

A vision for biodiversity in agricultural landscapes

Introduction

1. This paper shows how farming has changed England's landscape and the ecology of its wildlife. It outlines what needs to be done to retain this biodiversity and its ecological processes.

2. While the English countryside still contains a rich diversity of landscapes and wildlife, the huge increase in farm production over the last half century has been at the expense of the biodiversity that formerly occurred in crops and pastures. The challenge for the future is not to curtail agriculture but to find ways to ensure that farmers are able to restore this lost wildlife alongside modern farm systems. The countryside is also a catchment which supplies the nation's water and provides an open space for quiet recreation; but although most farmers can get some support on the "income foregone" principle through agri-environment schemes, on the whole they gain no profit from these assets.

3. England's hill farms, with their in-by-pastures and moorland grazings, have changed less than lowland farms, but these uplands have been affected too, mostly by past overgrazing and government driven, but unwise, drainage schemes. Because of its unique flora and bird life, much of the English upland is designated by statute and receives special funding through environmental schemes.

Historical Context

4. The Neolithic people who built Stonehenge 4,000 years ago were not hunter-gatherers in an ancient wildwood - they were farmers cultivating fields, growing crops, maintaining grasslands and raising livestock. Agriculture was not an indigenous development. It had spread across Europe from the Middle East during the preceding 2,000 years. The principal staples of wheat and barley were derived from annual grasses that were growing in the "fertile crescent" in what is now eastern Turkey and northern Syria. With this spread of crops and livestock came many animals and plants from these eastern grasslands. To a lot of these we have given names that echo a farming association; mammals like harvest mouse and field vole; birds such as corn bunting, meadow pipit, field fare, barn owl, and hedge sparrow; the butterflies like hedge brown, and gatekeeper, as well as wild flowers including corn cockle, corn flower, and corn gromwell.

5. By Roman, and certainly by Anglo-Saxon times, most of England was an open countryside that would be familiar to us today. Some parts of our landscape have changed more than others. The broad sweep of arable dominated land that extends from Dorset, through northern Hampshire, Wiltshire, Berkshire and on to East Anglia and Lincolnshire, has been termed a "planned countryside" where older field patterns were replaced in the Middle Ages by big open common fields subdivided into furlongs and bounded by wide headlands to allow an oxen team to swing round at the end of each furrow. Between the 16th and 19th centuries this landscape was re-planned again by enclosure which created a patchwork of smaller fields and discrete

farm ownerships. Villages lost their farmhouses and farmyards as these were moved out to the new buildings among the enclosed fields. Lost also was peasant farming as small holdings were consolidated into larger ones. In other parts of England, things changed much less, and the south west and the south east, as well as the uplands, retained much of their older character.

Recent agricultural changes and the biodiversity challenge

6. Although life for farm workers has probably always been hard, farm profitability reached a golden age in mid-Victorian times but this was followed by agricultural depression. There were 5½ million hectares of cereals growing in Britain in 1860 which dropped to 3½ million by 1935. Massive government intervention during the Second World War reversed this and severe rationing led directly to European countries maintaining their home production by farm subsidy. Post war changes were rapid and profound. Coal and petroleum provided fuel, fertiliser and pesticide, which not only hugely improved yields, but reduced man-power and freed up land to produce food instead of fodder for draught horses. The potential impacts of these changes on wider “rural amenities” were described as early as 1945 in the Agriculture Committee minority report but it was not until the 1970s and 1980s that these wider impacts were more widely recognised. The imperative for food production – which remains as the world’s population continues to increase – has come to predominate, but this has resulted in an unintended reduction in biodiversity. However, there have been significant improvements in pesticide formulation and fertiliser application technology in recent years which have decreased pollution. Since 2003 farm subsidies have largely been de-coupled from production and a proportion of farm payments are now for conservation schemes through agri-environment measures.

Guiding Principles

7. As a nation we have a strong emotional attachment to the countryside and it is a recurring theme in our paintings and poems. This cultural value underpins the bedrock of public support there is for rural causes.

