Enhancing arable biodiversity through the management of uncropped land

an HGCA guide

Summer 2011
Introduction

Biodiversity is valuable for more than just environmental reasons: it underpins the biological processes associated with agricultural production. Increasing biodiversity can enhance the contribution of natural enemies to pest control and some agri-environment options can act as buffers to protect watercourses from spray drift and soil erosion. Nearly all of the approaches described in this guide are currently financially supported in the Entry and Higher Level Stewardship schemes in England and some are also supported in Scotland and Wales (see page 14).

Within the current Common Agricultural Policy (CAP), biodiversity concerns are addressed through measures underpinning both Pillar 1 (direct support payments) and Pillar 2 (rural development payments). Environmental management is an important feature of modern agriculture and the upcoming round of CAP reforms is expected to examine which specific measures can add the most value in terms of biodiversity.

Results from the Farm4bio project were part of the evidence base used to develop the Campaign for the Farmed Environment (www.cfeonline.org.uk), aiming to show, through voluntary measures, that farmers and land managers can provide a healthy environment within commercial agriculture and reduce the likelihood of compulsory set-aside being reinstated.

There is clear evidence that benefits to biodiversity are greatest where every farm does something specifically for biodiversity, rather than having isolated pockets of favourable habitats and food sources across the landscape.

Every farm can have an environment where wildlife can prosper

What is in this guide?

This guide describes simple techniques to enhance on-farm biodiversity through the efficient use of land without impacting greatly on farm management and profitability.

These guidelines are mainly formulated from the LINK project Farm4bio (www.hgca.com/Farm4bio). The project set out to determine whether acceptable levels of biodiversity could be achieved on conventional arable farms through the management of uncropped land.
How much cropping land should be devoted to biodiversity?

For farmland birds there are clear benefits to having an area of around 4 in every 100 hectares as uncropped land; the more that can be supplied the better. For insects the more food (mainly flowers over the summer) and habitat (often grassy) that can be supplied the better.

Uncropped land

Uncropped land in the context of this guide is: land that could otherwise be cropped. The 4 in every 100 hectares of arable land can be surprisingly easy to find as virtually all blocks of arable land already have existing areas of uncropped land, less productive areas or areas that are awkward for machinery operation.

Not all of the uncropped land needs to be sown to the mixtures suggested in this guide, but existing uncropped land can be improved with sown mixtures to encourage biodiversity.

Working with existing landscapes and species

Different species have adapted to thrive in different landscapes.

It is best to maintain the appearance of the landscape and encourage those species that are already present. Where there are large open fields that have few hedges or field margins it is better to encourage bird species such as lapwings or skylarks. Where the landscape is heavily divided by hedges and woodland, species such as song thrush and yellowhammer should be encouraged (see page 7).

What is needed to increase the amount of wildlife?

Pollen and nectar are essential for:
- Pollinators
- Natural enemies of crops pests
- A range of other insects, which provide summer food for farmland birds

Growing cereal grain and oily seeds of different sizes will help sustain populations of:
- Farmland birds
- Small mammals

Supplementary feeding is often needed in late winter/early spring

Hedgerow and field margin habitats:
- Provide nesting and foraging areas
- Support insects
- Can be enhanced with perennial strips of flowers on the sunny side of field boundaries

Open, short vegetation away from field boundaries:
- Supports ground-nesting birds
Vegetation types

Are grass margins enough?

Many arable farms already have stewardship margins. While beneficial, their biodiversity value could be at least doubled for some species if they contained flowering plants. It is difficult to introduce reliably flowering plants into established grass margins. Instead, some of these areas could be replaced with flower-rich grassland, or legume mixes could be sown alongside them.

![Figure 2](image-url) Percentage increase in numbers of wild bees (excluding honey bees), butterflies and hoverflies in wild bird seed and flower-rich grassland compared to grass-only margins during July (data from the Farm4bio project).

![Figure 3](image-url) Percentage increase in bird chick-food biomass and numbers of parasitoids in wild bird seed and flower-rich grassland compared to grass-only margins (data from the Farm4bio project).

Each farm can make a difference by...

