Can organic farming deliver natural heritage goals in the UK uplands?

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Summary

Policy support for organic farming in the UK is based in part on the ability of organic farming systems to deliver natural heritage benefits. Most UK research on the natural heritage benefits of organic farming has addressed lowland arable systems. A reanalysis of a subset of data from a MAFF-funded study of biodiversity in England and Wales suggests that organic systems in predominantly pastoral landscapes may show similar biodiversity benefits to ones in predominantly arable landscapes. Future research needs to address organically managed pastoral, hill and upland systems across the UK.

Keywords: Organic farming, natural heritage, uplands, biodiversity, agroforestry

Background

Research on the impact of conventional agriculture on natural heritage (wildlife, habitats, landscapes, soils, water and air) has taken place on all major farm and land types. However, most research in organic systems has concentrated on lowland arable and stock farms (Shepherd *et al*., 2003; Fowler *et al*., 2004). In Wales and Scotland over 94% of the organic land was under pasture in January 2006 (Soil Association, 2006), much of this being in the hills and uplands. Policy support for organic farming in the UK is partly based on the ability of organic farming systems to deliver natural heritage benefits. This paper reports provisional findings from a review being carried out for Scottish Natural Heritage. It addresses the potential of organic farming to deliver natural heritage goals in the uplands and presents a new analysis of bird data from pastoral landscapes collected on organic and conventional farms in England and Wales.

Do management practices on organic and conventional farms differ in the uplands?

Agriculture in the UK uplands is dominated by livestock production. The major differences in upland systems between organic and conventional systems likely to affect natural heritage features can be summarised as: non-use of soluble N fertilisers; restricted input of other mineral fertilizers; increased use of legumes and of herbs in swards; greater emphasis on forage in the diet; lower stocking rates; increased ratio of cattle:sheep; use of livestock breeds adapted to their environment; limited products to control external parasites; reduction and restriction on the use of prophylactic veterinary medicines and mechanical and manual weed control.

Natural heritage impacts of organic farming in the uplands

Soil, water and air

There are few UK studies of the effects of organic versus non-organic farming on soil quality, none of these in the uplands (Shepherd *et al*., 2003). Bengtsson *et al*. (2005) concluded that diversity of soil organisms, including fungi, tended to be higher under organic management. The published information on greenhouse gas emissions from organic farming is still very limited, particularly in upland systems. The often high organic matter content and low pH of upland soils means much published lowland work on gaseous losses is not applicable in the uplands. Ball *et al*. (2002) working in NE Scotland concluded that CO_2, N_2O and CH_4 emissions would be lower than from conventional systems due to lower stocking rates. Watson *et al*. (2004) concluded that the influence of organic production on water quality will depend upon the intensity of the systems in question together with specific cropping and management practices on individual farms.

Biodiversity

Several studies have compared biodiversity in organic and non-organic farming systems, reviewed in Hole *et al*. (2005). However, most large-scale studies of biodiversity on organic systems have been biased towards (e.g. Chamberlain *et al*., 1999), or targeted upon, lowland arable systems (e.g. Fuller *et al*., 2005). Positive effects of organic farming have been detected for species diversity of butterflies, soil organisms, predatory invertebrates, bats and birds (Bengtsson *et al*., 2005; Fuller *et al*., 2005). In addition to differences in management practices, the greater diversity of land use is likely to contribute significantly to farmland biodiversity.

