Paper 1: Charles Godfrey

Sustainable intensification in agriculture: premises and policies

"Improving nutrition is a key part of food security and food security is about more than just calories."

Tara Garnett

A policy known as sustainable intensification could help meet the challenges of increasing demands for food from a growing global population, argues a team of scientists in an article in the journal Science.

The goal of sustainable intensification is to increase food production from existing farmland says the article in the journal's Policy Forum by lead authors Dr Tara Garnett and Professor Charles Godfray from the University of Oxford. They say this would minimise the pressure on the environment in a world in which land, water, and energy are in short supply, highlighting that the environment is often overexploited and used unsustainably.

The authors, university researchers and policy-makers from NGOs and the UN, outline a new, more sophisticated account of how 'sustainable intensification' should work. They recognise that this policy has attracted criticism in some quarters as being either too narrowly focused on food production or as representing a contradiction in terms.

The article stresses that while farmers in many regions of the world need to produce more food, it is equally urgent that policy makers act on diets, waste and how the food system is governed. The authors emphasise that there is a need to produce more food on existing rather than new farmland because converting uncultivated land would lead to major emissions of greenhouse gases and cause significant losses of biodiversity.

Sustainable intensification is the only policy on the table that could create a sustainable way of producing enough food globally, argues the paper; but, importantly, this should be only one part of the policy portfolio. 'It is necessary, but not sufficient,' said Professor Charles Godfray of the Oxford Martin Programme on the Future of Food. 'Achieving a sustainable food system will require changes in agricultural production, changes in diet so people eat less meat and waste less food, and regulatory changes to improve the efficiency and resilience of the food system. Producing more food is important but it is only one of a number of policies that we must pursue together.'

Increasing productivity does not always mean using more fertilisers and agrochemicals as these technologies frequently carry unacceptable environmental costs, argue the authors. They say that a range of techniques, both old and new, should be employed to develop ways of farming that keep environmental damage to a minimum.

The authors of the paper accept that the intensification of agriculture will have some implications for other important policy goals, such as preserving biodiversity, animal welfare, human nutrition, protecting rural economies and sustainable development. Policy makers will need to find a way to navigate through the conflicting priorities on occasion.

Lead author Dr Tara Garnett, from the Food Climate Research Network at the Oxford Martin School, said: 'Improving nutrition is a key part of food security and food security is about more than just calories. Around two billion people worldwide are thought to be deficient in micronutrients. We need to intensify the quality of the food we produce in ways that improve the nutritional value of people's diets, preferably through diversifying the range of foods produced and available but also, in the short term, by improving the nutrient content of commonly produced crops.'

'Sustainability requires consideration of economic, environmental and social priorities,' added Dr Michael Appleby of the World Society for the Protection of Animals. 'Attention to livestock welfare is

both necessary and beneficial for sustainability. Policies to achieve the right balance between animal and crop production will benefit animals, people and the planet.'

Agriculture is a potent sector for economic growth and rural development in many countries across Africa, Asia and South America. Co-author Sonja Vermeulen, from the CGIAR Program on Climate Change, Agriculture and Food Security (CCAFS), said: 'It is sustainable intensification that can provide the best rewards for small-scale farmers and their heritage of natural resources. What policy-makers can provide is strategic finance and institutions that support sustainable and equitable pathways, rather than quick profits gained through depletion.'

Full reference:

Garnett, T., Appleby, M. C., Balmford, A., Bateman, I. J., Benton, T. G., Bloomer, P., Burlingame, B., Dawkins, M., Dolan, L., Fraser, D., Herrero, M., Hoffmann, I., Smith, P., Thornton, P. K., Toulmin, C., Vermeulen, S. J. & Godfray, H. C. J. 2013. Sustainable Intensification in Agriculture: Premises and Policies. *Science*, **341**, 33-34.

Notes

This article 'Sustainable intensification in agriculture: premises and policies' by Tara Garnett et al was published in the 5 July issue of Science.