1. Seeking advice from local conservation advisers
2. Managing existing habitats including hedgerows and field edges
3. Identifying what is needed to encourage wildlife
4. Creating new habitats that provide food, breeding areas and shelter
5. Checking that improvements are working

Local conservation advisers (eg FWAG, Game & Wildlife Conservation Trust, Natural England, Wildlife Trusts) may be able to provide advice on species identification or arrange for surveys to be conducted.

The Campaign for the Farmed Environment website ([www.cfeonline.org.uk](http://www.cfeonline.org.uk)) has maps that will enable a targeted approach to be adopted.
What are the key vegetation types?

Each farm is unique and different practices are required to exploit the natural features. The common aim is to provide food, breeding areas and shelter for species throughout the year, so as a minimum the aim is to provide two types of vegetation:

**Flower-rich grassland**

- Non-competitive grasses with a range of flowering plants. Seed can be sourced from around £150/ha. The mixture can be left down for many years with appropriate management, making it ideal for establishment in awkward corners.

**Wild bird seed**

- Cereal grains and oily seeds sown as mixtures or co-located strips. Alternatively, leave some wheat standing over winter (ie unharvested cereal headlands and establish a mix of seed-bearing broad-leaved plants elsewhere).

There are five additional options that may significantly add value:

1. **Legume mixes**
   - Use a diverse mix with no grasses to extend the flowering period and ensure longevity
   - Can be used to compensate for the lack of flowers in grass-only margins by providing flowers over the summer
   - May last for four to five years

2. **Broad-leaved insect-rich cover**
   - Broad-leaved plant species, such as vetches and brassicas will create an appropriate habitat for foraging birds provided that they can access the ground - second year kale is especially good
   - Can also be left through the winter as a source of seed for birds to complement an unharvested cereal headland
   - Can be established in both autumn and spring to increase biodiversity

3. **Unfertilised and unharvested cereal headlands**
   - Can be used to create insect-rich habitats for foraging birds and provide seed in winter
   - Locate in areas with good populations of spring-germinating weeds as these support the most insects
   - When autumn-sown, oversow with broad-leaved plants (eg mustard, vetch or phacelia) in spring to encourage insects

4. **Skylark and lapwing plots**
   - Encourage nesting by skylarks and lapwings during the summer, but may not provide a food source or a resting site during the winter
   - Summer fallows provide similar benefits

5. **Natural regeneration after early spring cultivation**
   - Helps conserve rare arable plants likely to be found around field edges and corners, on land with a history of spring cultivation, with low fertility such as sandy or chalky soils and a sunny aspect
   - Should aim to encourage weed species that host insects or produce seeds that feed birds over winter – including fat hen, red dead nettle, groundsel, knot-grass and common chickweed
   - Unadvisable on heavy ground and where the site is infested with aggressive weeds such as barren brome, black-grass, cleavers, docks and thistles

---

See pages 8 & 9

See pages 10 & 11

---

An alternative to flower-rich grassland but needs annual establishment

The value will be diminished where there is no recent spring cropping history

Will only be of value if the land has been regularly spring cropped
Plants
A diverse range of perennial and annual flowering plants can be present on farmland but typically thrive best in areas free from fertiliser and herbicides.

Hedges and ditches
The hedgebase can support a diverse mixture of herbaceous perennial species which should not be cultivated or subjected to fertiliser or herbicide drift. Hedges should be cut in rotation, leaving some uncut to allow shrubs to flower and produce berries. Ditch vegetation should be cut in a two-year rotation and only from late summer onwards.

Rare annual plants
Plants such as cornflower and corn marigold are among the rarest plants in the UK. They once colonised crops but now only survive in field corners and edges where agrochemical inputs and soil fertility are lower. Where found, they can be encouraged by cultivating the area and allowing natural regeneration to occur.

Other annuals
Other useful annual plants provide early or late sources of pollen and nectar (eg chickweed, field speedwell, dead-nettles and groundsel) or insects and/or seeds for birds (fat hen and knot-grass).

Insects
The diversity of insects depends on plant diversity to promote specific requirements and/or a continuous supply of habitat and food.