Analysis of bird data collected on grassland farms in 1992–1994

Between 1992 and 1994 birds were surveyed on paired organic and non-organic farms throughout England and Wales. The number of farm pairs sampled ranged from 7 to 18 depending on year/season, less than 10-km separated each pair. Survey visits were carried out in winter (6) and the breeding season (4). In winter, all birds were counted on each visit by walking each field boundary length and crossing fields (to flush birds). In the breeding season, a similar procedure was carried out for field boundaries, but only Skylarks were surveyed in fields. Full methods are given by Chamberlain *et al*. (1999). For this work, a subset of the farm pairs were analysed. These farms were selected to be representative of lowland farming in Scotland, where pastoral and mixed enterprises are commonly found within a generally grass-dominated landscape. Consequently sites in pastoral and mixed counties of England and Wales were selected, and then only if grass > arable area in the surrounding landscape (derived at the 10 km scale from ITE Landcover Map 1990 data). Only seven farms met the criteria. Paired comparisons of bird density were carried out by allocating birds to groups based on diet. The Defra Farmland Bird Indicator (FBI) species were analysed as a group, and a series of mutually exclusive groups were defined: small granivores, large granivores, insectivores and earthworm feeders. For the breeding season, the latter two groups were combined. The density of all species was recorded.

In winter, there was a significantly higher density of insectivores, FBI species and all species on organic farms. Furthermore, the mean density was higher on organic farms in each case and for large granivores, this difference approached significance (Table 1).

Table 1. *Mean density of birds defined into groups on organic and conventional farms in Wales and western England. Density is per ha in winter and per 100 m of field boundary in the breeding season.* *P < 0.05, (*) 0.05 < P <0.10 *(paired* t*-test)*

Season	Habitat	Species group	No. farm pairs	Organic	Conventional	T
Winter	Whole farm	Small granivores	6	1.98 ± 2.66	0.35 ± 0.38	1.72
		Insectivores	6	0.90 ± 0.55	0.60 ± 0.38	2.65*
		Earthworm feeders	6	2.75 ± 3.66	1.63 ± 1.08	0.97
		Large granivores	6	0.69 ± 0.76	0.04 ± 0.06	2.02(*)
		FBI††	6	3.04 ± 1.98	1.06 ± 0.80	3.27*
		ALL	6	8.30 ± 3.52	4.05 ± 2.12	3.02*
Summer	Field boundaries	Small granivores	7	0.23 ± 0.15	0.19 ± 0.12	1.73
		Insectivores	7	0.54 ± 0.25	0.43 ± 0.23	2.67*
		FBI†	7	0.08 ± 0.07	0.05 ± 0.04	1.94
		ALL	7	1.05 ± 0.44	0.95 ± 0.55	0.71
Summer	Fields	Skylark	6	0.01 ± 0.01	0.02 ± 0.02	-0.76

†Defra Farmland Bird Indicator Species

In the breeding season, only insectivores showed a significant difference, again density being higher on organic farms (Table 1)

Opportunities for agroforestry in the uplands

Agroforestry is the integrated management of crops, animals and trees, which can be beneficial to all components including the farmer and the natural heritage. Insufficient work has been done on the potential benefits of organic agroforestry, but the large body of work on agroforestry already available, combined with extrapolations such as those described above and practical experience of organic agroforestry systems, all indicate that the benefits are likely to be highly significant. In the Scottish context, there is now considerable active interest in a range of upland and hill systems involving sheep, cattle and pig grazing on pasture in different types of woodland (Proceedings of 2nd Woodland Grazing Workshop, 2005). The consensus appears to be that further development of such systems could be beneficial for the natural heritage while producing both timber and high quality meat from healthy animals. Our view is that organic conversion of such systems could help further in delivery of natural heritage benefits while improving sustainability and underlining the quality of the products through appropriate premiums to the producers.

Conclusions

The literature review has highlighted the paucity of data on the natural heritage benefits and/or disbenefits associated with UK hill or upland systems, with virtually no data available for Scotland. It has also highlighted the lack of data on organically managed pastoral systems. Re-analysis of data from the 1992–1994 study suggests organic systems in pastoral landscapes may show the same biodiversity benefits as those in arable landscapes. However, this analysis was carried out on a very small dataset and the hypothesis needs further robust testing. In order to understand the natural heritage value of organic farming in Scotland, Wales and Northern England it is important that future research specifically addresses pastoral and upland systems.

Acknowledgements

The authors are grateful to SNH for sponsoring this research. The 1992–1994 bird survey was funded by MAFF. We thank all those who contributed to the original survey.

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