The article follows a workshop on food security convened by the Oxford Martin School and the Food Climate Research Network at the University of Oxford. A more detailed account of the workshop is at: http://www.futureoffood.ox.ac.uk/sustainable-intensification

Dr Tara Garnett runs the Food Climate Research Network: http://www.fcrn.org.uk

Professor Charles Godfray is the Director of the Oxford Martin Programme on the Future of Food: http://www.futureoffood.ox.ac.uk

For more information on the Oxford Martin School, please visit http://www.oxfordmartin.ox.ac.uk

Dr Michael Appleby is Chief Scientific Adviser for Humane Sustainable Agriculture at the World Society for Protection of Animals www.wspa.org.uk

Dr Sonja Vermeulen is Head of Research at the CGIAR Research Program on Climate Change, Agriculture and Food Security http://ccafs.cgiar.org

Link to the press release: http://www.fcrn.org.uk/fcrn/press-releases/press-release-sustainable-intensification-agriculture-premises-and-policies

Paper 2: Georgina Mace

Views of nature, views of conservation

When we think of nature conservation, some of us may imagine wilderness protected in a natural park. Others may think of species closer to home, such as birds and butterflies helped to recovery by the reintroduction of hedges. In this essay, Georgina Mace traces the changes in conversation thinking in the past 50 years. She identifies four different views of nature as emphasis has shifted from individual species to ecosystems, and from viewing nature as separate from humans to considering direct benefits to humans from nature. The different views have important implications for how scientists can measure conservation success and how policy-makers value and manage nature.

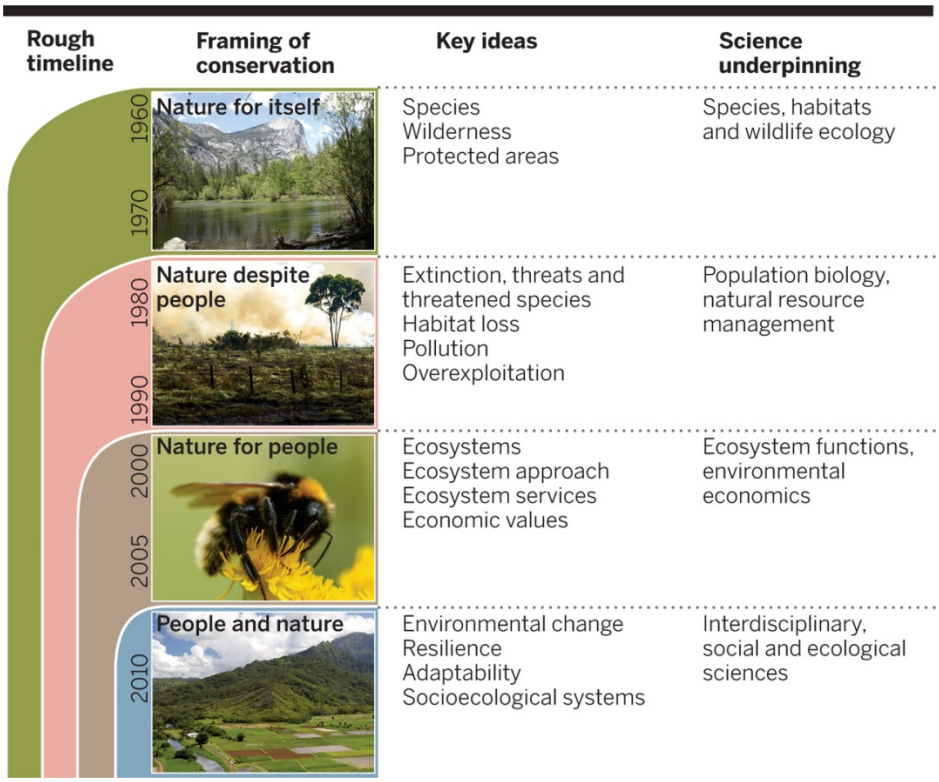

Figure: Over the past 50 years, the prevailing view of conservation has changed several times, resulting, for example, in a shift in emphasis from species to ecosystems. None of the framings has been eclipsed as new ones have emerged, resulting in multiple framings in use today.

This summary was published as an editorial in Science:
http://www.sciencemag.org/content/345/6204/twis.full.pdf

Paper 3: Ian Bateman

University of East Anglia research reveals true cost of farming to UK economy

The British landscape is not being used to its best advantage according to a new report from environmental economists at the University of East Anglia (UEA).