Pollinators
Bees are the most important pollinators. There are 25 bumble bee species (although only 6 are common) and 230 solitary bee species in the UK that all need two essential resources: flowers and nest sites. A diverse legume mix with some wildflowers will provide flowers from April to September and be appropriate for both short- and long-tongued bees. On farmland, bumble bees and solitary bees make use of holes in the ground and dry areas at the base of tussocky grasses for nest building.

Butterflies
Butterflies require host plants (eg grasses, bird’s-foot trefoil, nettles) and flowers for adults and can have very specific requirements; for example, some butterfly larvae may only survive on one plant species.

Predatory insects
Predatory insects such as hoverflies, parasitic wasps and other enemies of pests require an abundance of prey, most of which will be plant-feeding. They also need nectar from simple flowers (eg yarrow, wild carrot and cow parsley) and shelter, which are all provided by flower-rich grassland. All insects need somewhere safe to over-winter, whatever life stage this may be (see HGCA’s Beneficials on farmland: identification and management guidelines).

Mammals
Some rare mammals occur on farmland including the brown hare, dormouse, harvest mouse and several bat species. Although hares are still common in some areas they have become rare in large parts of the country. Hares feed upon short, young grass, herbaceous plants and young arable crops, and are vulnerable to predation by foxes.

Hedgeows support the rare yellow-necked mouse, harvest mouse and dormouse, along with the common voles and shrews that are an important food for larger animals and birds (owls and kestrels). Harvest mice need tall, undisturbed vegetation as occurs in hedgeows, reed beds or beetle banks. Thick grassy areas are used by voles and shrews. Bats commute and forage along tall hedgeows that link roosting and forage sites while other insect-rich habitats can provide additional useful foraging areas.

Birds
All birds require a nesting habitat that is protected from predators. This can be either close to or in hedges or in open habitats. The majority of farmland birds feed on invertebrates in summer and seeds and berries in winter.
Bird species of high conservation concern

<table>
<thead>
<tr>
<th>Nest requirements</th>
<th>Foraging requirements</th>
<th>How far do they travel to find food when breeding in the summer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoiding boundaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lapwing</td>
<td>Fallow plots of at least 1 ha well away from trees and pylons</td>
<td>Open areas or strips at least 100m away from the field edge, preferably late-maturing spring crops, unimproved grassland and fallows</td>
</tr>
<tr>
<td>Skylark</td>
<td>Skylark plots, spring crops, unimproved grassland and fallows</td>
<td></td>
</tr>
<tr>
<td>Yellow wagtail*</td>
<td>Spring crops and unimproved grassland</td>
<td></td>
</tr>
<tr>
<td>Mature boundaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turtle dove*</td>
<td>Tall thick hedgerows with trees</td>
<td>Weedy bare ground, crops, fallows, cultivated mixtures, tracks and sparse margins</td>
</tr>
<tr>
<td>Yellowhammer</td>
<td>Short thick hedgerows with no trees, scrub or grass margins by hedges or scrub</td>
<td></td>
</tr>
<tr>
<td>Song thrush</td>
<td>Mature hedgerows with trees or woodland</td>
<td>Pasture, hedgerows and woodland</td>
</tr>
<tr>
<td>Open or mixed boundaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey partridge</td>
<td>Tall vegetation such as grass margins or nettles with or without hedges</td>
<td>Weedy bare ground, wild bird seed, unharvested cereal headlands, crop edges and fallows</td>
</tr>
<tr>
<td>Linnet</td>
<td>Open hedges, gorse or scrub, normally away from trees</td>
<td>Weedy bare ground, crops and sown mixtures, fallows, tracks and sparse margins</td>
</tr>
<tr>
<td>Corn bunting</td>
<td>Open herb-rich margins or crops well away from trees</td>
<td>Open weedy ground, sown mixtures, late spring cereals, barley or fallows</td>
</tr>
</tbody>
</table>

NB. The range over which birds will hunt for insects during the summer indicates how close insect-rich mixtures should be sown. To maximise the number of territories of field-edge nesting birds it may be best to sow the mixtures for insect food in strips close to the hedgerows across the farm.

