets out the detail of the Innovation Union; it is clear that only effective co-ordination can make these objectives achievable. At Appendix 5 we print a copy of a reply from the European Commission to a series of questions which we raised about the agriculture EIP.

BOX 8

Innovation Union

The European Commission's Communication of October 2010 saw the biggest challenge for the EU and its Member States as the need to adopt a much more strategic approach to innovation. It set out ten actions to achieve the Innovation Union:

(1) continued investment in education, R&D, innovation and ICTs in times of fiscal constraints

(2) reforms to get more value for money and tackle fragmentation from research and innovation systems

(3) modernising education systems at all levels

(4) enabling researchers and innovators to cooperate across the EU as easily as within national borders

(5) simplifying access to EU programmes and enhancing their leverage effect on private sector investment

(6) getting more innovation out of research, by enhancing cooperation between science and business

(7) removing the remaining barriers for entrepreneurs to bring "ideas to market"

(8) "European Innovation Partnerships should be launched to accelerate research, development and market deployment of innovations to tackle major societal challenges, pool expertise and resources and boost the competitiveness of EU industry ..."

(9) exploiting strengths in design and creativity better

(10) working better with international partners

74. A recurrent theme of our inquiry has been the need to make connections between the different groups concerned with innovation in agriculture: for example, between researchers on the one hand and farmers on the other; or between research institutes in different parts of the EU that are duplicating work done elsewhere. Professor Kell said that a large part of tackling the need to promote innovation was "to bring together all of the multiple funders and users to help the innovation chain, because keeping people separate in silos inhibits this ..."[95] The Commission's reply states that the EIP "would

94 COM(2010)546

95 Q 436

mobilise and bring together all actors around a common target—from those conducting basic and applied research, all the way to the final user like farmers and businesses, including every step in between".

75. However, connections need to be made within organisations, as well as between them. In our March 2010 report on adapting EU agriculture to climate change, we noted that the separate Directorates-General of the Commission responsible for agriculture, and for the environment, were working together on climate change issues; and that the appointment of a new Climate Action Commissioner was intended to ensure better integration of climate change adaptation into EU policies.

76. There is the same need to overcome long-standing organisational fragmentation of policy responsibility in relation to innovation in EU agriculture. For DG Agriculture, Mr Häusler said that, although a decade ago there had been a research branch in the CAP structure, it had been superseded by the creation of a Research DG, and that the level of agricultural research supported by the EU had declined. The launch of the agriculture EIP was meant to reverse this decline.[96] Mr Häusler's reference to the co-operation between his Directorate-General and the Research DG was echoed by Ms Reilly, who set it in the context of President Barroso's encouragement to the present Commissioners "to work horizontally, to co-operate on their own dossiers, and to try to take a helicopter view of the societal challenges that we face, as opposed to everyone working in their own silos."[97] We say more about co-operation within the Commission in paragraph 152.

77. We heard support for the agriculture EIP from some of our witnesses. Mr de Castro, Chair of the Agriculture Committee of the European Parliament, commented that agriculture was "at the centre of an Innovation Union and the new global challenge".[98] Professor Oldham and Dr Vriesekoop saw considerable potential in the EIP concept, while stressing the need to implement the concept in a meaningful and inclusive manner; Professor Oldham raised the possibility that the EIP approach might be used to modify CAP expenditure so that it stimulated innovation more effectively.[99]

78. We are clear about the need to reinforce EU support for research into agricultural innovation, and this requires not only that funding be maintained and properly focused, but also that research priorities are determined on the basis of co-operation among research centres across the EU, and between those centres and other key players, from the farming sector and the agri-food system more widely. We understand these to be the intentions underlying the proposed agriculture EIP. **We support the idea of a European Innovation Partnership (EIP) on agricultural productivity and sustainability, but only on the understanding that it will be founded on effective, action-based co-operation, including between the different Directorates-General of the Commission.** EU agriculture will not be sufficiently helped to tackle the challenges ahead if the policy framework is weakened by a lack of cohesion within the Commission. For

96 Q 515

97 Q 578

98 Q 220

99 Q 639

the UK Government, Mr Paice commented that it was still "very early days" for the agriculture EIP. While this is true, **we are clear that the Government must work closely with the Commission and other Member States to clarify and guide the EIP proposals.**

79. We draw attention to InCrops' submission on a European Innovation Network for Agriculture (see Appendix 6). In particular, we highlight the call in that submission for a network initiative to follow a twin-track approach: "EU networking and transnational delivery", to be based on the sort of partnership arrangements envisaged in the EIP; but also "innovation delivery to the agricultural sector", ensuring that innovative knowledge generated across the EU is conveyed to farm business "to ensure that local delivery of support, whilst respecting local traditions and systems, draws on the expertise in all member states". We add that it will be important that measures are devised and publicised for guiding and monitoring the impact of the proposed agriculture EIP: these should include not simply organisational and reporting milestones, but metrics of the take-up and application of innovative practices by the farming sector across the EU. **We recommend that the Commission follow a "twin-track approach" (EU networking, local delivery) in taking forward the agriculture EIP; and that it develops metrics and identifies clear targets, so that the progress of the EIP is measured against those targets and is regularly reviewed.**

The need for a strategic approach to research into agricultural innovation

80. We agree with the view which was held by most, if not all, of our witnesses about the centrality of agriculture to the EU's ability to confront the challenges of food security. This was well expressed by Mr Häusler: "In every crisis there is a chance, and now there is a chance for agriculture. The big debate that we will have in the coming months, in the College[100] and later outside it, is about bringing agriculture and the agricultural economy back into the centre of political debate. It is not a debate about a specialist agricultural minister in a little corner discussing the price of milk, but a strategic debate about the future of the continent".[101] **We welcome the fact that greater prominence is being given to agriculture in the deliberations of the European Commission, and we urge that it should be given a similar priority in political debate in the UK.**

81. This strategic debate requires a strategic approach to the next research framework programme, responding to grand societal challenges. The EU's research efforts need to take particular account of the challenges of mitigating, and adapting to, climate change, of utilising natural resources (water, soil) more effectively and of responding to the linked challenge of global food security. Innovation-related links need to be made between agricultural research and other areas, such as manufacturing and transport. By doing so, the case can be made that investing in European agricultural R&D is fundamental to raising Europe's agricultural, and overall economic, competitiveness.

82. Research must be framed to respond to the characteristics of the agri-food system as a whole, and there is a need for further interdisciplinary work between natural science and social science, bringing the insights of the latter

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[100] The 27 European Commissioners are known collectively as the College of Commissioners.

[101] Q 538

to bear, for example, on consumer demand for food and on behaviour change.[102] The relevance of social science was set out for us in evidence from Madame Guillou,[103] and from Mr Tim Smith, Chief Executive of the Food Standards Agency.[104] **We consider that a more strategic approach to agricultural research is required. Agricultural research must be seen as an integral part of agricultural and food policy—in particular, if the CAP demands more from farmers in terms of tackling climate change, the research agenda needs to respond accordingly.** Defra has taken steps to build up the social science contribution to its research base.[105] **We call for a strengthening of interdisciplinary work, bringing natural and social scientists together to work on food security.**

83. Agricultural innovation must be central to both national research priorities and to EU research priorities: we welcome the evidence that we have received from the European Commission that agriculture has a central role in the EU's Innovation Union agenda and will be given increased prominence in the future Framework Programme. **We regard it as unacceptable that agricultural research funding at the EU level is under €2 bn over seven years, while the agricultural policy budget is around €400 bn. Increased funding for agriculture under the Research Programme, through the suggested grand challenges approach, should be supported financially by reducing the proportion of the EU budget devoted to supporting the Common Agricultural Policy. Within the remaining, and still substantial, agricultural budget, funds should be partially re-allocated towards innovation under the Rural Development Fund.**

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[102] Some interdisciplinary research is already taking place in the UK: for example, the work of Newcastle University's Rural Economy and Land Use Programme, which is currently funding such research by BBSRC, ESRC and NERC on how to manage the countryside and rural economies.

[103] Q 430

[104] QQ 463, 464

[105] See paras 66 to 69 of Defra's "Evidence Investment Strategy: 2010–2013 and beyond: 2011 update": http://www.defra.gov.uk/publications/files/pb13471-eis-110427.pdf

CHAPTER 5: KNOWLEDGE TRANSFER AND INNOVATION SYSTEMS

> "... knowledge is no good unless it can be used by those who benefit from it."
>
> Mr Tony Pexton, Board Chairman, National Institute of Agricultural Botany[106]

Introduction

84. In our report on adapting EU agriculture and forestry to climate change,[107] we concluded that knowledge gained from research or from others' experience must be communicated to farmers in a practical, helpful and useable way. Such communication of information is known as "knowledge transfer". Knowledge can also be exchanged between a farmer and a researcher to mutual benefit, from where the term "knowledge exchange" is derived. A further level of complexity is introduced by the concept of a "knowledge and innovation system", involving a network of interested organisations, enterprises and individuals. In relation to agriculture, all three concepts apply and we discuss their application in this chapter. Our considerations also take in the communication of knowledge about agricultural innovations to consumers.

85. As regards EU policy, it should be noted that, under the Common Agricultural Policy,[108] Member States have the obligation to operate a system for advising farmers on land and farm management: this is the Farm Advisory System (FAS: see Box 9). Some financing is available under Pillar 2 of the CAP (the Rural Development Fund) to support provision of the FAS in two ways. First, farmers' use of farm advisory services may be co-financed up to a maximum amount of €1500 per farmer. Second, Member States may co-finance the establishment of farm advisory services, using degressive support over a maximum period of five years.

BOX 9

The Farm Advisory System (FAS)

In each Member State, the CAP's FAS may be operated by one or more designated authorities or by private bodies. The FAS should offer advice on matters relating at least to cross-compliance, under which CAP support is paid in full only if farmers meet certain requirements relating to the environment, food safety, animal health and animal welfare. Participation in the FAS is voluntary for farmers, and Member States may give priority to certain farmers at their own discretion.

The importance of knowledge transfer and exchange

86. In line with the conclusion of our previous inquiry, we were left in no doubt by witnesses that knowledge transfer remained a key consideration.[109] Mr de

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[106] Q 285

[107] Op. cit., para 138

[108] Articles 12–13 of Council Regulation (EC) No 73/2009

[109] Q 392, IEUA 15, 26

Castro and the European Commission both underlined the need to bridge the gap between academic research findings and the farm.[110] Pete Riley of GM Freeze recognised that the push for sustainable farming systems, based around agro-ecology, demanded knowledge transfer in order that farmers know how to conserve nutrients and manage organic waste.[111]

87. Some witnesses made a distinction between knowledge transfer and knowledge exchange. With a focus on knowledge exchange, the Agriculture and Horticulture Development Board (AHDB) agreed that "innovation is certainly fostered by a close and regular two-way interaction between researchers and end-users such as farmers, processors or suppliers of products."[112] The co-existence of both knowledge transfer and knowledge exchange was highlighted by Incrops, who noted that some particularly innovative businesses will wish to engage with scientists, but "the majority will in the main want to utilise existing research to improve processes or products."[113] The NFU indicated that knowledge exchange is essential "to improve knowledge transfer and ensure research is informed by, and well-aligned, to industry needs."[114] We see knowledge exchange as intrinsic to the systems approach to agriculture, which we explore further below.

Methods and diversity of knowledge transfer

88. Knowledge is transferred in a variety of ways. First, the transfer may be through advisory services, which may be publicly or privately financed. In Denmark, for example, "the main body is the advisory service",[115] and this was similarly the case in Poland, through advisory services run by national and local government.[116]

89. Second, industry acts as a conduit for knowledge. In terms of plant breeding, large companies are generally responsible for knowledge transfer for farmers: ultimately, private companies will sell their seed to farmers.[117] We heard that this is also the case in Denmark, Poland and the Netherlands.[118] The Polish Government added that machinery companies also offer advice but observed that the interests of a manufacturer may not always be economically aligned with those of a farmer.[119] John Deere, a machinery manufacturer, confirmed this to be true, and observed that their information is consequently viewed with some scepticism by the farming community.[120]

90. Third, a wide range of private consultancies, non-governmental organisations and non-departmental public bodies may also be involved in knowledge transfer. In England, there is an array of organisations, such as ADAS, TAG-NIAB, Velcourt, RSPB, Natural England, the Environment Agency and the Soil

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[110] QQ 199, 514

[111] Q 392

[112] IEUA 2, para 9

[113] IEUA 21

[114] IEUA 14

[115] Q 484

[116] Q 541

[117] QQ 84, 94

[118] QQ 484, 544, 583

[119] Q 559

[120] QQ 724, 725

Association.[121] Within this range, an important role can be played by farmer-funded bodies, such as the levy bodies[122] in England. All these organisations may deploy various techniques in order to offer information and advice, one of which is the use of demonstration farms.[123] This is a model run by Morrison's through their own demonstration farm, by which the company accepts the risk for innovations that can then be taken up by their supplier farmers.[124] Other techniques cited by the NFU were one-to-one advice, workshops, fact sheets and trade press articles.[125] Emma Hockridge explained to us that the Soil Association holds regular seminars, which tend to be very popular.[126]

91. Finally, we heard about the sharing of information between peers, which is valuable in persuading the more risk-averse to adopt new technologies or practices.[127] The Polish Government commented that, "if one farmer does something, the others will observe what happens and then the next farmer will follow".[128]

92. Above all, it was emphasised to us that a diverse range of approaches to knowledge transfer is indeed appropriate—across Member States and regions and between farmers and sectors. Both the UK Government and the Dutch Government told us that "one size" will not "fit all."[129] Similarly, the NFU stated: "farmers are highly diverse in terms of their needs, attitudes and capabilities in the adoption of knowledge transfer."[130] Dr Vriesekoop also commented that farmers in different parts of Europe have disparate needs. While some might look to demonstration farms, others (such as the Dutch) might seek to solve a problem themselves.[131]

93. The diverse nature of agricultural systems also needs to be taken into account. The Spanish INIA emphasised the "complex and unique" nature of Spanish agriculture, referring to fragmented land ownership and a very broad diversity of crops.[132] INRA similarly reminded us that agricultural systems and societal structures differ across Europe.[133] Mr de Castro emphasised that there was a need to take as local an approach as possible.[134] Evidence from the Dutch Government underlined the relevance of economic histories to the differing development of agricultural industries.[135] It was suggested that it might be difficult to encourage a step change in innovation without a major economic crisis affecting the industry.[136]

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121 IEUA 14, Q 681—for example, the joint Natural England and Environment Agency "England Catchment Sensitive Farming Delivery Initiative" (ECSFDI)

122 Membership organisations funded by compulsory levies on farmers.

123 QQ 636, 700, IEUA 15, 36

124 Q 456

125 IEUA 14

126 Q 393

127 QQ 145, 392 IEUA 19

128 Q 559

129 QQ 597, 685

130 IEUA 14

131 Q 636

132 IEUA 12

133 Q 635

134 Q 199

135 Q 586

136 See paragraph 52 for the Dutch response to a smaller-scale crisis in the 1990s, when German consumers stopped buying Dutch tomatoes.

94. We note the diversity of methods used in order to transfer knowledge. **Consequently, we conclude that there is no one single solution that is applicable across the EU. Knowledge transfer is complex: it must be fine-tuned to national and regional practice and, as far as possible, to individual farmers.**

Alternative approaches

95. In the course of our inquiry, we were keen to understand how different Member States approached agricultural knowledge transfer. We were helped by a European Commission report in November 2010 on the application of the Farm Advisory System (see Box 10),[137] which was accompanied by a full analysis.[138] The report focused on delivery of the minimum FAS required under the CAP and did not examine the totality of farm advice available through various sources in each Member State. Indeed, the Commission observed that, in around half of the Member States, the FAS was set up as a specific service and in others was interwoven with existing services.

96. The analysis and report suggested that the FAS is still work in progress, and recommended that it be strengthened under the revised Common Agricultural Policy, a suggestion supported by Mr de Castro.[139] In evidence to us, the Commission explained that the FAS "works in some countries but not as well as in others", for various reasons: lack of trust by farmers, excessive administration and hesitation to use private consultants.[140] Instead, farm advice should "be seen by farmers as something that helps them to do things better, to make better decisions and better investments."[141] This should be with the aim of promoting both sustainability and profitability.

