

Ecologists Review Evidence on Environmental Benefits of Organic Farming

The increasing evidence that organic farming has benefits for biodiversity and the delivery of ecosystem services was under the spotlight at a recent joint meeting of the Organic Research Centre (ORC) and the British Ecological Society (BES).

The event, held on Tuesday 17th May 2011 at the Organic Research Centre near Newbury brought together leading scientists, policy makers, farmers and NGOs to discuss the role of organic farming in delivering biodiversity and a wide range of other ecosystem services within a productive UK farming sector.

At the heart of this meeting was a discussion of the critical issues around sustainable farming and land-use including apparent trade-offs between different demands on land, such as food production, biodiversity and other ecosystem services.

Speakers included Prof. Martin Wolfe (ORC/Wakelyns Agroforestry), Dr Lisa Norton (Centre for Ecology and Hydrology), Dr Jo Smith (ORC), Rob Brown (University of Reading) and Andy Goldring (Permaculture Association). They covered agro-ecological approaches to sustainable agriculture, the effects of organic farming at a landscape level and the evidence on the biodiversity benefits of organic farming.

Delegates had the opportunity to see innovative examples of organic farms demonstrating the delivery of a range of ecosystem services through visits to Sheepdrove Organic Farm and Tolhurst Organic Produce.

Commenting on the event Prof. Nicolas Lampkin (Director, ORC) said:

“The evidence being presented today will show that organic farming has a clear role to play in supporting biodiversity and a sustainable future for UK farming. There is an increasing wealth of evidence that organic/agro-ecological farming approaches can and do deliver a wide range of ecosystem services, including food, in a joined up way”.

Abstracts and pdf's of the presentations and posters are available below.

Prof. Em. Martin Wolfe, Wakelyns Agroforestry and Organic Research Centre

Abstract: Sustainable agriculture is in our nature

Because of its predominance in global land use, agriculture must make a major contribution to ecosystem services as well as to producing food. Unfortunately, over the last two hundred years, the global balance has swung heavily towards food production to the major detriment of biodiversity and ecosystem services. Awareness of this process has led to various suggested solutions, most of which propose some form of maintained separation between agriculture and the natural world, which is now being restricted to parks and field margins. There is, however, an under-exploited option, ecological farming, whose productivity depends on the interactions of wide-ranging elements of biodiversity and which therefore brings together food production and support for ecosystem services.

Organic farming is one form of ecological farming as indicated by consistent evidence for improvements in the abundance, richness and evenness of simple biodiversity markers relative to non-organic systems. Such markers are, however, crude and take only limited cognisance of the multiple elements of functional biodiversity and processes involved in ecological farming systems. Consequently, there is an urgent need to develop more complex, ecologically-based systems such as eco-agroforestry which can bring a simultaneous step change in overall productivity and biodiversity while improving climate change mitigation through carbon sequestration.

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Lisa Norton, Senior Scientist at the Centre for Ecology and Hydrology, Lancaster

Abstract: Landscape differences between organic and conventional farms

This paper provides a detailed description and analysis of habitat and management differences between 89 pairs of organic and non-organic fields on 161 farms containing arable crops distributed throughout England. Data were derived at different scales ranging from field to landscape scale using a range of methods including: land manager questionnaires, habitat surveys and the use of large scale landscape datasets. Organic farms were situated in inherently more diverse landscape types, had smaller field sizes, higher, wider and less gappy hedgerows subject to less frequent management, used rotational practices including grass, were more likely to be mixed farms and did not use artificial fertilisers and pesticides.

Organic farms were inherently associated with heterogeneous landscape types. However, even in such landscape types the organic farming system produced greater field and farm complexity than farms employing a non-organic system. The findings of the study point to the importance of organic farming systems for maintaining landscape and local complexity with consequent benefits for biodiversity in arable farming landscapes. Differences between organic and non-organic systems may provide a focus for policy initiatives to arrest declines and restore biodiversity on farmland. However, the extent to which individual factors can enhance biodiversity when divorced from the farming system is unclear.

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Io Smith, Agroecology Researcher, Organic Research Centre

Abstract: Biodiversity impacts of organic farming: the evidence

Ecology and biodiversity are at the heart of the organic principles and organic systems rely on ecosystem services such as pollination, pest control and decomposition to maintain productivity. The delivery of these services requires a biodiverse agro-ecosystem, and organic systems are planned and managed to encourage biodiversity. The biodiversity impacts of organic farming were supported by two 2005 reviews of comparative studies (Bengtsson et al, JAE; Hole et al, Biol. Cons.) which concluded that organic farming is beneficial for a wide range of taxa. These reviews also raised a number of methodological limitations such as selection of appropriate controls to take into account landscape characteristics and variation in spatial scales of studies. This paper presents a review of comparative studies of organic and conventional systems published since 2005. The majority of these studies report positive responses of biodiversity to organic farming, and several found an interaction with the landscape so that the biggest benefit is seen in simple landscapes with a high percentage of arable land. However, even within complex landscapes, within-field biodiversity is usually higher in organic systems. The evidence for relationships between biodiversity and ecosystem services such as pest control and crop pollination in organic systems is also discussed.