In winter all of these species except the summer migrants (*) require areas in which to shelter and forage, such as weedy stubbles and wild bird seed mixtures.
**Flowers over summer**

**Flower-rich habitats**

Flowers must be provided if pollinating insects (bees and hoverflies) and pest natural enemies are to be encouraged. Such areas can also act as nesting and foraging areas for farmland birds and small mammals. Flower-rich areas can be created using either a mix of wildflowers and grasses or legumes. Mixes that provide both complex and simple flowers are the most beneficial as these support both short- and long-tongued insects.

**Flower-rich grassland**

This is created by sowing a mix of perennial, herbaceous wildflowers (eg knapweed, yarrow, common vetch and bird’s-foot trefoil) and some fine grasses (eg crested dog’s-tail and sheep’s fescue). The grasses act as a nurse crop and are hosts for butterfly and moth larvae. Wherever possible flowers should be sourced locally from indigenous plants.

Data from the Farm4bio project (Figure 4) showed that most farmland plants flower between June and August. Species that flower outside this period should be encouraged to ensure a more even availability of pollen and nectar.

These include:
- Hedgerow shrubs
- Herbaceous plants (eg cow parsley and ivy)
- Flowering annual weeds

Other early- and late-flowering plants that can be added to sown mixtures such as:
- Agrimony (late)
- Black medic (early)
- Chicory (late)
- Cowslip (early)
- Crimson clover (early)
- Field scabious (late)

Spring-sowing may be preferred where it is necessary to reduce grass-weed infestations, particularly black-grass.

**Legume mixes**

Legume mixes (clovers, trefoils, sanfoin and vetch), although a cheaper seed option than flower-rich grassland, have a shorter lifespan and will need replacing after four to five years when sown without grasses. The lifespan is shorter when sown with grasses.

The flower mix is usually a mix of agricultural clovers, vetches and trefoils but can also include wildflowers. Wildflowers of native origin should be considered for long-term schemes because they persist longer.
**Tips for sowing flower-rich grassland**

**Preparation**
- Because it lasts for several years, flower-rich grassland is suited to areas that are awkward to access and farm efficiently using large machinery.
- Avoid areas with an abundance of perennial weeds.
- If perennial weeds are present, e.g., thistles and docks, treat with a glyphosate before establishment.
- Creating a stale seedbed during the preceding summer will reduce the annual weed competition.
- Sow on the soil surface between late-March and mid-September.
- Sow or broadcast onto a consolidated seedbed, preferably into moist soil or when rain is expected.

**Maintenance**
- During the first year regular cutting is usually necessary to reduce annual weed competition, particularly the grass weeds.
- After the first year, annual cutting in autumn will reduce perennial grasses’ competitiveness.
- Removing cut vegetation will reduce the loss of flowering plants.
- If flower loss occurs, reduce the grasses using a spring application of a graminicide* but only if sufficient flowering plants still remain.

*A beware that the use of graminicides will require a derogation and care needs to be taken of drift into vulnerable areas.

**Tips for sowing legume mixes**

**Preparation**
- Use mixes without grasses, on fertile soils, especially if sowing next to an existing grass margin.
- Sow very close to the soil surface in August or mid-April.
- Sow into a very consolidated seedbed.
- Sow into moist soil or when rain is expected.
- A graminicide* may help control grasses but ensure the product is safe to clovers.

**Maintenance**
- To encourage late flowering cut part of the area mid-June to early July and remove the debris.
- Cut the whole area in August and remove the debris.
- Spot-treat pernicious weeds.
Seeds over winter

Winter bird food
Plan a rotation of wild bird seed mixtures to ensure a supply of grain and oily seeds is available somewhere on the farm every year. Aim for high seed yields that also meet scheme requirements.

Useful oilseeds are kale, rape, fodder radish, sunflower and linseed. Quinoa is a useful addition as it provides a good source of protein. With the exception of sunflowers and quinoa, these can be sown in the autumn or spring.

Sow in blocks or strips at least 6m wide away from woodland. Retain the cover until at least March 1st.