BOX 10

Commission Report on application of FAS

The Commission made the following observations on the state of play in Member States:

—in 24 Member States, the FAS is coordinated and supervised by public bodies (although it might be delivered by a private body, such as in England);

—in 14 Member States, the FAS focuses strictly on cross-compliance;

—the most widely adopted approaches were on-farm one-to-one advice (with the sole exception of England) and on-farm small group discussions;

—the main beneficiaries of the FAS have been large farmers[142] (and some Member States reported problems in reaching smaller farmers);

—across the EU, only 5% of farmers receiving the single farm payment received FAS advice in 2008.

97. COPA-COGECA would like to see FAS extended beyond cross-compliance, and particularly to meeting new challenges such as climate change—for

137 COM(2010) 665

138 http://ec.europa.eu/agriculture/eval/reports/fas/index_en.htm

139 Q 199

140 Q 515

141 Q 531

142 Until 2009, MS were required to give priority to farmers in receipt of over €15,000 of direct payments p.a.

example, encouraging drought-resistant crops.[143] Mr Paice agreed that the FAS should be extended beyond cross-compliance, and added that the Government had prolonged the current contract for the provision of cross-compliance advice until the end of 2011 in order to give them time to consider options for future delivery of advice.[144]

98. **The introduction of the Farm Advisory System at the time of the last CAP reform was welcome, but the time has now come to extend it beyond cross-compliance. We recommend that there should be an obligation under the CAP for Member States to ensure that comprehensive farm advice is available throughout their territories, geared towards meeting the new challenges of food security, climate change and the need for sustainable intensification.** This would require Member States to give this issue full attention, and would allow the European Commission to monitor progress.

99. In the course of our evidence, the picture painted of knowledge transfer in England was of a disjointed and complex system lacking direction. A proliferation of independent agronomists and representatives of seed companies can result in the provision of conflicting advice to farmers. This was recognised as an issue by one of those private consultancies, ADAS, but they were not sure how the problem might be addressed.[145] Mr Paice described the system as "complicated and pretty vague."[146] Philip Richardson lamented the demise of a publicly funded farm advisory system in England, concluding that the links between research and the farm "have withered significantly."[147] NIAB and John Deere both agreed that an independent advisory body of some sort would be useful, able to give advice without "a commercial bent to it all the time."[148] By contrast, evidence that we received about farm advice in Scotland indicated a stronger and better integrated approach.[149] Wales and Scotland have retained features of a state-organised advisory system.

100. As noted above, levy bodies[150] are among the organisations in England involved in knowledge transfer. Several of our witnesses suggested that the role of the levy bodies in this regard could be enhanced.[151] According to the NFU, with specific reference to the AHDB, this was not least because the industry can identify with it.[152] The Minister similarly saw potential in the future role of the AHDB to assist with the provision of farming advice; he explained that the Board was involved in an integrated advice pilot project.[153] The AHDB itself noted that the knowledge exchange function "is central to what the AHDB seeks to orchestrate on behalf of its levy payers", but it regretted the lack of public resource available for that activity.[154] It

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143 QQ 609, 615

144 Q 684

145 QQ 242–5, 260

146 Q 681

147 IEUA 16, para 5

148 QQ 288, 290, 297, 724

149 Q 339

150 They include the AHDB (Agriculture and Horticulture Development Board), BBRO (British Beet Research Organisation), PGRO (Processors and Growers Research Organisation) and DairyCo (Dairy levy board)

151 IEUA 6, 8, 14, 18, Q 178

152 Q 161, IEUA 14

153 QQ 681–2

154 IEUA 2, para 12

differentiated itself from other sources of knowledge by its independence.[155] There have been recent changes in the leadership of the AHDB which should serve as an opportunity to strengthen the organisation's performance.

101. **The provision of farm advice in England is fragmented and overly complex. Taking on board best practice from elsewhere, and with the support of the Government, we recommend that the levy boards play a central role in broadening and deepening the range of advice currently offered to farmers in England.**

102. Inspiration for a future expansion of bodies such as the AHDB might be taken from the Danish Agricultural Advisory Service, which is farmer-owned and user-paid. One knowledge centre is the main supplier of professional knowledge, with advice offered by 31 independent local advisory centres.[156] An alternative privately supported model is offered in the Netherlands, where advice is provided "by privatised consultancy companies, by agribusiness co-operatives which give their own advice to farmers and ... by farmers' own accountants."[157]

103. At the other end of the spectrum is a Member State such as Poland, which has a mostly state-run system. A central agricultural advisory system is supervised by the Ministry of Agriculture and Rural Development with 16 regional centres. In addition, there are: an advisory system created by local self-governments; systems created by private consultants and companies; an advisory system for forestry; and a separate advisory system within the farmers' organisation. Of 4856 advisers, only 200 are private.[158] Interestingly, the Commission was keen to emphasise that, while it saw merit in the use of the private sector, it was important not to disrupt alternative systems that might work in some Member States.[159]

104. We heard from US representatives that their land grant universities system[160] is a key element of agricultural knowledge transfer in the US. Land grant status allows colleges to receive Federal funds in return for certain activities, which include agricultural advisory work. There is at least one land grant university in each State, and each has an agricultural advisory agency, although priorities will differ according to location. Some, but not all, activities are funded from the Federal budget, and land grant universities will work with the private sector on, for example, creating demonstrations. The US representatives emphasised that the land grant universities are just one part of the farm advice available: farmers "look to where the best information is for their question", which may be from a private seed manufacturer or "in some cases, farmers will band together and pay for a consultant."[161]

Payment for knowledge transfer

105. We had some discussion with our witnesses about the financing of knowledge transfer activities. The Commission was clear that "financing is a choice for Member States". As noted above, funds are available under Pillar 2 of the CAP

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[155] Q 70

[156] IEUA 40

[157] Q 582

[158] QQ 541, 543

[159] Q 531

[160] Established by the Morrill Act in 1862, and developed through subsequent legislation.

[161] Q 182

(rural development) to support farm advice. In its report on the FAS, the Commission observed that the measure supporting farmers' use of farm advisory services was planned in 20 Member States and the measure supporting the establishment of advisory services was planned by seven Member States. The Commission explained that it is thinking of "general flat-rate help" to farmers to enable them to get advice but, in the long run, "advice should have its price and farmers should see it as an investment and pay for it"; and "if the farmer does not see added value, he will not pay—but if he does, he will".[162]

106. Professor Godfray advocated a mixture of private and public finance: "it should be logical for food producers to pay for advice that increases their profit line", but society needed to recognise that it was demanding increasingly more from farmers and advice to "produce what are essentially public goods" should be paid for from the public purse.[163] It was also emphasised to us that "some are prepared to pay for advice and knowledge; others are not."[164]

107. In consideration of how the CAP might further assist the provision of advice, COPA-COGECA told us that it would support a re-orientation of Pillar 2 towards FAS.[165] As we explain in Chapter 6, some re-organisation of Pillar 2 was recommended by various witnesses in order to support innovation, including the possibility of increasing the co-financing rate for innovative projects.

108. We note that models and financing of farm advice differ significantly between Member States, and that finance is generally available from a mixture of public and private sources. **Financing is a decision for Member States**. **Nevertheless, we agree that greater resources could be made available under Pillar 2 of the CAP to support the provision of farm advice. While its use ought to remain discretionary, it could be encouraged by ring-fencing a certain amount of money or by offering a different co-financing rate for such measures. We recommend that this matter be explored in discussions on reform of the CAP.**

Elements of successful knowledge transfer

109. The key point raised by witnesses when questioned on successful knowledge transfer was the importance of presenting a clear business case for adopting a new technology. The Polish Government noted that "economics are very important because farmers are open to innovation if it brings benefits to them."[166] The English Regional Development Agencies explained that new technologies needed to be translated into a business investment.[167] This is particularly so, explained Philip Richardson, because of the great deal of uncertainties (weather, disease and price volatility) inherent in farming, which make farmers more risk-averse than other business people.[168] John Deere emphasised that farmers needed to understand how a product could work for them,[169] and US representatives were clear that "farmers will follow the lead if they think they have a good chance of success."[170]

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[162] QQ 516, 532
[163] Q 650
[164] Q 70
[165] Q 616
[166] Q 559
[167] IEUA 15
[168] IEUA 16, para 2
[169] Q 726
[170] Q 182

110. **We agree that the key to successful knowledge transfer is the presentation of a clear business case. Presentation and communication skills, in addition to a clear understanding of the needs of farmers, thus become as important among farm advisers as knowledge of the innovation itself.**

111. Another suggestion put forward by some witnesses was the idea that knowledge transfer should focus on the most productive farms. The Polish Government suggested that "we should concentrate on innovative, modern, willing-to-develop farmers".[171] This was a view shared by the UK Government, who noted that it was logical to focus on the largest, most productive farms because they were capable "of delivering the biggest economic and environmental performance gains and of embedding new techniques and practices". Mr Paice said that small farms should not be ignored, but that their importance lay in local food markets rather than in terms of boosting productivity.[172]

112. While we understand the rationale behind a focus on larger, productive farms, we recommend caution. There are questions of equity to consider. Moreover, incremental innovations such as marketing changes can just as easily be adopted by small scale farmers at the local level to the benefit of local economies. Nonetheless new, often costly, techniques are more likely to be of interest to larger farmers better able to assume the necessary risk.

Systems

113. We heard a substantial body of evidence promoting the idea of agricultural knowledge and innovation systems (AKIS) (see paragraph 38). Under such an approach, cooperation takes place between basic researchers, applied researchers, the plant breeding sector, the food processing industry, other industries with uses for agricultural products, retailers, farmers and consumers. The European Commission noted that such systems complement agricultural advisory services.[173]

114. The Dutch Government explained their model of AKIS to us: with agricultural producers at its heart, it links those producers to research, advisory services, policy support systems and education through various mechanisms.[174] One of those is the "Innovation Network", which is part of the newly formed Ministry of Economic Affairs, Agriculture and Innovation. Its aim is to set "radical new concepts" in motion and to put them into practice. The importance of involving producers from the outset was emphasised: "a key feature of some of the successful examples ... of research going into practice has been involvement of those end users from the start."[175]

115. Madame Guillou explained that France was moving towards a more systems-based approach: "we have built this system so that farmers tell us what they have found, researchers tell the farmers where they are, and together they choose the questions they will work on". INRA had developed three groups working respectively on vegetable integrated management, crops integrated management and animal breeding integrated management.[176] Somewhat similarly, Incrops

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171 Q 560

172 IEUA 25, 2 (2), Q 676

173 IEUA 39

174 Q 582

175 Q 641

176 Q 426

stated that "the most important component of successful innovation systems are the businesses which implement new ideas".[177] This was reflected by David Evans, of Morrison's. He explained that the supermarket chain has its own farm, on which it applies, on behalf of its producers, existing evidence and research. Morrison's therefore assumes the risk and "if it is successful and if we can apply it profitably and sustainably ... it is extended to the farmers."[178]

116. Some of our witnesses told us about systems aiming at combining public and private interests. One such example was the public-funded Danish Green Development and Demonstration Programme, the objective of which is to encourage projects that "contribute to securing a high level of environmental protection but at the same time ensure that products are profitable and have a sound economic business profile". It has a board of predominantly private sector interest, but its work plan is signed off by the Minister. Its focus is innovation in relation to the agricultural sector and primary producers.[179]

117. A specific example of a similar project was provided by Dr Paul Vriesekoop—hen housing project in the Netherlands, which aimed to deliver both an economic and an animal welfare benefit (see Box 11),[180] which is demonstrating success. He welcomed this sort of approach and emphasised: "I think that, for the future, to be more innovative in total we have to understand much better how we can integrate and work together over disciplines."[181]

BOX 11

Hen housing project ("*Rondeel*") [182]

The *Rondeel* hen houses are round, rather than rectangular, and integrate animal welfare standards comparable to free range and organic eggs, but with the advantages of closed systems producing cage eggs and barn eggs. After an initial failed attempt to launch the project, an egg packing firm involved with the original attempt teamed up with a poultry husbandry manufacturer in order to develop a prototype, supported by the scientist who had advised on the original attempt. As the project progressed, it got key support from:

- a local municipality, to grant a permit (for a style of building not currently provided for in legislation) and to provide a location to build the system;
- the Dutch Animal Protection Society, in order to negotiate an animal welfare standard;
- local farmers, including the Southern Farmers' Organisation (ZLTO);
- the Ministry of Agriculture, Nature and Food which, with the ZLTO, provided the financial guarantee to investors in the case of failure, which also gave encouragement to retailers which were initially sceptical of a high value, expensive product.

Interestingly, independent consultants often provided a key neutral link in discussions between partners.

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[177] IEUA 21

[178] Q 456

[179] QQ 477, 487

[180] Q 641

[181] Q 633

[182] "Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment", Agricultural Systems 103 (2010) 390–400, Klerckx, L. et al

118. COPA-COGECA emphasised the desirability of a systems approach, whereby research takes more into account what is operationally possible on a farm, in addition to getting the research onto the farm.[183] With specific reference to the dairy industry, Dairy UK was critical of the lack of a framework allowing for "the specific needs of the sector at an EU level to be identified or for research results to be shared across Member States."[184]

119. The European Commission made reference to the work of the SCAR[185] working group on AKIS. The Commission told us: "Linking the world of practical knowledge and know-how of farmers and business with research results and opportunities emerging from technological development is a key to innovation."[186] In written evidence the Government updated us on the progress of the working group, which is in the process of collecting evidence from around the EU and is due to report in 2012.[187] Underlying this work is an acknowledgement that Member States are increasingly moving towards a systems approach and away from a linear model of knowledge transfer.

120. While the focus of our inquiry was not the UK, we were nevertheless disturbed to hear evidence that was critical of the performance of the Technology Strategy Board,[188] described as the UK's "national innovation agency", in the area of agriculture.[189] The TSB funds[190] a sustainable agriculture and food innovation platform, which Mr Paice explained would focus on crop productivity, livestock, waste reduction and greenhouse gas reduction. SAC told us that the schemes funded were "fantastic for enabling commercially orientated research" but failed to capture schemes of joint public and private interest; Professor Oldroyd was concerned that it was insufficiently responsive.[191] The Minister commented that it was very early to judge the success of the relevant innovation platform.[192]

121. **R&D knowledge transfer to farms is just one part of the agricultural innovation system. As suggested by the various theories outlined in Chapter 3, it is a complex and interactive process involving scientists, the farming community, food processors, retailers, government and consumers.**

122. **This suggests that, to be successful, sustainable intensification of agriculture will require better cooperation among farm businesses, advisory bodies and scientists; greater responsiveness in European agriculture to markets; improved interdisciplinary research among scientists and social scientists; and farmers becoming actively involved in setting agricultural research agendas.**

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183 Q 613

184 IEUA 8

185 Scientific Committee on Agricultural Research

186 Q 579, IEUA 39

187 IEUA 41

188 The Technology Strategy Board is a Non-Departmental Public Body established in 2007 to stimulate technology-enabled innovation.

189 QQ 95–6, 632

190 Over 5 years: £50m from the TSB, £30m from Defra and £10m from the BBSRC

191 Q 96

192 Q 689

123. **Effective innovation requires systems to be in place promoting communication between all of these actors. We welcome the work of the EU-level working group on agricultural knowledge and innovation systems; Member States should give its conclusions high political priority.**

Consumers and knowledge about agricultural innovation

124. It was suggested that consumer involvement in the innovation system is through driving demand "so the products have to be meeting a need of the consumer and it will be everything from price to performance to availability."[193] Professor Lillford explained that the retail sector had to respond to a new type of consumer, "the alerted consumer", who was aware of food safety, production methods, provenance and health.[194] This analysis was supported for the most part by Professor Moloney and by Which?[195] Morrison's confirmed that the needs of both its consumers and supply base are important.[196]

125. However, some witnesses felt that consumers' concern with sustainability was limited. According to Professor Lillford, most consumers consider that tackling issues of sustainability is a matter for retailers themselves: "at the moment it is too diffuse and distant a topic for people other than the passionate to engage with."[197] Sue Davies, for Which?, similarly considered that, while consumers were aware of particular issues of sustainability relating for example to palm oil and fish stocks, there was a need for a "broader-based debate" encompassing animal welfare and climate change.[198]

126. We took some evidence on the extent to which consumers and industry will need to consider dietary change, particularly reduced meat consumption, as a contribution to sustainable intensification of agriculture.[199] Professor Godfray agreed that "we are at a very low public awareness of some of the issues around the demand side", citing the need to reduce meat consumption: "it is impossible that we feed the 9.5 billion by the middle of the century if they consume meat at the rate that we do."[200] Mr de Castro agreed that there may soon be a need to "reflect on the impact of our diet. We cannot just replicate the European diet in other countries in the world. If we go in this direction, there is not enough land and not enough animal products."[201]

127. A view expressed by many of our witnesses was that communication with consumers on innovative developments was crucial, though often fraught with difficulties.[202] Professor Moloney lamented that "it has been very

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[193] Q 5

[194] Q 438

[195] QQ 114, 468

[196] Q 456

[197] Q 444

[198] Q 473

[199] Another important issue in relation to dietary change, which may have implications for food production, is that of obesity. Our inquiry did not focus on that issue, but tackling obesity has been considered as a case study in the inquiry into behaviour change which has been carried out by the Science and Technology Committee of this House. The report of that inquiry is expected to be published in late July 2011.

