How can food and farming research deliver for the long-term public good?

Meeting the demands of a rapidly growing global population will require substantial improvements in agricultural productivity, whilst agriculture must become more sustainable and resilient. Food and farming research is helping us achieve these goals, to ensure a safe and high-quality supply of food sufficient to deliver future food and nutritional security.

Research is delivering significant improvements across the agriculture and food system and providing economic and social benefits to the UK through increased productivity, improved quality and safety, increased trade and exports, and protecting the wider environment for generations to come.

Our world-class research capabilities in institutes, centres, universities and businesses are harnessing the genomics revolution in crop and livestock breeding for improvements in traits including resilience, sustainability and resistance to pests and diseases. We are developing and using new tools and digital technologies, robotics and autonomous systems, big data, machine learning and artificial intelligence to revolutionise farming practices in the UK and further afield.

To understand real-world challenges, research into sustainable agricultural systems is integrating the biology of crops and farmed animals with farm management and the wider environment. This requires balancing production (including optimising potential trade-offs) with maintaining the natural capital on which agriculture and other ecosystem services depend.

Food and farming research is of key economic and social importance to the UK and globally. As the UK’s largest public sector funder of agriculture and food security research, BBSRC takes its responsibility for future generations seriously. Our community is harnessing the step changes in understanding the biology of crops and farmed animals and combining this with novel innovations and new technologies to help address the global food and farming challenges.

If food and farming research is to deliver for the public good, it must ensure that such research takes adequate account of agrobiodiversity - the diversity of crops, animals, fish and other species that are part of all production systems.

Agrobiodiversity is necessary to secure the long-term sustainability of food production systems, achieve food security, and embed the principals of food sovereignty in food systems. Research on improved use and availability of, as well as access to, agrobiodiversity will be fundamental to achieving these objectives.

Agrobiodiversity must be included in debates on the nature and content of food and farming research. This means making sure that the farmers and communities who are developers and custodians of that diversity are fully engaged in the research setting process. It also means ensuring that the research agendas recognise and respond to their roles and needs, and takes full account of their importance for the continuing maintenance and use of that diversity.

Farmers and communities that maintain agrobiodiversity include indigenous peoples and farmers in marginal environments who are often excluded from the research setting processes and whose cultural and production practices are often undervalued, if not denigrated. These include shifting cultivators and pastoral peoples around the world.

Their inclusion in any research setting process and in the development of research priorities is therefore an essential part of the development of an ethical research agenda that delivers for the long-term public good. This will require transdisciplinary research approaches that take account of different world views and traditional knowledge.
I have always cared about the relationship between environmental sustainability and food security. With 52% of the food we eat coming from the UK, more research is needed to find ways of ensuring that our food supplies are secure, particularly in the face of issues such as Brexit and its implications for the agricultural workforce.

We live in a time of technological revolution, and food production and farming are no exception. Through research we can make use of new technologies such as automatic milking, robotic farming and hydroponics, which can be labour saving, environmentally sustainable and secure.

However, we must also give thought to reversing the massive rise in intensive factory farming and mega-farms. As well as concerns about animal welfare, these also have negative implications for public health. For example, almost three quarters of factory-farmed pork and chicken sold in UK supermarkets has been found to be contaminated with antibiotic-resistant bacteria such as E. coli.

We could also carry out more research into our eating habits. For example, can we realistically sustain our insatiable appetite for meat? If we want to continue delivering food for the long term, a diet with less meat would reduce the need for intensive farming.

Finally, we would do well to ask how we use the food we generate. Our country throws away more than seven million tonnes of edible food each year. With a steadily growing population we need to find more efficient and environmentally friendly ways of using the food and farms we already have before expanding in an unsustainable way.

As a farmer, it seems everyone wants to sell you stuff that they tell you – often with little evidence – will magically increase your yields by tonnes. This was one reason why I began to farm organically. I wanted to see what I could achieve using my own resources, such as rotations, good manure management and excellent husbandry.

At first it felt like a research project. I had ideas that seemed worth investigating, and questions that I wanted to answer. But support for this kind of work, which I knew would have many environmental – and potentially financial – benefits was in short supply.

There was some interest in organic methods, but it was mainly focused on policy differences rather than performance improvements. Practical work was conducted on research units rather than working farms, leading to delayed and hard-to-find results. Sometimes, as industry began to co-fund R&D, inconvenient results were smothered, with commercial partners delaying publication until they’d taken advantage of the funding. This despite public finance bearing the lion’s share of the cost.

That’s why I’ve long been keen to see two things. In applied research, I want the farmer/end user to be in the driving seat, ideally being funded to do the trials themselves, with support from scientists, as in the Soil Association’s Innovative Farmers network (part of the Duchy Future Farming Programme).

For ‘blue skies’ research, the public should be involved in determining the work to be done. Otherwise, our new technologies will carry high levels of sunk cost that drive the need for them to succeed commercially – even though they may have little relevance to the public interest. This conflict wastes everyone’s time, energy and money, when R&D could be used for the betterment of society.

Food and farming research has taken a wrong turn in the UK due to successive governments’ obsession with genetically modified (GM) crops. Our research institutes and scientists have misused public money to align the research agenda with the interests of GM corporations. This has come at the expense of public interest research into areas of practical benefit, such as crop rotation, non-toxic pest management, and building healthy soil – which in turn make healthy crops and healthy people.

Even GMO promoter Achim Dobermann, head of the UK’s Rothamsted Research, has finally admitted that GM crop technology is not a “major solution for agriculture”. We’ve known for years that GM simply isn’t up to the task of producing more or better food – including the new gene editing techniques, which Dobermann claims “will change the whole picture” of farming. In reality, new GM poses the same risks as old GM and will lead us down another blind alley.

Dobermann’s institute has swallowed millions of pounds of public funding since it jumped on the GM bandwagon. Yet this arm of its work has produced nothing of benefit to farmers or the public. It’s ironic that the UK government and scientific establishment are trying to impose this failed system, which only benefits GM seed and chemical companies, on other nations. It’s time to focus on participatory research that involves farmers and the public in a transparent way from the outset.

We already produce enough food for 14 billion people. Over 400 world experts agree that non-GM breeding, integrated pest management and agroecology can meet our present and future food needs in a sustainable way. Scientists should look at how they can serve these objectives while retaining the support of the public that pays their wages.
It is often said that the food system is broken. Globally, obesity and diet-related disease are increasing\(^1\). Nutrient levels of fruits and vegetables have declined over the last 50 to 100 years\(^2\). The University of Sheffield reported in 2014 that British soils may support only 100 more harvests. Industrial farming has created many negative externalities: biodiversity loss; the eutrophication of water courses with phosphorus and nitrogen; the development of antibiotic resistant bacteria in animal production; and the loss of insect pollinators linked to neonicotinoids.

We now understand that current methods of food production present many challenges to sustainability\(^3\). To meet them, the food system must change. Research is required which places people and diet-related health at the heart of farming and food industry practices, and targets the restoration and enhancement of ecosystem services.

The dilemma is that many of the food system’s failings are caused by intensive, high-input agriculture driven by corporate-funded research intended to secure greater profits; but not necessarily to benefit human health and food system sustainability. Solutions enabling long-term sustainability and healthy people may offer reduced profits for corporations. If so, who will fund the research?

The answer is to embed food and farming research strongly within national food policy. Governments must recognise their moral duty to fund such research for the long-term public good.

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