Wild bird seed
Wild bird seed must be either a mixture of at least three seed-producing plants (starchy and oily seeds) or with each species sown separately or co-located. It can be annual or biennial and can either be spring- or autumn-sown.

Sowing times

<table>
<thead>
<tr>
<th>Autumn</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can sow winter varieties of cereals, kale and linseed</td>
<td>Vulnerable to droughts</td>
</tr>
<tr>
<td>Provides foraging ground for birds during early spring</td>
<td>Brassicas more vulnerable to insect pests</td>
</tr>
<tr>
<td>Sowing date: late summer/autumn</td>
<td>Lower black-grass infestations on heavy soils</td>
</tr>
<tr>
<td></td>
<td>Sowing date: March to mid-June</td>
</tr>
</tbody>
</table>

A mixture of both spring and autumn sowing is ideal as this provides seed over a longer period of winter

Management tips
- The sowing date should be appropriate for the seed mix
- As the aim is to produce seed, they should preferably be managed like any other crop by creating good seedbeds and using pesticides to aid establishment (while adhering to scheme regulations)
- A seed treatment can help reduce the impact of flea beetle
- Birds may need supplementary feeding with cereal seed and oilseeds from February until April if there is no food remaining in the sown mixtures. This is most easily done by spreading tail corn/rape seed thinly over farm tracks or, preferably, using hoppers
**Seeds**

<table>
<thead>
<tr>
<th><strong>Linseed</strong></th>
<th><strong>Mustard – spring-sown</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>May be the preferred oilseed in areas where there are likely to be high levels of pollen beetle and where the wild bird seed is to be spring-sown.</td>
<td>Easy to establish and fast growing. Ideal for broadcasting into existing cereals to provide extra cover and encourage insects.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Quinoa</strong></th>
<th><strong>Smaller starchy seeds</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A good source of protein. Ideal for sowing with kale. Must be spring-sown.</td>
<td>To provide a range of starchy seed sizes use millet. Must be spring-sown.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Fodder radish</strong></th>
<th><strong>Triticale</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid growing and competes with weeds. Can be used when other crops have failed. Can be sown May to September but not especially winter hardy.</td>
<td>Holds its head longer over the winter than other cereals. Winter- or spring-sown varieties available. Winter triticale seed is not usually available until late September after the optimum period for sowing oilseeds.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Kale</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Harder to establish than fodder radish, but preferred by most bird species. Provides good winter cover and insect-rich cover when in flower. Often establishes better if sown alone, which restricts the impact on non-target invertebrates if an insecticide is used. Biennial if spring-sown - sow annually around the farm to ensure seed is available every year.</td>
<td></td>
</tr>
</tbody>
</table>

Seed companies can provide advice on the appropriate mixes for your farm.

### Use of seed-bearing crops by farmland birds

<table>
<thead>
<tr>
<th></th>
<th>Rape</th>
<th>Kale</th>
<th>Linseed</th>
<th>Mustard</th>
<th>Quinoa</th>
<th>Borage</th>
<th>Sunflower</th>
<th>Teasel</th>
<th>Wheat/Triticale</th>
<th>Millet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bullfinch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chaffinch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Greenfinch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goldfinch</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Linnet</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reed bunting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Corn bunting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Yellowhammer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tree sparrow</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grey partridge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Red-legged partridge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pheasant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wood pigeon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Skylark</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Blackbird</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dunnock</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Song thrush</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Does this simple approach encourage problems?

Rabbits
No increases were recorded in the Farm4bio project, even where the suggested mixes were sown extensively.

Invasive weeds
The main problems were associated with creeping thistle in the flower-rich grassland.

Top tips:
- Sow on a clean site, deal with thistles with a spot treatment of glyphosate whilst still at low levels. If ragwort is present hand-pulling keeps infestation under control
- In areas infested with annual grass weeds, including black-grass, mixtures should be spring-sown
- Cut flower-rich grassland regularly in the first year
- Rotate wild bird seed mixtures to reduce weed burden
- Use glyphosate prior to sowing on weedy land

NB In some grant-aided schemes prior permission is required for the spot treatment of glyphosate.