8. Conservation on farmland must recognise our agricultural history and the interdependence of farming, landscape and wildlife. We must aim for viable populations of our farmland flora and fauna in suitable habitats within the limitations of geography and climate.

9. Our principles are based on the three essential objectives of conservation first set out explicitly in the World Conservation Strategy in 1984 by IUCN and the United Nations. These are:

- to maintain essential ecological processes and life support systems (such as soil regeneration and protection, the recycling of nutrients and the cleansing of waters), on which human survival and development depend;
- to preserve genetic diversity (the range of genetic material found in the world’s organisms), on which depend the functioning of many of the above processes and life-support systems, the breeding programmes necessary for

the protection and improvement of cultivated plants, domesticated animals and microorganisms, as well as much scientific and medical advance, technical innovation, and the security of many industries that use living organisms;

- to ensure the sustainable utilization of species and ecosystems (notably fish and other wildlife, forests and grazing lands), which support millions of rural communities as well as major industries.

Turning principles into policy

Maintaining essential ecological processes:

10. Farmland is essentially a highly modified natural prairie or steppe. In natural grassland energy from the sun is used by plants to produce carbohydrates that are consumed by animals. Water, carbon dioxide and oxygen are exchanged with the atmosphere, but nutrients, mostly derived from the mineral rock, are recycled back to the plants by decomposition in the soil. Traditional farming systems mimic this ecological process by moving crops and livestock around to different parts of the farm each year so that even though much of the plant production is diverted to human consumption the nutrients are returned to the soil. Modern agriculture by contrast relies on non-renewable fuels, pesticides and fertilisers and primary production is exported out of the ecosystem. Traditional farming, because of its similarity to natural grassland, usually supports a greater biodiversity than modern farming.

11. Without compromising food production we need farmers to adopt methods that more closely follow the ecological pathways of natural grassland. To do this, we need strategies that:

- Increase the organic matter in soils so enhancing the soil fauna including earthworms. Methods of reduced tillage for arable crops are likely to be important as are the greater use of organic fertilisers and incorporation of crop residues.
- Ensure that water courses that run through farmland carry the minimum of silt, fertiliser and pesticide. Appropriately-sized and maintained buffer strips with good vegetative cover located adjacent to ditches and streams help, but we need to improve the management of crop tramlines and field drains, and prevent livestock from trampling river banks and pasture. We need to retain ponds and other small wetland features where possible.
- Encourage approaches that minimise the adverse effects of artificial fertilisers and pesticides. New technology that applies exact measures to suit growing crops and the development of disease and pest resistant crops are good examples.
- Maintain a matrix of semi natural habitats, (hedgerows, banks, walls, ditches, trees, small patches of unimproved grassland, and woods) across all farmland. These semi-natural habitats support wildlife but they also are home

to many predatory and parasitic insects that help to keep down populations of crop pests like greenfly. They also harbour bees and other pollinators on which fruit crops depend.

Preservation of genetic diversity:

12. Genetic diversity increases species and ecosystem resilience. Maintaining and improving the ecological processes will help preserve the wild species, but their survival does not always depend on this alone and factors such as disease can also limit them.

13. It is important to conserve the many varieties of domesticated livestock and crop because not only are they the basis for future plant and animal breeding programmes, but variety also makes domestic crops and livestock less vulnerable to pests and disease outbreaks. Only 30 crops provide 90% of the world's diet, with wheat, rice and maize accounting for about half. Fewer than 15 species of mammals and birds account for 90% of global livestock production. The United Nations Food and Agriculture Organization indicates that a breed is being lost each month.

