World food security threatened – so what's new?

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Professor Sir John Beddington's Foresight report on Food and Farming commissioned by the Department for Environment Food and Rural Affairs (DEFRA) calls once again for urgent action to avert global hunger. What's new about this report is that its multidisciplinary nature makes it thoroughly convincing while at the same time more worrying for food security. In 20 years the world population could be around 8.3 billion, and in those 20 years we need to deliver 40% more food, 30% more fresh water and 50% more energy.

The world is on a knife edge poised for the 'perfect storm' to break – a growing population, climate change and diminishing resources for food production. Can we afford to take seriously those who say that there is no problem? That world food production is sufficient? That all we need is better and equitable distribution? The report suggests that if 'best practice' in agriculture was adopted globally, food production could be significantly increased. But would it be enough? What is best practice when confronting major unpredictable environmental pressures such as climate change?

Over the past five decades agricultural sectors in many countries have been transformed by crop genetic improvement. Billions of people can be fed today because of the Green Revolution and its modern varieties. More recently the Green Revolution has been succeeded by the 'Gene Revolution'. However, genetic technologies have not as yet enabled us to move on from the achievements of the Green Revolution – partly because spending on agricultural research has suffered a decline in funding since the 1990s and this is addressed in the Foresight report.

Arguably, the development of new crop varieties will provide essential options assuming that it can be achieved in time. Producing a new crop variety that is better able to withstand climate change takes as long as 15 years with conventional breeding technology. New crop varieties demand new genes and also the application of a range of new technologies as Beddington argues. A recent example is the discovery of a gene enabling rice to survive completely submerged for up to 17 days. We often think about climate change in the context of drought, but extreme weather events are also a consequence and hence the importance of flooding tolerance in some crops. At unprecedented rates farmers in India now cultivate flood-tolerant rice on large flood-prone areas; not just a result of the new gene, but due to faster seed multiplication, targeted dissemination, and linking of partners – a multipronged approach demonstrating 'best practice'.

Where did the flooding tolerance gene come from? Modern genetic technology pointed to an old variety of rice conserved in the International Rice Genebank in the Philippines. Such traditional varieties – and wild species closely related to crop plants – constitute agrobiodiversity, an important source of genes for the future that demand effective conservation.

Disseminating agricultural best practice is not enough. The natural genetic variation and genes within agrobiodiversity need to be exploited more efficiently, if necessary using genetic modification to speed up the crop improvement process. This cannot happen if gene sources are not conserved effectively, for they are themselves threatened by climate change. Agriculture itself can also threaten this conservation if it spreads onto more marginal biodiversity-rich land rather than intensifying current crop production, in order to cope with our demand for food.

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