[200] Q 657

[201] Q 214

[202] Q 187

difficult to demystify the science associated with agricultural production."[203] He said that there was a need to reduce the level of suspicion and apprehension about technology when applied to agriculture and food.[204] The FSA described consumers as "wary, uneasy and uncertain" about new technologies in relation to food.[205] Dairy UK observed that "consumers are naturally cautious about innovations that challenge their perception of dairy farming and dairy products".[206]

128. Which? relayed the results of their research which demonstrated that innovation was not "a dirty word" for consumers as regards food, but that there were concerns about safety risks and related social and ethical issues. Ms Davies concluded that "it comes down to what level of reassurance people have that the issues have been thought through and that we know what the long-term implications are, and that we have effective independent oversight in order to deal with those". She argued that the mistake made as regards some technologies was that consumers were insufficiently involved from an early stage of development of the technology.[207]

129. We received divergent views, however, on who should be responsible for such communication. With particular reference to genetically modified crops, Mr de Castro considered that the European Commission should outline the benefits to be derived from them, which he listed as offering savings in land, chemicals, pesticides and water.[208] Dairy UK concurred that the EU had a role in communication with the consumer, calling on the EU to help explain innovations in dairy technology and management methods.[209]

130. Many of our UK witnesses considered that the UK Government should take the lead in communicating scientific innovations as regards food.[210] Professor Moloney was clear that the only way to offer clarity to consumers "is through national leadership" and Dr Bushell suggested that politicians have "an amazing opportunity to shed light on the real risks associated with food and not the imaginary ones."[211]

131. Mr Paice took a contrary view, suggesting that Government are the worst source to offer such advice. He insisted that consumers trust retailers, and added that the scientific and farming communities have roles to play.[212] Professor Godfray took the view that Government had done all that it could.[213] The Food Standards Agency (FSA) confirmed that consumers lack trust in Government but that they have trust in family, friends, consumer groups, retailers and organisations such as the FSA.[214] As a major retailer,

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[203] Q 114

[204] Q 119

[205] Q 463

[206] IEUA 8

[207] Q 467

[208] QQ 211–2

[209] IEUA 8

[210] QQ 83, 204, 473

[211] QQ 133, 372

[212] Q 693

[213] Q 649

[214] Q 463

Morrison's were less inclined to lead the consumer and insisted simply that they should deliver what the customer wants and is prepared to buy.[215]

132. The failure of academia to engage with consumers and the broader public was acknowledged. Some felt that the scientific community should play a stronger role. Professor Oldham concluded that the willingness of the scientific population to engage was key, "as is training people to do it well."[216] Professor Godfray agreed that the scientific community needed to step up and considered that scientists had tended to argue on narrow environmental and health grounds, ignoring the bigger picture.[217]

133. A number of witnesses suggested that regular seminars and events on different sectors and areas of work can be effective.[218] Professor Kell suggested that engagement is best done locally; he explained that the BBSRC runs a lot of public exhibitions, and also spends £900,000 per year on Science in Society.[219] Professor Lillford said that, through debate and explanation, it is possible to educate consumers. Professor Godfray observed that, on a range of issues, some of the most trusted commentators are, in fact, non-governmental organisations. They would therefore in theory, he argued, be in a good position to embrace GM technology as a way of contributing to development in the most impoverished countries around the world, although many have not yet chosen to do so.[220]

134. Professor Oldham suggested that one of the most powerful ways of engaging with the public is through the media. In the last few years, he considered, television and radio presentation of agricultural developments has "become much more balanced and sympathetic to the industry interests."[221] Professor Godfray agreed that some parts of the media are "excellent" but criticised others. Morrison's were similarly critical of at least some of the media, but nonetheless considered it to be an important source of influence over consumer behaviour.[222] We heard that the independent Science Media Centre had improved the media's communication of scientific discoveries.[223]

135. **Consumers are a fundamentally important part of the innovation system, but their role has, we consider, been neglected. At the end of the food chain, consumer preferences determine what is on the shelf, but we are far from convinced that consumer preferences are formed on the basis of sufficient information about the sustainability of products. Communication, both about new agricultural technologies and about the issues surrounding the sustainable intensification of agriculture, goes to the heart of the challenge; it involves listening to consumers as well as directing information at them. It includes tackling the impact of dietary habits on the sustainability of food systems.**

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215 Q 470

216 Q 635

217 Q 649

218 Q 6

219 Q 429

220 Q 649

221 Q 635

222 QQ 471–2

223 Q 83

136. **Trust is a key concern, and it is appropriate to recognise that consumers may lack trust in messages from Government or business. That being said, it cannot be right for national and regional authorities to step away from the process of communication on the grounds that consumers will have no confidence in any messages which they, as public authorities, put across. Retailers and food processors must also accept responsibility for properly informed communication with consumers about innovative and sustainable agricultural products and practices, and about the wider implications of their dietary choices.**

137. **We consider that the European Commission should help to share best practice in communication with consumers. National and regional authorities should offer financial and organisational help to allow for public participation in discussions about innovation in agricultural and food systems. Getting the message across is a task in which scientists, industry, retailers, media and civil society should play a full role.**

CHAPTER 6: EU POLICY AND REGULATION

> "Millions of hectares are being lost to agriculture in the rest of the world—in China, Australia and the US—and probably even in Europe. Some of the big new emerging powers are buying millions of hectares of agricultural land in Africa and South America. We in Europe are sitting here saying, 'Agriculture is the old economy', in what I call an innovation-hostile environment. A lot of political groups are telling us to farm as we did in the 19th century, selling our tractors and doing it in the old way because it will be good for the environment … This is the strategic debate. Does Europe say that it can provide food for 500 million rich Europeans and import what we do not have, or does it play a role in feeding 9 billion people, including 1 billion people in China and India who are starting to eat meat?"
>
> Mr Georg Häusler, Head of Cabinet, DG Agriculture, European Commission[224]

Introduction

138. Various aspects of EU policy relate to innovation in agriculture, some of which have already been explored earlier in the report. In this chapter, we look in some detail at the Common Agricultural Policy (CAP) itself and consider some of the other policies which have an impact on the ability of the agricultural industry to innovate.

139. In its Communication on CAP reform in November 2010,[225] the Commission refers within the rural development section to "support for innovation, knowledge transfer and capacity building" but goes into no detail. We therefore seek, without repeating relevant conclusions of the preceding chapter, to probe further on how the reformed CAP can promote innovation in EU agriculture. We gave an earlier indication of our thinking in the comments which we published in January 2011 on the Commission's Communication.[226]

Direct payments—Pillar 1 of the CAP

140. Under Pillar 1, direct payments to farmers and market management measures are funded; we explored with witnesses how direct payments could support innovation. For the European Commission, Mr Häusler observed that the direct payment "gives a solid base for most of our European farmers: it gives them security, predictability and a planning period" and warned that, "if we did not have first pillar money, no farmer will invest".[227] This argument was supported by Mr de Castro and was based on farm income statistics indicating that the average income in farming is substantially lower than that in the rest of the economy.[228] A similar line was taken by the Polish

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[224] Q 538

[225] Op. cit.

[226] Op. cit.

[227] QQ 517–8, 520

[228] Q 207

Government who saw Pillar 1 as protection for basic needs and necessary for survival in less favourable years.[229] Both the NFU and the CLA agreed that farmers required "a certain level of income ... to be able to invest in new technologies".[230]

141. The alternative view on direct payments was that they act as a brake on innovation. Some of those advocating this argument asserted that innovation has been more apparent in historically unsupported sectors, such as pigs and horticulture. From the AHDB, we heard that "the unsubsidised UK pig industry has had to be continuously innovative and this enabled it to survive through a very difficult economic period in the 1990s".[231] Similarly, the Macaulay Land Use Research Institute (now part of the James Hutton Institute) observed that "technological, product and marketing innovation has been notable in those sectors for which a CAP commodity regime was, prior to 'decoupling'[232] light or absent, such as pigs, poultry, potatoes and most fruits and vegetables."[233] The UK Government considered that the single farm payment "stultifies competition" and called for a strategy looking forward towards the gradual reduction and eventual elimination of the Single Farm Payment, a position supported by the Danes.[234]

142. While there was a general consensus that direct payments should, or at least would, continue, there was also a strong recognition that payments should encourage environmental innovation. Professor Moloney was clear that subsidies could be "based on the introduction of innovative approaches that reduce our carbon footprint or benefit biodiversity at the same time."[235] The Dutch agreed that financing under Pillar 1 should reward innovative behaviour: "a farmer has to do something to get direct payments, either in competitiveness or sustainability"[236] and the Commission acknowledged that "we want to get something in exchange for our money."[237] The Polish Government supported a payment to support ecosystem services.[238]

143. Others recognised that Pillar 1 was likely to go further in future in making payments conditional on meeting environmental goals, but warned against over-complexity. Mr de Castro acknowledged the need to encourage farmers "to go in the right direction with good practice, taking care of the environment ... but at the same time we need to make them more competitive, to be strong enough to win".[239] COPA-COGECA suggested that payments should be based on "win-win measures that had a positive impact for the environment or reducing emissions, but also had a positive impact on the farmer, enabling him to have better resource efficiency, for example encouraging precision farming, manure processing and biofuel

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229 Q 560

230 QQ 150, 152

231 IEUA 2, para 4

232 This term refers to the removal of a link between an agricultural subsidy and a particular commodity.

233 IEUA 13, para 19

234 QQ 500, 707

235 Q 137

236 Q 601

237 Q 519

238 Q 561

239 Q 208

processing on farms". Any farmer not wishing to pursue such a path would be free to do so but would not receive that part of the payment.[240]

144. As we said in commenting to the Commission in January of this year, we see no case for payments that are made available without an environmental justification or, at the very least, without environmental conditionality. Moreover, payments that are essentially income support payments do not encourage innovation. **We consider that payments under Pillar 1 of the CAP should be made in return for delivery of public goods, responding to climate change, protecting biodiversity and encouraging environmental innovation.**

145. **We agree, however, that better integration of environmental considerations into Pillar 1 must not lead to further bureaucratic complexity. The sustainable intensification of the CAP must be achieved on the basis of real improvements to the EU's and Member States' knowledge transfer systems. More effective advice to farmers must strengthen the adoption of best practice which will have both economic and environmental benefits.** As set out in Chapter 5 of this report, we see significant potential for improvement both in the Farm Advisory System of the CAP, and in national arrangements for farm advice, notably in the UK.

Rural Development—Pillar 2 of the CAP

146. In our April 2011 report on the EU Financial Framework from 2014,[241] we concluded that Pillar 2 is a vital method of helping farmers to innovate, and we supported a strengthening of it in financial terms by moving funds from Pillar 1. This movement of funds from Pillar 1 to Pillar 2 is otherwise known as "modulation".

147. We heard various suggestions as to how Pillar 2 (see Box 12) might more effectively support innovation. The European Commission told us that it is considering offering a higher rate of co-financing[242] to promote innovation in Pillar 2: "there is a lot of new technology on the market that farmers do not use yet, or do not use enough, for cost and other reasons".[243] Such an increase in co-financing would boost the proportion of funding from the EU budget, thus reducing the proportion required from national budgets.

148. The Danish Government would like to see greater flexibility for enhanced public support, at least "for innovation projects that address the future challenges", although it did not specify that this should mean higher rates of co-financing. In particular, the Danes would support changes in order to allow greater public financing (whether EU or national) of renewable energies such as biogas. Higher levels of investment are currently restricted by state aid rules to products listed in Annex I of the Treaty (which are almost exclusively food products) as long as the results of the project are made public. They would also like changes to allow support for single projects because innovation is often performed by individual enterprises.[244]

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240 Q 611

241 Op. cit.

242 Most EU funding (with the exception of CAP direct payments) must be matched by national or regional finance, in addition to any private contribution—this is known as "co-financing". The contribution from the EU budget varies according to the budget line, region and Member State.

243 Q 522

244 IEUA 40

BOX 12

Rural Development Regulation[245]

Articles 26-30 of Regulation 1698/2005 provide for the funding of measures "aimed at restructuring and developing physical potential and promoting innovation". In particular:

- the modernisation of agricultural holdings (Art 26);
- improvement of the economic value of forests (Art 27);
- adding value to agricultural and forestry products (Art 28);
- cooperation for the development of new products, processes and technologies in the agriculture and food sector, and in the forestry sector (Art 29);
- infrastructure related to the development and adaptation of agriculture and forestry (Art 30)

Pillar 2 offers a suite of measures that can be supported, with the aim that Member States and regions have the flexibility to tailor their rural development programmes to their respective needs.

149. The Polish Government pointed to the potential of the current articles 28-30 of the Rural Development Regulation to be used to give money to investors to use knowledge generated somewhere else: the money could be directed for the development of new technologies to help research institutions to work on something that is of interest to industry or farmers.[246] The NFU also considered that Pillar 2 could be used more effectively to support projects of a genuinely innovative nature, suggesting that Pillar 2 has been too orientated towards agri-environment schemes, "rather than a focus on what would increase productivity and competitiveness".[247]

150. Morrison's considered that they should be able to access rural development funding in order to support new innovations that could then feed through into the agricultural supply chain.[248] This suggestion was underlined by the Danish Government, who called for greater flexibility in the levels of funding allocated to larger companies: "large companies act as well as small and medium sized companies as a driving force behind innovation".[249]

151. **Under Pillar 2, support for innovation-related projects must be core and a balance must be ensured between purely agri-environmental projects and funding to support agricultural innovation, whilst recalling that the two are often compatible.** One example might be support for projects using agricultural materials, such as straw in bio-energy. **In that light, we recommend that Pillar 2 be sufficiently flexible to encourage innovation in relation to all forms of agricultural material, whether food or not. Alongside such flexibility, we support the European Commission's proposal that a higher rate of co-financing be made available to support innovation-related projects under Pillar 2. Such an increase in financing can be supported, at least in part, by**

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245 Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), as amended by Council Regulation 473/2009

246 Q 548

247 Q 152

248 Q 473

249 IEUA 40

reducing the level of direct payments under Pillar 1. This would involve modulation from Pillar 1 to Pillar 2.

Regulatory regime—application of the precautionary approach

152. Some witnesses suggested that the European Union is hostile to innovation. Mr Häusler, of the Agriculture DG, described "the microcosm of Brussels" as "an innovation-hostile environment."[250] Examples of pertinent areas of regulation are offered in Box 13. The AHDB agreed that the right EU policy and regulatory environment to encourage innovation in agriculture "has been substantially absent", with specific reference to biotechnology and crop protection products.[251] Similarly citing pesticides and GMO legislation, the European Crop Protection Association (ECPA) noted that policies affecting agriculture's ability to innovate are often led by departments other than the Commission's Agriculture DG. The ECPA urged DG Agriculture to exert greater influence over other, related, policy areas.[252] **We are clear that policy incoherence in the Commission is a serious obstacle to agricultural innovation. The European Commissioner responsible for agriculture and food must ensure that the need to promote innovation in EU agriculture is respected by other parts of the Commission when they take decisions which will impact on the food and farming sector.**

BOX 13

A snapshot of EU regulation

Novel foods

Novel foods are defined in EU legislation as foods which have not been consumed in the EU to a significant degree before 15 May 1997. A regulatory framework is in place,[253] but attempts at agreeing a revised one recently failed.