Where should biodiversity areas be located?

Birds
Wild bird seed mixtures are best provided in large blocks, well away from woodland but near to hedges. Larger blocks are easier to manage with modern farm equipment. For birds that nest, rest and feed in open farmland, plots to provide habitat and feed can be created well away from the field edge. Habitats providing insects for boundary-nesting bird species need to be in strips alongside hedges.

Insects
Locating strips on the southern side of hedgerows where warmer conditions occur may also aid establishment and growth and are more attractive to warmth-seeking insects, especially butterflies. The width of the strips is not critical. Butterfly diversity is greater where there are more sown strips on the farm.

Flowers
Flower-rich habitats should preferably be sown as strips but large blocks of flower-rich habitat may be easier to manage and the risk of invasion by pernicious perennial weeds from margins is reduced. Such areas should be in sheltered locations.

Which options are financially supported?

All of the approaches described are currently supported in the Entry and Higher Level Schemes in England and some are funded under the Scottish Rural Development Plan and Glastir in Wales (see page 14). It is always necessary to meet the prescribed management conditions for each scheme.
Enhancing arable biodiversity through the management of uncropped land

Plan of biodiversity areas

- Unharvested cereal headland
- Broad-leaved crops
- Woodland
- At least 6m width of flower-rich grassland each side of a watercourse
- Hedgerows
- Flower-rich grassland (on the south side of hedgerows)
- Autumn-sown wild bird seed
- Spring-sown wild bird seed
- Beetle bank (tussocky grasses on a raised bank)
- Skylark plots
- Legume mixes
- Cereal crop
- Woodland
- Unharvested cereal headland

Does increased biodiversity aid crop management?

A very significant increase in the abundance of pest natural enemies was recorded in the sown mixtures in the Farm4bio project. There is evidence that this results in an associated increase in abundance of natural enemies within the crop that could contribute to pest control.
## Further information

Enhancing arable biodiversity through the management of uncropped land

<table>
<thead>
<tr>
<th>Habitat type</th>
<th>ELS</th>
<th>HLS</th>
<th>SRDP</th>
<th>GLASTIR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flower-rich habitats</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flower-rich grassland</td>
<td>EE3, EE9 – Buffer strips</td>
<td>HE10 – Floristically enhanced grass buffer strips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legume mix</td>
<td>EF4 – Nectar flower mixture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Seed in winter</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild bird seed</td>
<td>EF2 – Wild bird seed mixture</td>
<td>HF12 – Enhanced wild bird seed mix plots</td>
<td>Option 9 – Wild bird seed mix/unharvested crop</td>
<td>Option 33 – Establish a wildlife cover crop on improved grass and arable land</td>
</tr>
<tr>
<td>Unharvested cereal headlands</td>
<td>EF10 – Unharvested cereal headlands</td>
<td>HF14 – Unharvested, fertiliser-free conservation headland</td>
<td>Option 9 – Wild bird seed mix/unharvested crop</td>
<td>Option 34 – Unharvested cereal headlands</td>
</tr>
<tr>
<td><strong>Insect-rich</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conservation headlands</td>
<td>EF9 – Unfertilised cereal headlands</td>
<td></td>
<td>Option 16 – Management of conservation headlands</td>
<td>Option 30 – Unsprayed spring sown cereals, oil seed rape, linseed or legumes (whole fields) Option 31 – Unsprayed spring sown cereals retaining winter stubbles</td>
</tr>
<tr>
<td><strong>Arable plants, insects and seeds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural regeneration</td>
<td>EF11 – Uncropped cultivated margins for rare plants</td>
<td>HF20 – Cultivated fallow plots or margins for arable plants (rotational or non-rotational)</td>
<td>Option 27 – Fallow margins</td>
<td></td>
</tr>
<tr>
<td>Low input crop</td>
<td>EF15 – Reduced herbicide cereal crops followed by over-wintered stubble</td>
<td>HG7 – Low-input spring cereal to retain or recreate an arable mosaic</td>
<td>Option 31 – Unsprayed spring sown cereals retaining winter stubbles</td>
<td></td>
</tr>
<tr>
<td><strong>Within-field habitats for ground-nesting birds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skylark</td>
<td>EF8 – Skylark plots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lapwing</td>
<td>EF13 – Uncropped cultivated areas for ground-nesting birds on arable land</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information correct as at Summer 2011
Further information