14. Farmland is critical to the ecological functioning of the countryside and conservation and agriculture programmes must champion and maintain biodiversity in wild species and domestic breeds. We need to do much of the following:

- Identify, protect, and enhance the small pockets of habitat that contain species and sub-species of plants and animals wherever they exist buffering and linking them to other sites. SSSIs and Local Wildlife Sites are essential for this.
- Prevent the uncontrolled introduction of non-native wild species into our countryside, and we must eradicate or control the most invasive non-natives that threaten our fauna and flora.
- Use a range of measures (including agri-environment, voluntary or regulatory) to encourage farmers to preserve wildlife on their farms, not only in hedgerows, woods, and streams but in open fields and crops too.
- Use a range of measures to maintain those traditional forms of farming which support wildlife.
- Use rural development programmes, assurance schemes, and other market mechanisms to support the preservation of traditional and local livestock breeds - preferably in the localities in which they originate.

Sustainable use:

15. Farming by nature is a sustainable land-use compared with non-renewable resource industries such as mining. But because farming now relies on fossil fuel, industrial fertiliser and pesticide, modern farming is less sustainable than it once was. Cutting down on these non-renewables will be difficult if we are to maintain farm outputs. Organic farm systems in their current form, although more sustainable,

are unlikely to be productive enough for modern needs because organically farmed land typically requires long periods of grass in the rotation to re-build soil fertility. Nevertheless in the long-term, farming will have to radically reduce its dependence on fossil fuels, as well as minimise its use of pesticide and fertiliser through the greater use of integrated farm management systems. We also need to pioneer new systems that will take us further in this direction. These might include:

- The development of new crops which, like leguminous plants, fix atmospheric nitrogen thus reducing the need for artificial fertiliser.
- The development of perennial rather than annual staple crops so reducing cultivations.
- More pest resistant crops developed through breeding or genetic modification so minimising the use of pesticide.
- The better use of farm woodlands and streams for local energy production; for example, supplying and burning wood chips derived from restored coppice woodland or re-instating derelict river mills to produce electric power.
- Incorporating a greater proportion human waste (e.g. biosolids from sewage, and digestate from separated household refuse) back into farm soils.

Measuring performance

16. In order to judge progress in the three policy areas (maintaining ecological processes, preserving genetic diversity and developing sustainable use) we need indicators that directly measure the qualities we aim to improve. Indicators should not be substitutes set for management convenience. Good examples of appropriate indicators could be:

- River quality (Ecological process indicator)
- Organic matter content of agricultural top soils (Ecological process indicator)
- Maintenance of water levels in rivers through farmland (Ecological process indicator)
- Populations of farmland birds (Genetic diversity indicator)
- Populations of butterflies on farmland in England (Genetic diversity indicator)
- Condition of farmland SSSIs in England (Genetic diversity indicator)
- The quality and extent of other semi-natural habitats on farmland outside SSSIs (Genetic diversity indicator)
- Effective population size for native breeds of sheep, cattle, pigs and poultry (Genetic diversity indicator)
- Direct non-renewable energy consumption by farms (Sustainable use indicator)
- Indirect energy consumption by farms (Sustainable use indicator)
- Emissions of methane and nitrous oxide from agriculture (Sustainable use indicator)

Conclusion and inspiration

17. Philosophically there are two opposing approaches to maintaining biodiversity in a farmed landscape.

The first is to concentrate agriculture onto as small an area as possible and farm it intensively at the expense of wildlife; keeping the rest of the unfarmed landscape as wilderness or nature reserve. This can make sense in regions of the world where, for example, tropical forest is being cleared to make way for inefficient farming. In such cases it may be better to protect the forest and intensify agricultural production on a small fixed area.

The second is to integrate conservation into agriculture and if necessary subsidise less intensive farming to allow this to happen. This is much more suited to Europe, and England in particular, where most land has been farmed for centuries and where much wildlife is truly dependent on traditional mixed livestock and arable agriculture. Allowing farmland to re-wild into scrub and then secondary woodland will do nothing to conserve the brown hare, the barn owl or the chalkhill blue butterfly.

Farm profitability varies across England in relation to topography, climate and soil. Nature conservation and tourism can help reduce these differences, but often incomes from these sources benefit shops and pubs more than they do farmers. It is important that farming remains profitable across the country.

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