Animal cloning

Food products from cloned animals are considered a novel food, but are not banned, nor are those from the offspring of cloned animals. In October 2010, the European Commission published a Report[254] in which it proposed a temporary ban on cloning in the EU, although it is yet to do so. Particular debate surrounds the marketing of products derived from the offspring of clones. While such products are thought to be safe, animal welfare concerns have been raised.

Pesticides

New EU rules for the authorisation of plant protection products in commercial form and for their placing on the market, use and control within the EU came into effect on 14 June 2011.[255] The new rules use strict hazard-based criteria; some fear that this may reduce the pesticides available on the market, with an impact on crop yield.

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[250] Q 511

[251] IEUA 2, para 4

[252] IEUA 8

[253] Regulation (EC) No 258/97 concerning novel foods and novel food ingredients

[254] COM(2010) 585

[255] Regulation (EC) No 1107/2009 concerning the placing of plant protection products on the market

Genetically Modified Organisms

The EU regulatory framework on GMOs currently consists of two pieces of legislation.[256] In both cases, the relevant company makes an application for approval in the first instance to the Member State concerned. Under the framework, various authorisations for the placing on the market of GM food and feed have been granted but only two products have been accepted for cultivation in the EU: a GM maize product, MON 810, in 1998; and a starch potato, for industrial use, in 2010.

In summer 2010, the Commission proposed[257] changes to the regulatory framework in an effort to open the way for more GM products to be approved, if only for cultivation in some, not all, Member States. In spring 2011, there was little prospect that these proposed changes would soon be agreed.

153. According to Article 191(2) of the Treaty, the precautionary principle[258] should underpin EU environmental and related legislation. The Dutch Government reminded us that a restrictive regulatory environment in food safety was created by a number of problems, such as the BSE crisis: "it is not there for nothing."[259] Nevertheless, there was a feeling that the EU had taken the principle too far and that, by doing so, it had significantly limited innovation in agriculture.[260] Professor Moloney asserted: "the precautionary principle is very dangerous when used capriciously or just in selective cases".[261] Mr de Castro told us that "the precautionary principle is very important" but that it is important to look seriously at whether there is any evidence for damage to human health and the environment from agricultural innovations.[262]

154. Similarly, Dr Barsby emphasised the need for "science-based regulation and decision-making" and added that, because political issues get embroiled with the science, issues arise with timing of the introduction of new innovations.[263] Dr Little confirmed that the regulatory framework has a substantial impact on investment decisions. He noted that BASF had managed to get a GM crop authorised for cultivation in 2010 (amflora potato), 13 years after the first: "you certainly don't want to invest in products for Europe if you believe that it is going to be another 13 years before the next one is going to be allowed in".[264] The political step at the end of the food safety assessment process was recognised as an issue by others.[265] US witnesses observed that food safety assessment in the EU is similar to elsewhere, based on the *codex alimentarius*,[266] but that, in the EU, there is a political step at the end of the process.[267]

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256 Directive 2001/18/EC and Regulation (EC) No 1829/2003

257 COM(2010) 375

258 The "precautionary principle" has not been defined but, in its Communication on the Precautionary Principle (COM(2000)1), the Commission stated: "Recourse to the precautionary principle presupposes that potentially dangerous effects deriving from a phenomenon, product or process have been identified, and that scientific evaluation does not allow the risk to be determined with sufficient certainty". The acceptable level of risk and uncertainty is a political decision to be resolved in each instance.

259 Q 602

260 QQ 48, 82

261 Q 134

262 Q 213

263 Q 283

264 Q 374

265 Q 369

266 The *codex alimentarius* is a series of food standards that aim to provide a high level of consumer protection and fair practice in the international trade of food and agricultural products. It is overseen by the Codex

155. Instead, argued some witnesses, the EU should look to encourage innovation in EU agriculture, which would require a re-orientation of the precautionary principle. The Dutch Government raised the possibility that the regulatory environment could make adoption of innovation an assumption, with the requirement being to prove that an innovation is unsafe rather than that it is safe.[268] Dr Bushell emphasised the need for a regulatory environment that, rather than "stopping things happening" is "benefiting the outcomes that we want from agriculture and how it is encouraging innovation in order to get better outcomes".[269] Dr Little put the regulatory regime into historical perspective, noting that the CAP went through a period of overproduction. Consequently, there was little initial interest in technology that allowed more production. He noted, however, that we "are now in a situation where in some ways the overall policies of the EU to reduce productivity have to be reversed".[270]

156. There was particular criticism from witnesses of the restrictive regime for authorisation of GMOs for cultivation in the EU. Several confirmed that, if GM crops were allowed to be more widely available in the EU, they would almost certainly be planted.[271] On behalf of European farmers, COPA-COGECA told us that EU farmers should certainly have the choice to cultivate GM crops.[272] Scientists expressed frustration. Professor Oldroyd commented that "currently what we have is science essentially locked down"; Professor Moloney added that the regulatory framework had made it difficult for agricultural scientists to access funding in areas that will eventually matter.[273]

157. There was also a reminder that a restrictive approach to the growth of GM crops in Europe means that much of the plant protein on which EU animals are fed needs to be imported. Professor Moloney observed: "we will be eating them and using them, but we won't be growing them".[274]

158. Some witnesses, on the other hand, supported the current restrictive approach as regards GM technology specifically. Pete Riley was not convinced "that GM will be the answer to increased yields."[275] He emphasised that a plant "will thrive in an environment as a result of its total genetic base rather than single gene changes"[276] and he highlighted the growing problem of the increasing resistance of weeds to a particular herbicide (glyphosate) in areas where GM crops resistant to glyphosate have been grown. The co-existence of GM crops and organic crops was raised as a concern.[277] Dr Julian Little was confident that both crops can co-exist. He observed that no problems had arisen in terms of organic accreditation as a

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Alimentarius Commission (CAC), an intergovernmental body jointly sponsored by the Food and Agriculture Organisation (FAO) and the World Health Organisation (WHO).

267 Q 188

268 Q 602

269 Q 369

270 ibid

271 QQ 130, 154, 283, 306

272 Q 617

273 QQ 80, 119

274 Q 130

275 Q 379

276 Q 384

277 QQ 382, 640

result of GM field trials in the UK.[278] However, Emma Hockridge described GM crops and organic crops as "mutually incompatible" and brought to our attention the example of an Australian farmer who had lost his organic certification as a result of GM contamination from a neighbouring farm.[279]

159. As regards the development of genetic technology in livestock, Professor John Oldham emphasised the need to "be careful to make sure that we do not compromise the interests of animals." It was also observed that, as a result of complex genome mapping, many of the characteristics of interest of animals and plants are under the control of hundreds of genes, thus making genetic modification challenging. Genomic mapping might help instead with genetic selection. Professor Geoff Simm warned against the "danger that we see GM as a silver bullet to a lot of the problems that we face".[280] Similarly, Professor Godfray considered that "GM is extraordinarily important, but it is one of a suite of innovations from high-tech to low-tech that we need", such as utilising new genomics to mark selected genes and characteristics.[281]

160. We were interested to observe European Commission actions in relation to the EU regulatory framework and the precautionary principle. A Communication in 2000 (see paragraph 153) outlined the Commission's interpretation of the principle in some detail, but the Commission made clear that it should be seen as "the point of departure for a broader study of the conditions in which risks should be assessed, appraised, managed and communicated".[282] Since then, the Commission itself has not reflected specifically on the precautionary principle.

161. In the summer of 2010, the Commission brought forward a proposal to amend the regulatory framework, in order to allow greater discretion for individual Member States to authorise cultivation of GM crops in their own territories once a food safety assessment had been completed at EU level. Discussion of this proposal continued into 2011 but, at the time of preparation of this report, the indications were that in its current form the proposal was unlikely to resolve the current impasse in Europe.

162. More recently, the Commission published a report on the socio-economic implications of GMO cultivation on the basis of contributions sent by the Member States.[283] The report is inconclusive due to a statistical framework which we found to be particularly poor. A review of international literature on the economic implications of GMOs was also undertaken on behalf of the Commission, which similarly indicated inconclusive results.[284] **We urge the Commission and Member States to act with urgency in determining a robust set of factors, indicators and rules for data collection that will facilitate a better understanding of the socio-economic implications of GMOs.**

163. **Good regulation is evidence-based, taking into account environmental, economic and social considerations. We are clear that**

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278 Q 368

279 Q 382

280 Q 640

281 Q 649

282 COM (2000) 1, page 21

283 COM(2011) 214

284 Kaphengst, Timo; El Benni, Nadja; Evans, Clive; Finger, Robert; Herbert, Sophie; Morse, Stephen; Stupak Nataliya (2010): *Assessment of the economic performance of GM crops worldwide*

the precautionary principle must continue to underpin regulatory decisions with regard to food safety. It must, however, be applied with due consideration of available scientific evidence of potential risks and benefits. Reluctance to take a risk can be a risk in itself if, for example, global food security is likely to be threatened.

164. A wide range of innovative new technologies, including biotechnologies, is available for use and for further research. No single one should be seen as the silver bullet that will transform EU agriculture, either in the arable or in the livestock sector; and each needs to be assessed for its wider environmental impact as well as for its benefit to agricultural production. **But we are clear that it is critical for reasons of productivity, sustainability and competitiveness that appropriate technologies can be adopted swiftly after proper testing. The EU decision-making procedure should seek to help, rather than hinder, the adoption of appropriate new technologies. We would not recommend that new techniques should routinely be assumed to be safe unless proven otherwise, but there is undoubtedly a need for a much clearer articulation of the potential risks and benefits of any technology. In advancing this debate at a political level, it would be appropriate for the European Commission to re-visit its 2000 Communication on the Precautionary Principle and to re-consider the application of the principle in the light of the grand challenges faced by society.**

Animal welfare regulation

165. Another issue raised with us was that of animal welfare standards in the European Union which can place European farmers at a competitive disadvantage if the same standards do not apply to others. The Commission acknowledged that high animal welfare standards such as the Laying of Hens Directive[285] "puts the industry in a very difficult position compared with ... its most important competitors."[286] Mr de Castro recognised the same concern but emphasised that "we should be proud of our high standards of animal welfare" and should encourage others, outside Europe, to rise to our standards.[287]

166. Professor Oldham insisted that high animal welfare standards need not imply higher net costs: while the actual costs may rise, the returns may rise higher.[288] This was borne out by the Dutch hen housing example (see Box 11 in Chapter 5). By working with industry, animal welfare standards have been increased while improving productivity at the same time.

167. **We note concerns that high animal welfare standards in EU legislation can harm the competitiveness of EU farmers on the world market. Equally, however, we would not wish to see a weakening in EU standards as a result. Rather, we have been impressed to see how high animal welfare standards and business efficiency can be mutually supportive, and we encourage partnerships that can develop such win-win scenarios.**

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285 Council Directive 1999/74/EC of 19 July 1999 laying down minimum standards for the protection of laying hens

286 Q 511

287 Q 216

288 Q 641

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

A strategic approach to food production

168. The need for global food security requires a broad, co-ordinated and swift response from Member States and the Commission, which must take account of the different elements of the food system. Improving the productivity of EU agriculture is an important contribution to meeting the challenge. The response also requires innovation, through new products and processes, and through ensuring that farmers make use of best practice methodologies and technologies. Agricultural innovation must achieve "sustainable intensification" (paragraph 18).

169. Inputs (fossil fuels, fertilisers, water and pesticides) into agricultural systems will need to be reduced per unit area of land, while outputs are increased. Impacts on the ecological processes on which agriculture depends must be reduced, particularly on soils, climate, water bodies and biodiversity. In addition to rising demand for food, there is likely to be rising demand for public goods from agricultural ecosystems, such as carbon sequestration and the protection of bio-diversity (paragraph 19).

170. We agree on the vital importance of reducing food waste but are far from convinced that EU Member States are taking the issue seriously. The European Union must move swiftly towards adopting indicators for bio-waste prevention measures and then towards bio-waste prevention targets (paragraph 22).

171. The Government should define a clear set of widely agreed indicators to measure progress over time towards increased agricultural production and reduced environmental impact. These must be monitored by an independent expert committee (paragraph 29).

172. At the EU level, a food production strategy should underpin the Common Agricultural Policy (paragraph 30). National and EU-level strategies for food production should in turn underpin innovation. Without such strategies, conflicting priorities, between national government departments and within the European Commission, will inevitably act as obstacles to effective innovation. Strategies must be sensitive to the diversity of EU farming and food production systems, and should be framed within EU guidelines. They should be developed "bottom-up", not imposed "top-down". Local ownership and implementation are essential (paragraph 32).

Innovation—theory and practice

173. Innovation is an intrinsic aspect of agriculture, and EU agriculture will continue to need support in its efforts to innovate. The particular risks that it faces—climate, disease and price volatility—and the small size of the average agricultural business, must be recognised as a basis for helping this industry to innovate (paragraph 40).

174. The farming industry and scientific community are currently contributing to agricultural innovation in a large variety of ways. But the reach of innovation in EU agriculture must be extended, if substantial future risks to European food security are to be avoided, and to respond to the need for sustainable intensification of agriculture. Member States and the Commission should

both play a role in shaping the framework to strengthen this process (paragraph 49).

Agricultural research and innovation

175. Sustainable intensification of agriculture must be a determining feature of agriculture's future and of innovation within the industry; we urge those with national funding responsibility to prioritise support for further work on nutrient efficiency, water efficiency, genomics and soil science, as key elements of the UK's approach to sustainable intensification (paragraph 57).

176. The Government, and those with funding responsibilities, must look more urgently at how research aimed at translating scientific findings into practice can be revived and enhanced, building on initiatives already under way (paragraph 58).

177. The Government, with other key educational bodies, should review the content and presentation of agricultural studies and plant science from school level, through further and higher education, to adult re-training programmes: studying agriculture should be seen as a frontline activity of central importance to ensure that its relevance to the challenges of food security and sustainable intensification is clear (paragraph 61).

178. The Commission should play a full role in encouraging research collaboration between Member States outside the EU Framework Programme, and should consider including possible financing for such collaboration under the next Framework Programme, in addition to the current ERA-NET co-operation scheme (paragraph 66).

179. We strongly welcome the Commission's acknowledgement of the need to make research funding less bureaucratic; we consider that the UK Government should support this intention; and we urge the Commission to make rapid progress with the reforms which it has outlined (paragraph 67).

180. The EU's future Research Framework Programme should be organised more flexibly and in response to tackling grand challenges, rather than following the current approach which tends to brigade research according to rigid themes (paragraph 68).

181. The Government must ensure that, with the abolition of the Regional Development Agencies, successor arrangements enable ERDF support to be accessed easily, and without interruption, by appropriate projects in the UK (paragraph 72).

182. We support the idea of a European Innovation Partnership (EIP) on agricultural productivity and sustainability, but only on the understanding that it will be founded on effective, action-based co-operation, including between the different Directorates-General of the Commission. The Government must work closely with the Commission and other Member States to clarify and guide the EIP proposals (paragraph 78). The Commission should follow a "twin-track approach" (EU networking, local delivery) in taking forward the agriculture EIP; and it needs to develop metrics and identify clear targets, so that the progress of the EIP is measured against those targets and is regularly reviewed (paragraph 79).

183. We welcome the fact that greater prominence is being given to agriculture in the deliberations of the European Commission, and we urge that it should be given a similar priority in political debate in the UK (paragraph 80).

184. It is clear that a more strategic approach to agricultural research is required. Agricultural research must be seen as an integral part of agricultural and food policy—in particular, if the CAP demands more from farmers in terms of tackling climate change, the research agenda needs to respond accordingly. We call for a strengthening of interdisciplinary work, bringing natural and social scientists together to work on food security (paragraph 82).

185. It is unacceptable that agricultural research funding at the EU level is under €2 bn over seven years, while the agricultural policy budget is around €400 bn. Increased funding for agriculture under the Research Programme, through the suggested grand challenges approach, should be supported financially by reducing the proportion of the EU budget devoted to supporting the Common Agricultural Policy. Within the remaining, and still substantial, agricultural budget, funds should be partially re-allocated towards innovation under the Rural Development Fund (paragraph 83).

Knowledge transfer and innovation systems

186. There is no one single solution to agricultural knowledge transfer that is applicable across the EU. It must be fine-tuned to national and regional practice and, as far as possible, to individual farmers (paragraph 94).