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Robert Brown, PhD student, Centre for Agri-Environment Research, University of Reading

Abstract: Multiple biodiversity and ecosystem service benefits from legume-based mixtures

There is an increasing recognition of the importance of conserving farmland biodiversity and the ecosystem services it can provide. The introduction of legumes into the crop rotation is an effective way to maintain crop production by replacing lost nitrogen in organic systems. However, the potential of these legume leys to support wider biodiversity and other ecosystem services, such as pollination of neighbouring crops, and their potential to provide a habitat to species of conservation concern is poorly understood.

This project investigates the potential benefits to pollination and decomposer services in a novel legume mixture being developed by the DEFRA and industry-funded LegumeLINK programme. The mixture, containing 12 legume species, has been designed to increase the stability of nitrogen fixation in organic systems across diverse environmental conditions. However, the legumes also provide a large flowering resource that has a longer flowering duration than many standard white clover and rye grass leys. Here I present preliminary results from my study.

Understanding how diversity within legume leys affects aspects of ecosystem functioning other than nitrogen fixation, such as pollination and decomposition, will demonstrate the potential role of organic farming methods in sustaining biodiversity and providing multiple ecosystem services.

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Andy Goldring, Permaculture Association

Abstract: Enhancing biodiversity in cultivated ecosystems: the permaculture design approach.

Permaculture seeks to design sustainable human settlements that combine soil, plants, animals, water and other components in an integrated productive system. The long term intention is to meet human needs on the smallest land area possible, to enable the re-wilding of large tracts of currently cultivated land.

A central contribution of permaculture is the assemblage of highly diverse multi-species plantings which yield food, fuel, fibre, medicinal and other products, as well as ecosystem services such as soil-building, climate and rainfall stabilisation, and pollination. Scientific challenges arise from monitoring, recording, understanding and replicating these complex systems.

The presentation will provide a brief overview of the permaculture approach, our current research work to capture in situ evidence - at a range of scales from home gardens, public realm, smallholdings and farms - and then focus on emerging observations of how permaculture systems and their associated techniques support biodiversity to flourish.

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POSTER PRESENTATIONS

Hugo Envain, PhD student, University of Aberdeen

Abstract: Assessing the ecosystem services associated with organic farming in Scotland

With its first Land Use Strategy the Scottish Government called for the application of an ecosystem approach to land use: Land-use management should sustain and recognize the value to the economy and to the health of the services provided by ecosystems in Scotland. There are assumptions and evidences that organic farming potentially deliver higher benefits to the environment and health than conventional farming, but this needs to be embedded in a global ecosystem services assessment in order to be better recognized and valued, e.g. through public support.

This project aims to design a relevant Ecosystem Services (ES) approach to assess the benefits drawn by organic agriculture to human well-being in Scotland and the adequacy of public support. An on-going desk-based study is reviewing the existing ES assessment methods. One issue faced is that ES conceptual approaches are still being widely discussed. Applied ES assessment will have to be carefully designed according to aims and scale of the study in order to be relevant. The ES approach will then be applied through field studies in partnership with SOPA (Scottish Organic

Producers Association) farmers. The second aims of the study being to assess the potential differences in ES delivery within the range of organic farming systems present in Scotland and between organic and conventional farming system, pointing out the key-factors driving those differences.

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Laura Clements, PhD Student, University of Southampton

Abstract: The effect of anaerobic digestate on soil biota

Digestate, a by-product of anaerobic digestion, may be used as a soil fertiliser, however, the effects its application has on soil biota have not been documented. Application of digestate has the potential to be harmful by negatively affecting earthworm populations, resulting in a reduction of their role in providing soil fertility; an important ecosystem service. Earthworms can be divided into three ecological groups (leaf dwellers, deep burrowers and horizontal burrower), each having a beneficial role to play in agricultural processes. Experiments are often conducted on the earthworm *Eisenia fetida*, which is a compost worm (leaf dweller) and has a limited role in agriculture. It is rarely found in agricultural fields, and therefore studies of this species may not accurately represent the responses of field dwelling species. Here, I outline the value of the functional diversity of earthworms and present my own research conducted on the impact of digestate on earthworm populations.

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