HGCA publications and details of HGCA-funded projects are all available on the HGCA website – www.hgca.com

HGCA Guides and Topic Sheets

TS105  Managing uncropped land to enhance biodiversity (2010)
IS09  Oilseed rape herbicides and water protection (2009)
G35  Enhancing arable biodiversity – six practical solutions for farmers (SAFFIE project) (2007)

HGCA Research Reviews

RR71  An up-to-date cost:benefit analysis of precision farming techniques to guide growers of cereals and oilseeds (2009)
RR64  Importance of arthropod pests and their natural enemies in relation to recent farming practice changes in the UK (2007)

HGCA Project reports

PR416  Sustainable arable farming for an improved environment (2007)
PR356  Managing biodiversity in field margins to enhance integrated pest control in arable crops ('3-D Farming' Project) (2004)
PR173  Integrated farming systems (a field-scale comparison of arable rotations) (2004)

Websites

– Farm4bio project: www.hgca.com/Farm4bio
– Campaign for the Farmed Environment: www.cfeonline.org.uk
– Scotland Rural Development Programme: www.scotland.gov.uk/SRDP
– Glastir: www.fuw.org.uk/glastir.html
– The Wildlife Trusts: www.wildlifetrusts.org
– Game and Wildlife Conservation Trust: www.gwct.org.uk
– Natural England: www.naturalengland.org.uk

Wild bird seed
Flower-rich grassland
Acknowledgements

This guide, funded by HGCA as part of the Farm4bio project, was written by Jim Orson, NIAB TAG and Dr John Holland, Game & Wildlife Conservation Trust, in association with the Farm4bio project consortium of Dr Ian Henderson, The British Trust for Ornithology; Dr Peter Lutman, Dr Judith Pell and Dr Jonathan Storkey, Rothamsted Research; Dr Clare Stirling, HGCA; Dr Anthony Biddle, PGRO; Ian Wilkinson, Cotswold Seeds; Graham Hartwell, BASF; Paul Goddard, Bayer CropScience; Richard Brand-Hardy, Defra; Dr Andrew Leader, Dow AgroSciences; Adrian Sisson, DuPont and Peter Sutton, Syngenta.

The Farm4bio project was funded through Defra’s Sustainable Arable LINK programme, with sponsorship from BASF, Bayer CropScience, Cotswold Seeds, Defra, Dow AgroSciences, DuPont, HGCA, PGRO and Syngenta. Research partners included The British Trust for Ornithology, The Game & Wildlife Conservation Trust, NIAB TAG and Rothamsted Research.

HGCA is grateful to many people who have commented on draft versions of the guide, including: Dr James Holmes and Anna Farrell, HGCA; Brin Hughes, Conservation Grade; Jim Egan, FWAG; Peter Thompson and Dr Barbara Smith, Game & Wildlife Conservation Trust; Corrina Gibbs, NFU; Marek Nowakowski, Wildlife Farming Company; as well as Guy Smith, Andrew Cragg, Julian Hasler and George Lawrie.

Edited by Dr Emily Boys, HGCA.

Design by Pinstone Communications Ltd.

Photographs courtesy of Tom Birkett, Dr John Holland and Peter Thompson, Game & Wildlife Conservation Trust, Helen Martin, Rothamsted Research and Cotswold Seeds.

Disclaimer

While the Agriculture and Horticulture Development Board, operating through its HGCA division, seeks to ensure that the information contained within this document is accurate at the time of printing no warranty is given in respect thereof and, to the maximum extent permitted by law the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

Reference herein to trade names and proprietary products without stating that they are protected does not imply that they may be regarded as unprotected and thus free for general use. No endorsement of named products is intended, nor is any criticism implied of other alternative, but unnamed products.

HGCA is the cereals and oilseeds division of the Agriculture and Horticulture Development Board.