187. The introduction of the Farm Advisory System at the time of the last CAP reform was welcome, but the time has now come to extend it beyond cross-compliance. There should be an obligation under the CAP for Member States to ensure that comprehensive farm advice is available throughout their territories, geared towards meeting the new challenges of food security, climate change and the need for sustainable intensification (paragraph 98).

188. The provision of farm advice in England is fragmented and overly complex. Taking on board best practice from elsewhere, and with the support of the Government, we recommend that the levy boards play a central role in broadening and deepening the range of advice currently offered to farmers in England (paragraph 101).

189. Financing of farm advice is a decision for Member States. Nevertheless, greater resources could be made available under Pillar 2 of the CAP to support the provision of farm advice. While its use ought to remain discretionary, it could be encouraged by ring-fencing a certain amount of money or by offering a different co-financing rate for such measures. We recommend that this matter be explored in discussions on reform of the CAP (paragraph 108).

190. The key to successful knowledge transfer is the presentation of a clear business case. Presentation and communication skills, in addition to a clear understanding of the needs of farmers, thus become as important among farm advisers as knowledge of the innovation itself (paragraph 110).

191. The transfer of R&D knowledge transfer to farms is just one part of the agricultural innovation system. It is a complex and interactive process of knowledge exchange involving scientists, farmers, food processors, retailers, government and consumers. So, to be successful, sustainable intensification of agriculture will require better cooperation among farm businesses, advisory bodies and scientists; greater responsiveness in European agriculture to markets; improved interdisciplinary research among scientists and social scientists; and farmers becoming actively involved in setting agricultural research agendas. Effective innovation requires systems to be in place

promoting communication between all of these actors. We welcome the work of the EU-level working group on agricultural knowledge and innovation systems; Member States should give its conclusions high political priority (paragraphs 121 to 123).

192. Consumers are a fundamentally important part of the innovation system. At the end of the food chain, consumer preferences largely determine what is on the shelf, but we are far from convinced that consumer preferences are formed on the basis of sufficient information about products' sustainability. Communication, about new technologies and about issues surrounding the sustainable intensification of agriculture, goes to the heart of the challenge; it means listening to consumers as well as directing information at them. It includes tackling the impact of dietary habits on the sustainability of food systems (paragraph 135).

193. Trust is a key concern, and it is appropriate to recognise that consumers may lack trust in messages from Government or business. That being said, it cannot be right for national and regional authorities to step away from the process of communication. Retailers and food processors must also accept responsibility for communication with consumers about innovative and sustainable agricultural products and practices, and about the wider implications of their dietary choices (paragraph 136).

194. The European Commission should help to share best practice in communication with consumers. National and regional authorities should offer financial and organisational help to allow for public participation in discussions about innovation in agricultural and food systems. Getting the message across is a task in which scientists, industry, retailers, media and civil society should play a full role (paragraph 137).

EU policy and regulation

195. Payments under Pillar 1 of the Common Agricultural Policy (direct payments) should be made in return for delivery of public goods, responding to climate change, protecting biodiversity and encouraging environmental innovation. We agree, however, that better integration of environmental considerations into Pillar 1 must not lead to further bureaucratic complexity. The sustainable intensification of the CAP must be achieved on the basis of real improvements to the EU's and Member States' knowledge transfer systems. More effective advice to farmers must strengthen the adoption of best practice which will have both economic and environmental benefits (paragraphs 144 and 145).

196. Under Pillar 2 (rural development), support for innovation-related projects must be core and a balance must be ensured between purely agri-environmental projects and funding to support agricultural innovation, whilst recalling that the two are often compatible. Pillar 2 should be sufficiently flexible to encourage innovation in relation to all forms of agricultural material, whether food or not. Alongside such flexibility, we support the European Commission's proposal that a higher rate of co-financing be made available to support innovation-related projects under Pillar 2. Such an increase in financing can be supported, at least in part, by reducing the level of direct payments under Pillar 1 (paragraph 151).

197. Policy incoherence in the Commission is a serious obstacle to agricultural innovation. The European Commissioner responsible for agriculture and

food must ensure that the need to promote innovation in EU agriculture is respected by other parts of the Commission when they take decisions which will impact on the food and farming sector (paragraph 152).

198. We urge the Commission and Member States to act with urgency in determining a robust set of factors, indicators and rules for data collection that will facilitate a better understanding of the socio-economic implications of GMO cultivation (paragraph 162).

199. Good regulation is evidence-based, taking into account environmental, economic and social considerations. We are clear that the precautionary principle must continue to underpin regulatory decisions with regard to food safety. It must, however, be applied with due consideration of available scientific evidence of potential risks and benefits. Reluctance to take a risk can be a risk in itself if, for example, global food security is likely to be threatened (paragraph 163).

200. It is critical for reasons of productivity, sustainability and competitiveness, that appropriate technologies can be adopted swiftly after proper testing. The EU decision-making procedure should seek to help, rather than hinder, the adoption of appropriate new technologies. We would not recommend that new techniques should routinely be assumed to be safe unless proven otherwise, but there is undoubtedly a need for a much clearer articulation of the potential risks and benefits of any technology. In advancing this debate at a political level, it would be appropriate for the European Commission to re-visit its 2000 Communication on the Precautionary Principle and to re-consider the application of the principle in the light of the grand challenges faced by society (paragraph 164).

201. We note concerns that high animal welfare standards in EU legislation can harm the competitiveness of EU farmers on the world market. Equally, however, we would not wish to see a weakening in EU standards as a result. Rather, we have been impressed to see how high animal welfare standards and business efficiency can be mutually supportive, and we encourage partnerships that can develop such win-win scenarios (paragraph 167).

APPENDIX 1: SUB-COMMITTEE ON AGRICULTURE, FISHERIES AND ENVIRONMENT

The Members of the Sub-Committee which conducted this inquiry were:

The Earl of Arran
Baroness Byford
The Earl of Caithness
Lord Cameron of Dillington
Lord Carter of Coles (Chairman)
The Earl of Dundee
Lord Giddens
Baroness Howarth of Breckland
Lord Lewis of Newnham
Baroness Parminter
Baroness Sharp of Guildford

Declarations of Interests

The Earl of Arran
Married to farmer and landowner in Devon

Baroness Byford
Family farming interests in Suffolk
Member, NFU, CLA, National Trust
Member, Royal Agricultural Society of England
Patron/President of several rural charities
President 2010 The Royal Smithfield Club
Hon Ass. Member RCVS and BVA
President, Leaf
Patron, Women's Farming Union

The Earl of Caithness
Trustee of Queen Elizabeth Castle of Mey Trust which owns agricultural land

Lord Cameron of Dillington
Farmer and landowner
Trustee of Lawes Agricultural Trust at Rothamsted
Director of Royal Bath and West Agricultural Society
A Member of: CLA, NFU, RSPB, CPRE and National Trust

Lord Carter of Coles
Farms and farmland in Hertfordshire

The Earl of Dundee
Farmer, landowner and forester in Scotland
Director of farming company in Scotland
In receipt of Single Farm Payments

Lord Giddens
No relevant interests

Baroness Howarth of Breckland
No relevant interests

Lord Lewis of Newnham
Chair of Advisory Board, Veolia Environmental Services

Baroness Parminter
Vice-President, Royal Society for the Prevention of Cruelty to Animals
Baroness Sharp of Guildford
Visiting Fellow to Science Policy Research Unit, University of Sussex

A full list of registered interests of Members of the House of Lords can be found at:

http://www.parliament.uk/mps-lords-and-offices/standards-and-interests/register-of-lords-interests/

Dr Julian Clark and Dr Jonny Wentworth acted as Specialist Advisers for this Inquiry. Both have declared that they had no relevant interests.

APPENDIX 2: LIST OF WITNESSES

Evidence is published online at www.parliament.uk/hleud and available for inspection at the Parliamentary Archives (020 7219 5314)

Evidence received by the Committee is listed below in order of receipt and in alphabetical order. Witnesses without a * gave written evidence only. Witnesses marked with * gave both oral and written evidence. Witnesses marked with ** gave oral evidence and did not submit any written evidence.

Oral evidence in chronological order

*	(QQ 1-37)	InCrops
*	(QQ 38-106)	Agricultural and Horticulture Development Board (AHDB)
		John Innes Centre
*	(QQ 107-143)	Rothamsted Research Institute
*	(QQ 144-178)	National Farmers Union (NFU)
		Country Land and Business Association (CLA)
**	(QQ 179-197)	US Department of Agriculture
**	(QQ 198-222)	Mr Paolo De Castro MEP
	(QQ 223-275)	ADAS
*	(QQ 276-321)	National Institute of Agricultural Botany
		Professor David Leaver, Professor Emeritus, Royal Agricultural College
*	(QQ 322-354)	Scottish Agricultural College (SAC)
*	(QQ 355-414)	Agricultural Biotechnology Council
		Syngenta
		Soil Association
		GM Freeze
*	(QQ 415-436)	Madame Marion Guillou, President, Institut National de la Recherche Agronomique (INRA)
		Professor Douglas Kell, Chief Executive, Biotechnology and Biological Sciences Research Council
**	(QQ 437-476)	Professor Peter Lillford, Visiting Professor, Department of Biology, University of York
		Food Standards Agency
		Wm Morrison Supermarkets plc
		Which?
*	(QQ 477-509)	Danish Agriculture Attaché
*	(QQ 510-540)	DG Agriculture, European Commission
**	(QQ 541-564)	Polish Agricultural Attaché

**	(QQ 565-581)	DG Research and Innovation
*	(QQ 582-604)	Department of Knowledge and Innovation of the Dutch Ministry of Economic Affairs, Agriculture and Innovation (MEAAI)
**	(QQ 605-629)	COPA/COGECA
**	(QQ 630-641)	Scottish Agricultural College (SAC)
		Wageningen University and Research Centre
		Institut National de la Recherche Agronomique (INRA)
**	(QQ 642-672)	Professor Charles Godfray, Head of Department of Zoology, University of Oxford
*	(QQ 673-710)	Jim Paice MP, Minister of State, Defra
**	(QQ 711-737)	John Deere

Written evidence in order of receipt

*	(IEUA 1)	Agricultural Biotechnology Council
*	(IEUA 2)	Agriculture and Horticulture Development Board (AHDB)
	(IEUA 3)	British Agrifood Consortium and the Meshfield Foundation
	(IEUA 4)	British Beet Research Organisation
	(IEUA 5)	British Crop Production Council (BCPC)
*	(IEUA 6)	Country Land and Business Association (CLA)
	(IEUA 7)	Farmex Ltd
	(IEUA 8)	Crop Protection Association
	(IEUA 9)	Dairy UK
	(IEUA 10)	European Economic and Social Committee
*	(IEUA 11)	GM Freeze
*	(IEUA 12)	National Institute for Farming and Food Investigation and Technology of Spain (INIA)
	(IEUA 13)	Macaulay Land Use Research Institute
*	(IEUA 14)	National Farmers Union (NFU)
	(IEUA 15)	Regional Development Agencies
	(IEUA 16)	Philip Richardson
*	(IEUA 17)	Rothamsted Research Institute
	(IEUA 18)	Royal Agricultural Society of England (RASE)
*	(IEUA 19)	Scottish Agricultural College (SAC)
	(IEUA 20)	Sheep Improved Genetics Ltd
*	(IEUA 21)	InCrops

*	(IEUA 22)	John Innes Centre
*	(IEUA 23)	Syngenta
	(IEUA 24)	Research Councils UK
*	(IEUA 25)	Department for Environment, Food and Rural Affairs (Defra)
	(IEUA 26)	Scottish Rural Property & Business Association Ltd
*	(IEUA 27)	Food Standards Agency (FSA)
*	(IEUA 28)	National Institute of Agricultural Botany
*	(IEUA 29)	European Commission
	(IEUA 30)	Farm Ideas
*	(IEUA 31)	Wm Morrison Supermarkets plc
*	(IEUA 32)	John Innes Centre
*	(IEUA 33)	InCrops
*	(IEUA 34)	National Farmers Union
*	(IEUA 35)	Agricultural Biotechnology Council
*	(IEUA 36)	Syngenta
*	(IEUA 37)	Institut National de la Recherche Agronomique (INRA)
*	(IEUA 38)	Department of Knowledge and Innovation of the Dutch Ministry of Economic Affairs, Agriculture and Innovation (MEAAI)
*	(IEUA 39)	Danish Agriculture Attaché
*	(IEUA 40)	GM Freeze
*	(IEUA 41)	Defra

Alphabetical

** ADAS

* Agricultural Biotechnology Council (IEUA 1, 35)

* Agriculture and Horticulture Development Board (AHDB) (IEUA 2)

** Biotechnology and Biological Sciences Research Council (BBSRC)

British Agrifood Consortium and the Meshfield Foundation (IEUA 3)

British Beet Research Organisation (IEUA 4)

British Crop Production Council (IEUA 5)

** COPA/COGECA

* Country Land and Business Association (CLA) (IEUA 6)

Crop Protection Association (IEUA 8)

Dairy UK (IEUA 9)

* Danish Agriculture Attaché (IEUA 39)

** Mr Paolo De Castro MEP

* Department for Environment, Food and Rural Affairs (Defra) (IEUA 25, 41)

* Department of Knowledge and Innovation of the Dutch Ministry of Economic Affairs, Agriculture and Innovation (MEAAI) (IEUA 38)

** DG Research and Innovation

** Dutch Ministry of Economic Affairs, Agriculture and Innovation

* European Commission (IEUA 29)

European Economic and Social Committee (IEUA 10)

Farm Ideas (IEUA 30)

Farmex Ltd (IEUA 7)

* Food Standards Agency (IEUA 27)

* GM Freeze (IEUA 11, 40)

** Professor Charles Godfray, Head of Department of Zoology, University of Oxford

* InCrops (IEUA 21, 33)

* Institut National de la Recherche Agronomique (INRA) (IEUA 37)

** John Deere

* John Innes Centre (IEUA 22, 32)

** Professor David Leaver, Professor Emeritus, Royal Agricultural College

** Professor Peter Lillford, Visiting Professor, Department of Biology, University of York

Macaulay Land Use Research Institute (IEUA 13)

* WM Morrison Supermarkets plc (IEUA 31)

* National Institute of Agricultural Botany (NIAB) (IEUA 28)

* National Institute for Farming and Food Investigation and Technology of Spain (INIA) (IEUA 12, 37)

* National Farmers Union (NFU) (IEUA 14, 34)

* Jim Paice MP, Minister of State, Defra

** Polish Agricultural Attache

Regional Development Agencies (IEUA 15)

Philip Richardson (IEUA 16)

Research Councils UK (IEUA 24)

* Rothamsted Research Institute (IEUA 17)

Royal Agricultural Society of England (RASE) (IEUA 18)

* Scottish Agricultural College (SAC) (IEUA 19)

Scottish Rural Property & Business Association Ltd (IEUA 26)

Sheep Improved Genetics Ltd (IEUA 20)

** Soil Association

* Syngenta (IEUA 23, 36)

** US Department of Agriculture

** Wageningen University and Research Centre

** Which?

APPENDIX 3: CALL FOR EVIDENCE

Introduction

The House of Lords European Union Committee will conduct an inquiry, through its Agriculture, Fisheries and Environment Sub-Committee (Sub-Committee D), into how innovation in EU agriculture can be encouraged in the context of new challenges such as climate change, water scarcity and the need to encourage sustainable improvements in output. The inquiry will be held against the background of the EU's new Strategy for Growth and Jobs, Europe 2020, in which innovation is central. It was agreed by the European Council on 17 June 2010 that the Common Agricultural Policy (CAP) should play its part in delivering that strategy. The focus of the Committee's inquiry is not the upcoming reform of the CAP, although some of our conclusions may relate to that debate.

There is a relatively well-developed discourse on the future of the CAP, but this has tended to focus on the architecture of the policy rather than the flanking measures that might assist innovation in the sector and thus improve its competitiveness. The Committee has itself published relevant reports in recent years, including "*The Future of the CAP*" (2008), and "*Adapting to Climate Change: EU agriculture and forestry*" (2010).

In the course of our inquiry into adapting agriculture and forestry to climate change, we heard some evidence to suggest that agricultural research capacity has shrunk over several decades and that, even when the knowledge exists, there appears to be a significant problem in terms of knowledge transfer. At the same time, it was clear that new technologies would become increasingly important in order to adapt agriculture to existing and future challenges, such as climate change, water scarcity and the need to encourage sustainable improvements in productivity, not least in the context of food security.