Research published today in the journal Science shows that allowing land use to be determined purely by an agricultural market, which is distorted by multi-billion pound subsidies, will result in considerable financial and environmental costs to the public.

It shows that a shake-up in the way EU subsidies are given out could greatly improve the way UK farm land is managed.

While the research has looked specifically at the UK, the same methods could be applied to any area of the world with similar results for many countries.

Land use in the UK is dominated by agriculture which accounts for almost three quarters of the total surface area. Payments to farmers in subsidies exceed £3billion per year, or nearly half the total annual value of UK agriculture.

The research team looked at half a million land use records and found that at present, UK land use represents poor value for society relative to that subsidy level. But a refocusing of payments could substantially improve the situation.

Alongside tangible financial costs in the form of subsidies, the researchers assessed the economic value of other costs, such as poor opportunities for recreation and high emissions of greenhouse gases associated with present land use. They also took into account the impact of declining wild species and biodiversity caused by intensive farming.

Looking to the future, they weighed up the consequences of alternative land uses and assessed a range of alternative scenarios going forward to the year 2060.

Key findings:

- Land use policy based on market prices alone results in decisions which lower overall values at national scale.
- Potential improvements in land use planning would generate social gains sufficient to more than compensate for any associated losses.
- Substantial improvements could be achieved through relatively modest changes in land use.
- Targeted measures would greatly help conserve wild species, while only marginally reducing market profitability.
- Converting comparatively small amounts of farm land into open access recreation space will yield a modest loss in farm produce value while generating a far greater value from increased recreation, with greatest benefits close to urban areas.

Prof Ian Bateman from UEA's School of Environmental Sciences led the research project. He said: "There is a good case for subsidising farmers to produce the things we want which are not paid for though market prices - and that includes better habitats for biodiversity, high quality recreation areas and lower greenhouse gas emissions.

"We worked out an economic value for each of these 'non-market' items to help us create a much more detailed economic picture of land use in the UK.

"We looked ahead to 2060 and took into account other factors that may impact farming such as changing policies, environmental regulations, market forces, changes in farming technology and climate change, which could altering the growing season and amounts of rainfall.

"We found that a conventional market dominated approach to decision making will reduce the overall values from the landscape in many parts of the country. However, taking into account these non-market environmental benefits or costs of land use would lead to net financial gains nationally, due to reduced pollution, enhanced recreation and urban greenspace, and improvements in biodiversity habitats.

"It is absolutely vital that impacts which are difficult to put a price on, such as a loss of biodiversity, should be incorporated into land use policy. But no single policy will be optimal everywhere. Our findings show that a targeted approach to decision making is the best approach.

"The clearest way to achieve this goal is to reform the EU's Common Agricultural Policy (CAP) which oversees payments to farmers in excess of £3 billion per year. The vast majority of these payments are made without consideration for environmental performance. Rewarding farmers for delivery of a broad spectrum of ecosystem services would provide policy makers with a very powerful tool to secure beneficial land use change."

This article was published on the UEA website on the 4th July 2013:

https://www.uea.ac.uk/mac/comm/media/press/2013/July/true-cost-farming

Full reference:

Ian J. Bateman, Amii R. Harwood, Georgina M. Mace, Robert T. Watson, David J. Abson, Barnaby Andrews, Amy Binner, Andrew Crowe, Brett H. Day, Steve Dugdale, Carlo Fezzi, Jo Foden, David Hadley, Roy Haines-Young, Mark Hulme, Andreas Kontoleon, Andrew A. Lovett, Paul Munday, Unai Pascual, James Paterson, Antara Sen, Gavin Siriwardena, Daan van Soest and Mette Termansen (2013) Bringing ecosystem services into economic decision making: Land use in the UK, *Science*, **341**: 45-50

Related links

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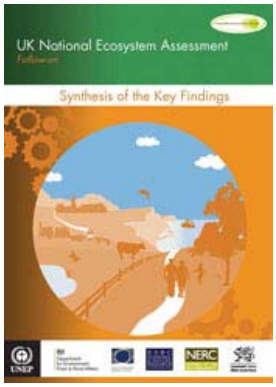

Reports from the UK National Ecosystem Assessment Follow-on Phase can be found here:

http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

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