We consider "innovation" to refer to: new technologies, such as biotechnology and new machinery; incremental change, such as commercial decisions to plant a new crop or alter a label; and to the more generic processes by which ideas are conceived, developed and deployed throughout the agricultural sector.

The issues

The Committee is seeking evidence from interested parties on the issues outlined below. On the basis of that evidence, the Committee will formulate conclusions and recommendations to inform the House of Lords, and to contribute to the development of policy on innovation in EU agriculture by the UK Government and the EU institutions over the next few years.

The Committee invites you to submit written evidence. The Committee would find it helpful if you would focus on a number of specific issues, listed below. You may also wish to draw our attention to additional issues not addressed by the questions below. It is recognised that those submitting evidence will not necessarily have an interest in all the questions and may therefore wish to be selective.

Views are sought on the following:

Definition of "innovation" in the agricultural context

(1) We have outlined above how we currently perceive "innovation" in the agricultural context, but we would welcome views on your interpretation of innovation in the agricultural sector.

Innovation in EU agriculture as a strategic objective

(2) The EU believes that innovation and knowledge are key to the EU's economic growth and that all sectors should play their part. Do you agree that innovation in EU agriculture should therefore be pro-actively encouraged? Alternatively, do you see agriculture as a distinct sector faced with particular challenges to which the sector will inevitably react in an innovative manner?

Innovation today

(3) How is EU agriculture innovating now? Can you explain under what conditions the agricultural sector is best placed to innovate? Do you have examples of circumstances where innovation would have been possible and would have been helpful, but did not occur?

Obstacles to innovation

(4) What are the current obstacles to innovation? Is there a shortfall in research capacity and in technology transfer? To what extent do issues such as intellectual property rules, resistance to new ideas, inertia, fear of failure and lack of communication block innovation in the agricultural sector? What are the obstacles to land managers incorporating forestry into their businesses?

Demographic structure of the sector

(5) To what extent is the demographic structure of the sector (an ageing farming population) an obstacle to innovation; and, conversely, might greater innovation in agriculture serve to bring new recruits to the sector? What incentives currently exist to encourage young people to agriculture; what further efforts might be made?

Future challenges driving innovation forward

(6) Looking forward, agriculture faces significant challenges, although those challenges may bring opportunities too. What challenges do you think will drive forward innovation in EU agriculture in the future? What do you think should be the responses to these challenges, and who would you expect to deliver these responses?

Knowledge and innovation systems

(7) Analysts have suggested in the past that innovation is best served by co-ordinated formal and informal systems of researchers, consumers, producers, retailers, advisers and government. What sort of systems do you think are required to support innovation in EU agriculture?

Research and Development

(8) Assuming that R&D has a role to play as part of knowledge and innovation systems, how should the research agenda be established in the field of agriculture? How should such research be funded, particularly in the light of budget cuts driven by austerity measures?

Education and skills

(9) What is the current state of education and skills provision relating to agricultural research, the agricultural sector and advisory services? How might such provision be enhanced?

Knowledge transfer

(10) How should research be translated into technology transfer and advice to practitioners? What are the respective roles, for example, of professional advisers, professional organisations, peer groups and the public sector?

EU policies

(11) What are the roles of the Common Agricultural Policy and EU research policy, including the Framework Programme for Research and Development, in helping to resolve the issues highlighted above? Where public intervention is desirable, what is best done at a lower level of governance?

The deadline for written evidence is **24 September 2010**.

APPENDIX 4: ACRONYMS

Below is a list of the main acronyms used in this report.

AHDB	Agriculture and Horticulture Development Board
AKIS	Agricultural Knowledge and Innovation System
BBSRC	Biotechnology and Biological Sciences Research Council
CAP	Common Agricultural Policy
CLA	Country Land and Business Association
COPA-COGECA	Committee of Professional Agricultural Organisations, General Confederation of Agricultural Cooperatives
Defra	Department for Environment, Food and Rural Affairs
DG	Directorate-General (of the European Commission)
EIP	European Innovation Partnership
ERA-NET	networking of research programmes in the European Research Area
ERDF	European Regional Development Fund
FAS	Farm Advisory System (under the CAP)
FP	Framework Programme (of research supported by the EU)
FSA	Food Standards Agency
GMO	Genetically Modified Organism
GPS	Global Positioning System
INIA	National Institute for Farming and Food Investigation and Technology (of Spain)
INRA	National Institute for Agricultural Research (of France)
JIC	John Innes Centre
JPI	Joint Programming Initiative
NFU	National Farmers' Union
RAE	Research Assessment Exercise
RDA	Regional Development Agency
REF	Research Excellence Framework

APPENDIX 5: RESPONSE FROM COMMISSIONER GEOGHEGAN-QUINN AND COMMISSIONER CIOLOS

Preparatory work and launch of EIP

Over the last months, the European Commission has initiated an internal reflection to define i.a. the objectives, key components and governance of the future European Innovation Partnership (EIP) 'agricultural productivity and sustainability', while ensuring coherence with other EIPs. It intends to involve the Standing Committee on Agricultural Research (SCAR), farm organisations, environmental NGOs and Member States into these reflections during the coming months before finalising the EIP implementation plan.

The official launch of the agricultural EIP, will be followed by the establishment of a High Level Steering Group which will be tasked with identifying, prioritising and selecting the areas that will most benefit from a partnership approach, and deliver productive, sustainable agriculture through innovation. This will be followed by a presentation of the EIP to the Parliament and the Council.

EIP membership

The partnership would mobilise and bring together all actors around a common target—from those conducting basic and applied research, all the way to the final user like farmers and businesses, including every step in between. This would require overcoming barriers resulting from a traditional 'division of labour', be it across geographical borders or areas of competence.

The partnership should provide these actors with a forum, in which they can indentify, develop and test innovative solutions and ensure the smoothest possible transition from conception to implementation. In addition to these stakeholders, it will involve Programming Authorities, the SCAR, and the Commission.

An important part of the governance structure of the EIP would be the setting up of a high-level steering group with a direct link to the political level (e.g. Council, European Parliament, region) and a balanced representation of private stakeholders (e.g. farmers, researchers, environmentalists, consumers).

Whilst it is important to have all major players on board, it is equally important to keep the steering group manageable and 'light', ensuring that it can work as efficiently as possible. The steering group should, therefore, have an upper limit as regards the number of members in total as well as per category of stakeholders.

Role of EIP in fast-track regulation

The main role of the possible future EIP 'Agricultural Productivity and Sustainability' would be to look at the whole innovation cycle from R&D all the way to products or services on the market and enhance the effectiveness and the integration of innovation instruments. In this respect it will rely mainly on existing instruments, rather than creating new ones. It will look at actions provided by the Rural Development Policy and the Research Framework. These may include cooperation, pilot-projects, knowledge transfer, advisory services, and dissemination. It is anticipated that the creation of a functioning network will fill the current gap between farmers, rural enterprises, and advisors, on the one hand, and science on the other to allow the sector to take full advantage of innovation to produce more with less. It will improve co-ordination between actors and facilitate

the use of opportunities provided by the different policy fields (Common Agricultural Policy (CAP), EU Research Policy).

Bottlenecks that stop ideas reaching the market

The possible future EIP 'Agricultural Productivity and Sustainability' will seek to overcome obstacles to innovation in the sector, and may include (in addition to those already mentioned in the reply to the first questionnaire of the House of Lords):

- In spite of valuable outcomes of agricultural research and the interest of farmers in innovation, research results often remain on the shelf, and instruments for testing and applying innovation are not used. The main problem is the insufficient information flow and missing links between different actors (farmers, advisers, enterprises, and researchers).
- Agricultural research across the EU is fragmented, as more than 90% of agricultural research takes place at Member State level. Interesting results and innovative concepts often do not gain sufficient attention due to limited exchange on research activities.
- Farmers' Unions level the criticism that most research projects are related to questions of policy support or conceptual work. They argue that it is necessary to give more emphasis to projects addressing directly farmers' practical needs. A better linkage of research actors in an agricultural innovation and knowledge system at European, National and Regional level could target innovation needs with research investments.
- The EU has consistently endorsed actions to integrate environmental concerns into European policies and to develop respective EU policy guidelines. EU agriculture is subject to a comprehensive regulatory framework related to environmental issues.[289] In spite of the importance of agricultural land and its functions, soil problems have not received sufficient attention. Thus, action is needed on sustainable land management—the High Level Steering Group may find that the EIP is a suitable way of addressing this.
- Current Rural Development Policy offers measures for co-operation. However, the measures are not offered in all programmes and uptake is low. One of the reasons, beyond lacking information, hindering the use of these measures is the current inflexibility concerning the involvement of actors other than farmers (e.g. industry and researchers).
- The current policy framework does not sufficiently facilitate the implementation of pilot projects. Pilot projects have a particularly important role for innovation as they are meant to support the development of knowledge, to check whether innovative ideas suggested by research results are applicable to practice and can be adapted to local circumstances. Evidently, the risk of failure for pilot projects is high and, therefore, pilot projects need special attention and promotion within programming.

[289] The most important legal acts are: Birds and Habitats Directives; the Water Framework Directive (WFD); the Nitrates Directive and the EU legislation on pesticides.

Building a bridge between farmers, businesses, advisory services and research

See reply to question 2.

Innovation in the "pre-EIP period"

The Rural Development Policy currently foresees a wide range of actions fostering innovation in the farm and forestry sectors: Actions concerning co-operation and clustering involve farmers, advisers, researchers, and administrations in view of bridging the gap between research and practice and spreading knowledge over successful approaches. Pilot projects can help transfer research results into practice, considering regionally different structures and natural circumstances. Networking and knowledge transfer promote the dissemination of innovative approaches. In addition the CAP provides for a Farm Advisory System (FAS), established to help farmers better cope with cross-compliance requirements.

However, it is certainly correct to state that more needs to be done in view of bringing research results faster to application and developing a research agenda corresponding to needs: The FAS has not yet been applied in all Member States and the actual application of innovation-related Rural Development measures may fall short of programme priorities identified by Member States and regions. Within a general overhaul of Rural Development Policy, attention would be given also to facilitating the uptake of measures by operational groups. Furthermore, the effective application of innovation measures under the EU Research Policy will be a matter of intensive reflection.

In this respect, the EIP will bring a more systematic approach, at all levels, of steering, and animating innovation measures.

Future EU research policy—Weaknesses/strengths of European Research Area

Simplifying the management and accessibility of the framework programme for research and development has been the object of specific actions by the Commission. It is in the Commission objectives that lessons learnt from the implementation of FP 7 be utilised for the design of the next programme through which research and innovation will be funded—the Common Strategic Framework for Research and Innovation funding. In February 2011 the European Commission launched a consultation on major improvements to EU research and innovation funding to make participation easier, increase scientific and economic impact and improve value for money. The proposed "Common Strategic Framework", set out in a Green Paper, would cover the current Framework Programme for Research (FP7), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT). This will create a coherent set of instruments, along the whole "innovation chain" starting from basic research, culminating in bringing innovative products and services to market, and also supporting non-technological innovation, for example in design and marketing. The Commission's Green Paper also provides the basis for far-reaching simplification of procedures and rules. The changes aim to maximise the contribution of EU research and innovation funding to the Innovation Union and the Europe 2020 Strategy. Stakeholders have until 20 May 2011 to respond.

With such tools as ERA-Nets, the EU research programme has proven able to deliver new value added of research at national and EU levels by fostering

coordination of national and EU research efforts to allow better targeting at a low budget and "administrative" cost.

In the agricultural field, several ERA-Nets improve coordination in several fields (e.g. for the FP 7: ARIMNET: agricultural research in the Mediterranean region; EMIDA: research on infectious livestock diseases; ETB-PRO: cooperation of biotech SMEs; ICT-AGRI: ICT and robotics in agriculture; RURAGRI: relationships between rural areas and agriculture in Europe). The SCAR whose mandate is to advise the Commission and the Member States on the coordination of agricultural research in Europe generates Collaborative Working Groups (CWG) on topics deemed of high importance, of which some have become ERA-Nets in a later phase

Work of Standing Committee on Agricultural Research

The collaborative working group on Agriculture Knowledge and Innovation Systems (CWG-AKIS), set up under the initiative of France and the Netherlands, started to operate beginning of 2010 with a work plan extending until the end of 2011. The CWG-AKIS aims to foster the links between research in the agricultural field and implementation of this knowledge through agricultural innovations. This has never been an easy task for a number of reasons. Yet in recent years, the needs for proper interactions between the research and agricultural areas have become even more important, given the new challenges that European agriculture has to face (climate change, environmental policies, etc.). Moreover this CWG takes place at the time when the reform of the CAP is being discussed. Therefore, the subject of CWG-AKIS turns out to be an extremely timely topic to be embraced by the SCAR.

The AKIS-CWG will allow to take stock of the existing AKIS set-ups in the various Member States and to come up with recommendations that could be taken up at the level of the individual Member States, but also at the EU level within the CAP reform process.

In order to be successful, the agricultural EIP will need to find the right implementing mechanisms for effectively applying the innovations serving the purpose of improving productivity in line with sustainable resource management. The review of AKIS in various Member States and the recommendations for the improvement of their delivery to be produced by the CWG-AKIS will provide a valuable input for designing the agricultural EIP to maximise its capacity to deliver.

European Bio-Economy—Roles EU and Member States; role of farmers

In cooperation with other Commission services, DG RTD is leading the preparations of the Commission Communication "European Strategy and Action Plan towards a sustainable bio-based economy by 2020" to be adopted in November 2011. A number of stakeholder consultations have been carried already, e.g. the Belgian Presidency's high-level conference "Knowledge Based Bio-Economy towards 2020" on 13-14 September 2010. The Commission has just opened an on-line public consultation (22 February 2011),[290] and, with the assistance of external expert groups, is preparing an impact assessment of a possible strategy and action plan. In this context the Commission will analyse ex-ante impacts on society, economy and environment, and skill needs for the future

[290] http://ec.europa.eu/research/consultations/bioeconomy/consultation_en.htm

bio-economy. A working group, composed of services of the European Commission related with bio-economy, was launched in late 2010 to assist the preparation of the strategy and action plan and the follow up of its implementation.

The strategy and action plan will aim at offering improved coordination at EU level of public investments, including the Framework Programme, Innovation Partnerships, innovation measures available under Rural Development Policy and the Structural Funds. The Communication will foresee a balanced, coherent, and efficient approach to foster bio-economy and to stimulate private investment. It will underline the need for achieving synergies, while allowing Member States to take their own initiatives according to the principle of subsidiarity. The implementation of the bio-economy strategy will require coordinated actions at EU and MS level.

Linking the world of practical knowledge and know-how of farmers and business with research results and opportunities emerging from technological development is a key to innovation. New combinations of knowledge to improve business models are needed to cope with new market opportunities and responding to demands of society for public goods delivery. In this respect knowledge networks need to complement agricultural advisory systems.

The Commission has taken up the challenge in several research projects (see for instance projects such as www.insightproject.net, http://www.esofarmers.org/, http://www.jolisaa.net/) and a ground-breaking workshop in Angers in 2008 (http://ec.europa.eu/research/agriculture/scar/pdf/anger/summary-report.pdf) which led to the establishment of a SCAR Collaborative Working Group on Agricultural Knowledge and Innovation Systems. The final report on AKIS is expected end of 2011.

The Bio-Economy Communication will build on these approaches and provide complementary options to enlarge farmers' business opportunities.

APPENDIX 6: SUBMISSION FROM INCROPS

EXECUTIVE SUMMARY

This paper sets out how the rate of innovation, adoption and exploitation of research can be increased in European Agriculture. The information is based on the experience of a partnership project in the UK, the InCrops Project. This project, backed by the public sector, provides a link between businesses and research with the specific objective of increasing the uptake of innovation within the industry.

The Development and Exploitation of Knowledge

The exploitation of research and the implementation of technology are essential for European agriculture to fully develop its commercial potential. This will only be achieved if the existing gap between research and implementation is effectively bridged.

There is a need for:

- Exchange of innovation and related research across the EU agricultural industry
- Increased use by businesses of the existing research base
- Effective and efficient knowledge transfer to businesses
- Stimulation of entrepreneurial activity
- Exploitation of research for commercial gain
- Faster and more widespread take up of 'proven' innovation within agriculture

Practical Considerations

Agricultural businesses are primarily SMEs. Many will engage at the local or national level, yet much of the research they need to access is located in other countries.

Pooling of research and technology is needed across the EU with the accumulated knowledge being channelled to the local level.

An effective innovation programme must ensure that:

- Those delivering technology exchange work collaboratively across Europe
- Whilst ensuring local access to and delivery of this knowledge base.

To ensure that the innovation communicated to businesses draws on all available new technology it is essential that local and national innovation support networks are active participants in international networks.

However, both the diversity of agriculture across the EU and different national traditions and approaches to farm business extension or innovation services, means that any innovation network must adopt the principle of subsidiarity. It must not be too prescriptive in how innovation support is provided locally.

Implementation of Research—EU Innovation Union

Implementation is necessary to achieve competitive advantage or economic gain. It is also required to address societal challenges, such as population growth or climate change.

Innovation in the agricultural sector is not a standalone technical/scientific process. Innovations in management and marketing are also required to deliver better supply chains, the development of new products, and improvements in workforce productivity through behaviour change.

Increasing the rate at which the wealth of European research impacts on productivity and sustainability will benefit both the agricultural industry and the European economy. This is backed up by the development of the EU Innovation Union. There is, within this programme, a proposal for European Innovation Partnerships (EIPs) in a range of sectors. A pilot in Active and Healthy Ageing is underway and a proposal for an EIP on Agricultural Productivity and Sustainability is planned for 2012.

This paper sets out how the EIP approach could be applied in agriculture through a partnership network between R&D, business and government across the EU.

The Agricultural Dilemma

Agriculture faces many challenges including the need to produce more whilst addressing sustainability and resource constraint issues. Research and technology can provide answers to many of the most pressing issues facing agriculture but, across Europe, technology translation has been weak. There is limited sharing of expertise and this severely restricts the exploitation of research findings.

InCrops has found that by creating a partnership between business end users, research centres and knowledge exchange experts, then greater commercialisation and exploitation of research is achieved.

However, it only works if an innovation programme meets the differing needs of individual businesses, research centres or agencies. A 'one size fits all' is not appropriate. It requires a number of focused partnerships, working together on specific areas, within a wider innovation network.

Developing Successful Innovation Partnerships

InCrops argues strongly that in developing European Innovation Partnerships (EIPs) in Agricultural Productivity and Sustainability, the following principles should be adopted:

- Resources focused on facilitating the implementation of new ideas by businesses—so exploiting the considerable investment already made in fundamental science
- Allowing flexibility with a range of approaches to innovation support including:
    - knowledge exchange in thematic areas, such as climate change
    - innovation clusters in emerging technologies, such as algae
    - industry partnership with academic and research centres to address specific business needs;
- Providing pro-active support to promote collaboration between business and research, recognising that many innovations take time to implement and allow each project to meet the specific needs of those who need to collaborate.

Learn From Success

Many current farm advisory services are patchy, focused on regulatory compliance and have poor links to research. This is not true everywhere and the EU should

learn from projects which are delivering more integrated innovation support, such as the InCrops project, Fraunhofer centres, UR Wageningen in the Netherlands, SAC, and seek to replicate the lessons from them.

These successful partnerships all unite academic, research and business engagement functions. These projects benefit from 4 key factors which are fundamental and should be replicated in proposals for an EIP in Agriculture. They are:

(1) Engagement of businesses in helping to determine their focus and mission

(2) Bringing together of multiple partners to provide integrated support

(3) Employment of specialist staff—skilled in knowledge exchange and with understanding of businesses

(4) Supported by multi-annual funding.

Summary of InCrops Innovation Model

InCrops proposes that the model for innovation should be based on the parallel delivery of two themes:

Theme 1—EU networking and transnational delivery, which includes:

- Promoting a partnership between business, research and government to define and prioritise investment in agricultural innovation at the EU level
- Facilitation of a pathfinder group of agricultural businesses working with the EU knowledge sector to develop new areas of innovation or systems of knowledge exchange
- A knowledge partnership between local and/or national innovation support bodies across the EU to share expertise based on events, exchanges and an ICT platform
- A programme of multi-country pilot projects to develop innovation programmes in new, key areas of European interest.

Theme 2—Innovation delivery to the agricultural sector

As noted above, most businesses will engage with the knowledge sector via local support systems. Theme 2 is therefore focused on utilising the innovation expertise available across Europe to ensure that local delivery of support, whilst respecting local traditions and systems, draws on the expertise in all member states.

Theme 2 would thus provide resources to strengthen innovation support available locally or nationally, with those accessing these resources automatically being linked into the trans-national partnership developed under theme 1.

EU Commitment

Finally the paper welcomes the commitment by the EU, in the proposals for a European Innovation Partnerships (EIP), to make these long term programmes with clear links to wider economic and innovation policy.

In agriculture it is essential that an EIP is also clearly linked to the strategic priorities in the CAP as well as the green economy. It is important that strategic input from businesses, researchers, governments and the EU is provided to guide the focus and integration of the programme

The commitment to agricultural innovation will require substantial funding, if the magnitude of the challenges facing the industry and wider society in terms of access of food, feed, renewable materials and environmental services are to be delivered.

The challenges facing the industry are long term in nature and, given that innovation takes time to commercialise or become embedded, the funding commitment to support must also be long term.

However, if businesses can see clear benefits to securing innovation support, they will also contribute towards the costs and fund the subsequent investments in new technology, facilities and products.

FULL PROPOSAL

Developing a European Innovation Network for Agriculture built on a Partnership between Knowledge, Business and Government Partners

The exploitation of research and the implementation of technology and innovation are essential for European agriculture to fully develop its commercial potential.

There is a gap between research and implementation that needs bridging if innovation is to be fully developed.

The challenge is to achieve:

- Exchange of innovation and related research across the EU agricultural industry;
- Increased use by businesses of the existing research base;
- Effective and efficient knowledge transfer to businesses;
- Stimulation of entrepreneurial activity;
- Exploitation of research for commercial gain;
- Faster and more widespread take up of 'proven' innovation within agriculture.

Achieving this will benefit both the agricultural industry and the European economy.

Addressing the need to increase the commercialisation of innovation at a European level is complex. Many of the businesses in the sector will be comfortable with engaging at the local or national level, whilst much of the research they need to access is located in other countries.

An effective innovation programme must ensure that:

- Those delivering technology exchange are working collaboratively across Europe;
- Whilst ensuring local access to and delivery of this knowledge base.

Across Europe the challenges of responding to the economic crisis has partly focused on the need to increase the rate at which European research impacts on productivity and sustainability. This has led to the development of the Innovation Union, and within this programme a proposal for European Innovation Partnerships (EIPs) in a range of sectors, with a pilot in Active and Healthy Ageing, and a subsequent proposal for an EIP on Agricultural Productivity and Sustainability in 2012.

Whilst the details of the EIP in Agriculture are still to be finalised, InCrops hopes that its own experience can help to inform a model which could be delivered effectively based on networking business, research and government in a focused partnership to increase the commercialisation of research findings.

Background

This model for discussion has been developed as part of an inquiry into Innovation in EU Agriculture led by the Agriculture, Fisheries and Environment sub-committee of the House of Lords in the UK Parliament[291]. InCrops presented its initial evidence to this inquiry in autumn 2010[292], and then appeared before the Committee[293]. This led to encouragement for the ideas discussed to be developed more fully—to create a more detailed submission to set out a model for how the EU could develop a Transnational Innovation Network for Agriculture focused on Knowledge Exchange.

InCrops Enterprise Hub www.incropsproject.co.uk is a business support and technology transfer company owned by University of East Anglia and based at the Norwich Research Park. Through the partnership with 13 academic organisations (leading UK and world class research organisations[294]), InCrops has access to expertise in plant biology, agronomy, food & feed, sustainable development and biotechnology. InCrops works closely with the Low Carbon Innovation Centre, a knowledge transfer hub encouraging, commercialising and investment in low carbon technologies across all industrial and societal sectors.

InCrops has EU and UK government grant funding (ERDF, EEDA and the University of East Anglia) to provide a knowledge transfer network for businesses. It provides support for entrepreneurs and companies developing sustainable supply chains, products and technologies based on the use of plant-based raw materials. It works with businesses in the automotive, construction, bioenergy, pharmaceuticals, functional food and packaging sectors amongst many others, to connect them to farming and agricultural supply chains which can help them access the raw materials they need. InCrops has a pipeline of commercially funded projects each of which is provided with the support needed to develop and launch new products.

InCrops partners, and the project itself, already have substantial experience in international collaborations to deliver innovation both in Europe as well as further afield. Projects such as the China-UK Sustainable Agriculture Innovation Network (SAIN) are involved in the translation of research between countries and have been addressing complex issues such as improved nutrient management to reduce carbon emissions.

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291 House of Lords (2010), Inquiry on Innovation in EU Agriculture, EU Sub Committee D—Agriculture, Fisheries and Environment

292 InCrops Enterprise Hub (2010), Response to the Call for Evidence from the House of Lords Inquiry into Innovation in EU Agriculture

293 Dr John French, Ms Marie Francis OBE (3rd November 2010), Unrevised transcript of evidence taken before the Select Committee on the European Union: Agriculture, Fisheries and Environment (Sub-committee D) Inquiry on Innovation in EU Agriculture

294 The InCrops partnership includes: Institute of Food Research (IFR), John Innes Centre (JIC), Norwich Research Park, Rothamsted Research, Buildings Research Establishment (BRE), National Institute of Agricultural Botany (NIAB), University of Essex, University of Cambridge Department of Plant Sciences, Renewables East, Easton College, Forestry Commission, University of East Anglia (UEA) School of Biological Sciences and the Low Carbon Innovation Centre at the UEA.

The Case for a Business Driven Innovation Network for European Agriculture

In 2011 the challenges which innovation must address continue to evolve, with many of the issues for farming and the industries it supplies being global in nature. Given the high and growing costs of developing appropriate responses the need for collaboration both within the EU and across the world is growing.

In setting out this case for a Pan European Innovation Network for Agriculture, InCrops is guided by a number of challenges which the sector needs to address, including:

- Growing market demand—set to double by 2050[295] (for food, feed, fuel, renewable materials and eco-system services), but also in changes in the products required;
- Global competitiveness for resources—resources becoming more expensive and constrained, requiring investment in technology to increase productivity within environmental constraints (sustainable intensification);
- Climate change—innovative responses are needed to maintain productivity in some regions whilst potentially allowing other regions to become more productive;
- Environmental and political imperatives—reducing dependence on oil by adopting biological systems which replace oil derived products.

The ability to deliver necessary improvements in agricultural productivity and sustainability requires increased investment in both research[296] and its translation to business[297].

Growth in European productivity has been falling, with current growth rates under 2% per annum against 4% in the 1970s. High income countries have been reducing the rate at which they increase agricultural research expenditure, with the average growth falling from 2.5% throughout the 1970s and '80s to 0.5% during the '90s[298].

Europe is now a net importer of food, with the trade deficit continuing to grow[299]. Farmers must use the latest science to deliver production efficiency but this requires the relevant science to be communicated to and exploited by industry.

As explained in more detail in appendix 1, this need for more translation of science into practice is hampered by:

- A big fall in the resources available for technology translation to agriculture across Europe;
- Inadequate co-ordination between member states;

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295 Thompson Prof Robert L (2008), conference paper at Growing Our Future Food—Supply is Too Important to Leave to Chance, Iowa State University

296 Professor Sir John Beddington (2011), Foresight: The Future of Food and Farming (2011) Executive Summary, the Government Office for Science, London.

297 Royal Society (2009), Reaping the benefits: Science and the sustainable intensification of global agriculture

298 OECD-FAO (2009), Agricultural Outlook 2009–2018

299 George Lyon MEP (rapporteur) (2010), Draft Report on the Future of the Common Agricultural Policy after 2013, Committee on Agriculture and Rural Development, European Parliament

- Weak links to other sectors with which agriculture needs to work (such as IT and engineering);
- The highly national and regional outlook and implementation of many areas of EU agricultural and rural development policy.

Developing a Successful Innovation Model

Assume nothing

Many complex constraints exist that limit the potential to achieve transnational European scale integration of innovation within agriculture. The first stage of any proposed model must be to:

- Analyse the limitations to technology and knowledge exchange in general
- And for agriculture in particular
- Or establish fully that this has already been carried out

This constraints analysis would then form the basis for proposing specific, novel actions to address these constraints at both the European and Member state level.

Identifying and addressing these constraints is the essential first stage in creating an effective and practical innovation model that goes beyond the idealistic, to something that will work in operation and deliver the required benefits.

Caveat

A scientifically rigorous analysis has not been carried out for this paper. The information given in this document is based on the experience of InCrops and their partners. For this reason the proposal for an Innovation Model is put forward as an example of what could be achieved: It is not a definitive model.

Features of a Successful Innovation Model

Successful innovation models require three key features:

- Focused on promoting innovation by businesses;
- Based on effective networks of support;
- Supported as a strategic imperative in economic development.

Implementation by businesses: Without implementation there is no competitive advantage or economic gain. There is also failure to address societal challenges, such as population growth or climate change.

Innovation in the agricultural sector is not a standalone technical/scientific process. Innovations in management and marketing are also required to deliver better supply chains, the development of new products, and improvements in workforce productivity through behaviour change.

Developing an integrated research, innovation and implementation policy

The following areas need covering:

(1) Thematic areas and/or societal challenges (e.g. climate change)—these need identifying and prioritising with business input.

(2) Innovation clusters—these need developing or identifying (some already exist) in priority areas (e.g. Algae, the role of agriculture in Carbon management). Co-ordinated innovation partnerships will enable the exchange of information, collaboration and the reduction of

duplication. These innovation clusters should work in areas identified as having long term and substantial business potential.

(3) **Industry-academia partnerships**—to support efficient knowledge exchange and collaboration between businesses and science. Knowledge transfer needs to be delivered with integrated business support to ensure both the development of commercial opportunities arising from research and the wider scale implementation of proven innovation and technological advances.

For businesses to effectively implement innovations they require:

- **Tailor made and flexible support**—programmes need to be able to respond individually to each business 'customer' in a way which meets their needs;
- **Time**—most innovations take time to commercialise, this requirement must be recognised when developing support programmes for companies;
- **Proactive support**—the number of innovations delivered is increased by proactive identification of potential partners and by creating the conditions for them to meet, exchange ideas and collaborate.

In terms of operation and management, innovation networks require:

- **Business leadership**—innovation programmes need active business engagement in their design and management to ensure they stay focused on business needs;
- **Delivery partnerships**—most companies need a range of support which is unlikely to be available from a single advisor or research partner. A key role for innovation networks is to provide a way for businesses to access advice from a range of sources across the public and private sectors;
- **Specialist staff**—knowledge exchange and technology translation require staff with the specialist skills to work with both research and commercial partners;
- **Multi-annual funding**—innovation and the systems to support it take time to develop and mature, short term funding withdrawn just as systems begin to operate effectively is inadequate[300].

The importance of networks and partnership

Although some businesses (SMEs) will engage directly with transnational projects, the majority need involvement at the local or national level.

Local and national innovation support networks need to be active participants in international networks to ensure that the innovation communicated to businesses draws on all available new technology.

Linking to existing centres

The Fraunhofer Gesellschaft in Germany is an excellent example of innovation and translational infrastructure that bridges the gap between research and technology. The Fraunhofer Institute model is based on one third of their budget from core funding, a further third through competitive bids to regional, national or EU public research projects and the final third from research contracts with the

[300] Dr Hermann Hauser (2009), The Current and Future Role of Technology and Innovation Centres in the UK—a report for Lord Mandelson, Secretary of State, Department of Business, Innovation and Skills

private sector. The focus is usually on a specific sector or technology rather than across a wide range of sectoral fields.

The European Agricultural Innovation Network should look to replicate certain aspects of this model. In particular, the focus on technology translation supported by core public funding, backed up by publicly funded competitive bids and commercial funding. This provides the mix of stability, competitiveness and business focus needed to drive success.

Innovation as a strategic objective

As explained in appendix 2, innovation programmes must pay close attention to the broader strategic context in which they operate, and ensure that they deliver the objectives agreed for the sectors they serve. This will ensure that the innovation programme gains from synergies with other programmes at the local, national or EU level and avoids problems of duplication or poor alignment with other support.

An example of a Model for a Trans-national Innovation Network for European Agriculture

InCrops sets out below how an EU Innovation Network for Agriculture could increase the rate of innovation in agriculture *(but refer to the caveat on p.77)*.

Purpose

To establish a transnational European Innovation Network for European Agriculture to:

- Exchange innovation and related research across the EU agricultural industry;
- Increase the use by businesses of the existing research base;
- Promote effective and efficient knowledge transfer to businesses;
- Stimulate entrepreneurial activity;
- Exploit research for commercial gain;
- Develop faster and more widespread take up of 'proven' innovation in agriculture.

Focus

The unique qualities of the InCrops Enterprise Partnership model that are relevant when developing a European wide innovation network, are the ability to:

- Enable collaboration;
- Lever relevant research;
- Refocus research effort;
- Work bottom up with business to identify needs and respond to them.

It will be necessary to disseminate information as widely as possible across the EU so increasing the rate at which innovation is exploited. This will require making demands on the pan-european research base by:

- Driving out costly duplication between centres;
- Encouraging collaborative approaches;
- Reinforcing the need for socially or business relevant research.

The Network should encourage two way ***knowledge exchange partnerships***, whereby businesses gain insights into new science or technology which can benefit their businesses, but also have the opportunity to promote their needs and priorities to research teams and those working on technology translation.

The Network's detailed operational focus should be guided by business input, but in principle should cover the full range of agriculture, land management and agricultural products. This includes knowledge exchange to facilitate the economic competitiveness of, and improvements in the sustainability of:

- Agricultural, horticultural and forestry production;
- The supply chains which utilise the products of agriculture, horticulture and forestry to produce food, feed, fuel and raw materials for industry;
- Waste and energy management in the agricultural supply chain;
- Land, soil and water management.

Given the diversity of agriculture across the EU, the network should allow for different groups of businesses and knowledge partners to focus on individual project areas that can also encompass local needs. These innovation clusters will be based on 'communities of interest'. They would fall into three main types of network:

(1) **European wide exploitation networks**—central to this would be a Carbon and Agriculture group. This would specifically address the role of European agriculture in carbon sequestration, energy provision and in developing income streams from carbon credits. Other areas may include areas such as an EU wide Innovation Network for Algal exploitation, grouping together commercial and research interests in an emerging industry;

(2) **Product specific exploitation networks**—such as around Olive production in the Mediterranean states or the potential to develop and market sea buckthorn across the EU.

(3) **Location specific exploitation networks**—to cover areas such as the development of new methods of sustainable land management for mountain farming systems in the Alps or drought tolerant methods of production in Mediterranean states.

These potential foci are closely aligned with the EU Commissions proposals to establish European Innovation Partnerships (EIPs) in a number of sectors with a pilot in Active and Healthy Ageing, and a subsequent proposal for an EIP on Agricultural Productivity and Sustainability in 2012.

The proposed Innovation Network could also share some of the priorities in the 'EU Public Private Partnerships in Research'[301], launched in 2009 as part of the investment in the European Economic Recovery Plan. This focused on three sectors: Factories of the Future; Energy Efficient Building; Green Cars, and provided a multi-annual budget to stimulate research, promote a strong business role in implementing research, linked to a focus on the exploitation of research to support innovation in SMEs.

Strategic Management of the Innovation Network

[301] European Commission (2009), Public Private Partnerships in Research

The Network should be managed strategically to ensure that the uptake of innovation across the EU is maximised by aligning it clearly with industrial priorities, existing research and technology programmes and other publicly funded support services.

To achieve this, the network should be overseen by a board comprising representatives of the agricultural supply chain, the EU research and technology community and the European Union.

The programme board would be responsible for:

- The strategic direction of the network;
- Priority areas for work;
- Integration with EU and member state programmes;
- Allocation of the network budget.

Advisory groups would need to work closely with the board, suggestions are:

(1) **Pathfinder group of farm businesses**—comprised of 100 progressive farm businesses drawn from across the EU. These would identify innovation needs and trial new approaches to innovation dissemination. This group of 'early adopter' businesses would be used to challenge the knowledge base to focus on new areas of need, as well as new ways to maximise the effectiveness of knowledge exchange programmes at the local level.

(2) **Knowledge base group**—comprising of a representative of the research and knowledge transfer community in each member state. This group would meet to develop collaboration between national innovation support systems, share best practice in facilitating innovation, and provide advice on how EU and national resources can be aligned to increase the uptake of innovation;

(3) **Member states group**—comprising of a representative of each member state government to develop collaboration between national innovation support systems. Also, to provide a link to the agricultural department or ministry in the member states and thus to the Agricultural Council, so ensuring that innovation is debated as a strategic priority by EU agriculture ministers.

Operation of the Innovation Network

The proposed network would have two main strands of activity:

- Theme 1—EU network and transnational delivery
- Theme 2—Innovation delivery to the agricultural sector

Each theme would have a budget, and targets to deliver in terms of numbers of business and knowledge partners engaged, new product development, new business creation and new processes adopted.

Theme 1—EU network and transnational delivery

Focused on maximising the dissemination of innovation across the EU. It would be delivered primarily through 4 networking activities and a programme of pilot projects.

The networking activities would be:

- Management of the EU Innovation Network for Agriculture (as set out above) to set priorities and agree the focus for the innovation network;
- Developing a strategic transnational position on facilitating innovation in agriculture and promoting this with member state governments, research bodies and business support organisations. This can tackle 'difficult' issues such as GM;
- Facilitation of knowledge exchange activities for the 'pathfinder' group of farm businesses (drawn from across the EU) to promote the sharing of innovation across member states from the 'bottom up', and to help technology translation services understand the needs of progressive farming businesses;
- A programme of workshops and exchanges to help knowledge partners share innovation across the EU, supported by an ICT platform for all farm innovation support organisations in the EU. The ICT platform would be accessible to farm businesses across the EU, but would primarily be targeted at increasing the rate of dissemination amongst those working to support innovation in agriculture.

Pilot projects would be supported to:

- Trial new approaches to knowledge exchange between member states, or within particular sectors or thematic areas;
- Develop EU collaboration in the exploitation of new or emerging technologies.

All pilot projects supported would have to include:

- Partners from at least 3 member states;
- Businesses (from agriculture, or its associated input or supply chains);
- Knowledge based partners;
- A commitment to disseminate the findings of the project across the whole EU via the ICT platform established for the Innovation Network;
- A demonstration that they could be 'mainstreamed' or sustained beyond the period of grant funding.

Theme 2—Innovation delivery to the agricultural sector

This would support the roll out of local innovation networks at the member state or more local level.

The roll out phase of innovation, when a successful innovation is applied on a wider basis, requires:

- A positive attitude to change in the target businesses;
- An effective dissemination process and adequate funding.

The innovations promoted must also be capable of adoption by most target businesses without major disruption, unless there are clear economic benefits which justify more major change.

Given the diversity of agriculture across the EU and different national traditions and approaches to farm business extension or innovation services, the Innovation Network should adopt the principle of subsidiarity and not attempt to be too prescriptive in how innovation support is provided locally.

To avoid duplication the national delivery of the innovation network would be aligned with existing farm extension, research and technology programmes.

To avoid displacing existing resources at the national level, each national programme would have to make a formal application for funds, which clearly explained how the support of the EU programme would complement rather than replace existing innovation services.

However, InCrops experience suggests that there are key factors which affect the success of innovation programmes:

- Flexibility in the support offered;
- Proactive support;
- Broad delivery partnerships—to help businesses access the full range of support required and the people with specialist skills in knowledge exchange and technology translation.

All national programmes would be required to explain how they would deliver these features in their local programmes.

At the national level, trade and professional bodies often have extensive and efficient mechanisms to communicate with farmers, and in conjunction with the trade press can be very influential in helping businesses access support. Innovation support at the local level will therefore be encouraged to work with these established intermediaries.

Funding

Given the magnitude and critical nature of the challenge facing the agricultural sector, the scale of the sector across Europe and the central role which innovation will play in helping the sector meet future challenges, a budget comparable to that allocated to similar sector based innovation programmes is needed.

Ultimately most innovation uptake will be funded by business. Government can, however, help to increase innovation by targeted grants or incentives which 'pump prime' and encourage businesses to explore the potential of investing in new technology.

Grants which support the provision of innovation advice at low or no cost (e.g. to research or technology exchange organisations) can be very cost effective at increasing the number of innovations commercialised.

Funding should be clearly focused on helping business access innovation, and not on the investments which they need to make in new pieces of equipment, buildings or products.

Conclusion

The exploitation of research and the implementation of technology and innovation are essential for European agriculture to fully develop its commercial potential.

There is a growing need for innovation in EU agriculture to enable the industry to increase its productivity and to deliver a range of products and services. These include new products, more food and feed, raw materials for industry, ecosystem services, including carbon sequestration and the ever more efficient use of resources.

The proposals set out for an Innovation Network for European Agriculture are ambitious in their scope and aspirations. However, with sufficient support,

financially and through a supportive policy context, a network could have a major impact on EU agriculture.

Many current farm advisory services are patchy, focused on regulatory compliance and have poor links to research. This is not true everywhere, and the EU should learn from projects, programmes and centres which are delivering more integrated support e.g. the InCrops project, Fraunhofer centres in Germany, SAC in Scotland, UR Wageningen in the Netherlands, and seek to replicate the lessons from them.

This would not only benefit agriculture, but also has the potential to contribute to the EU growth agenda and the rebalancing of the economy following the global downturn. It will, however, require a substantial increase in the rate at which Europe's strong science base is applied in the field through new investment.

InCrops believes that an EU response to agricultural innovation must be:

(1) Led by businesses working with the knowledge base and member states to define, manage and deliver a flexible programme of innovation support

(2) Focused on knowledge exchange which allows farmers and supply chain businesses to learn from the knowledge base, but also increases the input of industry into defining the priorities and focus of research centres

(3) Supported by staff with expert knowledge transfer skills who can bridge the gap between research and commercial partners

(4) Focused on partnership solutions to help business access the full breadth of the knowledge base which can support them

(5) Be facilitated with clear incentives and a supportive policy which champions the role of innovation as a strategic imperative in driving agricultural competitiveness

To deliver a successful programme it must build on the innovation work in EU other sectors, and deliver significant investment at the EU and national level. The programme must also build collaboration across Europe between knowledge partners, but recognise that many businesses will engage in the network via national and local systems.

Appendix 1—Constraints on Agricultural Innovation across Europe

The major obstacle to agricultural innovation results from weak linkages between research, technology development and farming businesses. Businesses, particularly the SMEs which dominate agriculture, find it hard to identify the full range of innovations which may benefit them and usually have a poor knowledge of the work conducted in research centres.

A 2008 report from the European Commission Standing Committee on Agricultural Research (SCAR)[302] summarises the problems currently inherent in the delivery of agricultural knowledge systems (AKS) as:

Over the years, as they have been to an increasing extent privatised, there has been a progressive dis-investment by public authorities in AKST. Many countries among the EU25 have dismantled to a considerable extent the basis for dis-interested science and

[302] Brunori G, Jiggins J (rapporteur), Gallardo R, Schmidt O (2008), EU Commission Standing Committee on Agricultural Research (SCAR): 2nd Foresight Exercise—New Challenges for Agricultural Research: climate change, food security, rural development, agricultural knowledge systems

public good training and advisory services, as well as the mechanisms that supported longer term public good AKST and applied and adaptive research.

This report also argued that:

AKST infrastructures at European level are not organised at the moment to provide adequate capacity (infrastructures and expertise) to integrate agricultural, health, food, climate change and environmental knowledge, science and technologies, and there is a lack of instruments and trained personnel to assess in an integrated way the relevance and the urgency of issues such as climate change impacts and mitigation potential in food and farming.

The report concludes by arguing that a renewed European wide approach to agricultural knowledge systems is needed which has a clear strategic focus, includes users and commercial partners in planning delivery, and links to existing local administrations. It also recommends that these systems must focus on learning processes, information exchange, network building and knowledge hybridisation.

The lack of co-ordination between national agricultural knowledge systems is a significant weakness for Europe and means that the potential of its investment in World class research is not being optimised. Currently the only area of farm extension where the EU takes an active role, the Farm Advisory Services[303], only focuses on cross compliance and not knowledge exchange to drive competitiveness.

Current provision of agricultural extension across Europe is very mixed, with the 2009 (ADE et al) review showing that provision ranges from: evolving and not yet formalised (e.g. Italy); to publicly driven systems with private sector input (e.g. Ireland); devolution to chambers of agriculture (e.g. Austria); private systems (e.g. Netherlands) and mixed systems (e.g. UK). It is critical that a European Innovation Network for agriculture, both recognises the existing Farm advisory systems in members states, and utilises this existing network wherever possible.

However, to drive competitiveness it is also essential that farmers have access to the latest research in Universities, research centres and the growing number of Technology Innovation Centres. In many EU countries the current farm advisory service is not well connected to these systems. There are some countries in which links are stronger, e.g. UR Wageningen in the Netherlands, SAC in Scotland and InCrops in England where research and university centres are intimately engaged in business outreach and these should be used as a model to develop a European wide approach to innovation support.

Appendix 2

Innovation in EU Agriculture as a Strategic Objective

Responding to the challenges set out above cannot be achieved by only directing more resources at knowledge transfer programmes for farmers at the EU, national or local level.

To be successful a European Agricultural Innovation Network must be supported as a strategic objective and integrated with other work undertaken by the EU or member states. It is essential to align it with:

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[303] ADE, ADAS, Agrotec, Evaluators.EU (2009), Evaluation of the Implementation of the Farm Advisory System, European Commission

- **The Common Agricultural Policy (CAP)**—the forthcoming reform of the CAP should be used to assist innovation in agriculture, through encouraging competitiveness and continuing the move to a market focused policy. Pillar 2 could more explicitly support innovation through a stronger focus on knowledge transfer, skills and support for innovative businesses and new product development (Axis 1) or new approaches to sustainable land management (Axis 2) (Lyon 2010).
- **Growth policy**—the EU has been working to stimulate economic growth, notably under the Lisbon Treaty. This work has been given added impetus since 2008 through the European Economic Recovery Plan, and recently in Europe 2020: a strategy for European Union Growth[304]. Given the growth in global demand for agricultural products it is essential that the economic potential of the sector is used to contribute to the EU's ambitions in relation to sustainable economic growth.
- **EU Sustainability Policy**—the EU has taken the lead on many environmental issues, and green growth now features as a key theme in EU growth policy. As a sector agriculture has a large environmental impact[305], but also has the potential to help the EU respond positively to challenges including climate change, resource depletion and waste reduction. Innovation support for agriculture should link to EU and national programmes on the environment, green growth and sustainability.
- **EU research policy and the Framework Programmes**—innovation programmes must build on the investment made in research collaboration under the Framework Programmes. Agricultural innovation should not be separate from other research areas, because many of the most important innovations will occur in areas where agriculture interacts with other businesses e.g. in the food sector, renewable materials, energy or resource industries. The agriculture sector also needs to utilise research in biotechnology, engineering, chemistry, informatics and robotics amongst others.
- **Existing member state agricultural knowledge systems**—all EU countries to some extent support knowledge exchange in agriculture and farm advisory services with which it is critical to link.

The development of a European Agricultural Innovation Network should be linked to the EU's Strategic Innovation Agenda and the European Institute of Innovation and Technology (EIT). EIT was established in 2008 to drive EU competitiveness through stimulating innovation[306]. It has currently identified three Knowledge and Innovation Communities (KICs): Information and Communication Society; Sustainable Energy; Climate Change. Each KIC is focused on uniting the 'knowledge triangle' of higher education, research and business innovation, and includes partners from across Europe over a 7-15 year time horizon. Whereas the EIT is concerned with building a strategic innovation agenda, the operational responsibility to drive innovation is contracted to the KIC.

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304 European Commission (2010), Europe 2020: a strategy for European Union growth

305 EU (2006), Environmental Impact of Products (EIPRO)

306 European Commission (2010), Strategic Innovation Agenda

In developing the Innovation Network for Agriculture links to the EIT and existing KICs should be explored, both to learn from their experience and to identify areas for collaboration.

End Note

This proposal was developed in conjunction with Collison & Associates, an agricultural consultancy, which supported the development of the InCrops project and which has worked with the InCrops partnership since launch. Its principals have managed horticultural and farming businesses and have over 20 years experience in agricultural education and extension. They specialise in promoting the potential of the agri-food sector and the role of knowledge exchange in meeting the challenges facing the industry.