Experiment 2. Management of the non-cropped margin structure to maximise biodiversity

The overall aim was to enhance farmland biodiversity by integrating novel habitat management approaches, in the crop and non-cropped margins, to develop more sustainable farming. Improved understanding of interactions will lead to increases in invertebrate and weed seed abundance, the availability of which will be of particular benefit to farmland birds.

Materials and methods

Field sites

Field trials were carried out on 3 sites between 2001 and 2005. The sites were located at ADAS Boxworth, ADAS Gleadthorpe and ADAS High Mowthorpe

Treatments

There were nine treatments at each site,. Treatments comprised three seed mixtures applied in factorial combination with three management techniques as detailed in Table 0-1.

Table 0-1. Seed mixture and management treatments.

	Seed mixture	Management
1.	Countryside stewardship mix	Cutting
2.	"	Scarification
3.	"	Selective herbicide
4.	Tussock grass plus broad-leaves/forbs	Cutting
5.	"	Scarification
6.	"	Selective herbicide
7.	Fine leaved grass plus broad-leaves/forbs	Cutting
8.	"	Scarification
9.	"	Selective herbicide

Seed mixture

The tussock plus broad-leaves/forbs and countryside stewardship seed mixtures were identical at all sites. The fine grass plus broad-leaf/forbs species were tailored to soil type and site, species are detailed in Table 0-2. Seed was purchased from a central source. Countryside stewardship mixture was drilled at 20 kg/ha, and the tussock and fine grass mixtures were drilled at 35 kg/ha.

Table 0-2. Details of seed mixtures used

a) Countryside Stewardship Mix

Species	Common Name	% (by wt.)
Agrostis capillaris	Common Bent	5.0
Cynosurus cristatus	Crested Dogstail	15.0
Dactylis glomerata	Cocksfoot	10.0
Festuca pratensis	Meadow Fescue	10.0

Festuca ovina	Sheep Fescue	20.0
Festuca rubra ssp. juncea	Slender Red Fescue	20.0
Poa pratensis	Smooth Meadow Grass	20.0

b) Tussock grass plus broad-leaves/forbs

Species	Common Name	% (by wt.)
Grasses		
Alopecurus pratensis	Meadow Foxtail	4.0
Dactylis glomerata	Cocksfoot	16.0
Deschampsia cespitosa (w)	Wavy Hair-Grass	8.0
Festuca pratensis	Meadow Fescue	20.0
Festuca rubra spp. rubra	Red Fescue	20.0
Holcus lanatus	Yorkshire Fog	4.0
Phleum pratense	Timothy	8.0
broad-leaves/forbs		
Achillea millefolium	Yarrow	1.2
Centaurea nigra	Common Knapweed	2.4
Centaurea scabiosa	Greater Knapweed	1.6
Daucus carota	Wild Carrot	2.4
Dipsacus fullonum	Wild Teasel	1.6
Galium mollugo	Hedge Bedstraw	2.0
Geranium pratense	Meadow Cranesbill	1.6
Lathyrus pratensis	Meadow Vetchling	1.0
Leucanthemum vulgare	Oxeye Daisy	2.0
Silene dioica	Red Campion	3.0
Vicia cracca	Tufted Vetch	1.2

c) Fine leaved grass plus broad-leaves/forbs

Species	Common name	% by weight		
		Boxworth	High Mowthorpe	Gleadthorpe
Grasses				
Agrostis capillaris	Common Bent		5.0	
Cynosurus cristatus	Crested Dogstail		35.0	
Festuca rubra ssp. commutata	Red Fescue		15.0	
Festuca rubra ssp. juncea	Slender Red Fescue		25.0	
Broad-leaves/Forbs				
Achillea millefolium	Yarrow	0.5	0.5	0.5
Centaurea nigra	Common Knapweed	1.0	0.5	1.0
Daucus carota	Wild Carrot	1.0	1.0	1.5
Galium verum	Lady's Bedstraw	1.5	1.0	2.0
Leucanthemum vulgare	Oxeye Daisy	1.0	1.0	1.0
Lotus corniculatus	Birdsfoot Trefoil	0.5	1.0	0.5

Plantago lanceolata	Ribwort Plantain	1.0	1.0	1.0
Primula veris	Cowslip	1.2	1.0	1.0
Prunella vulgaris	Selfheal	1.0	1.0	1.0
Ranunculus acris	Meadow Buttercup	3.5	1.5	1.5
Rhinanthus minor	Yellow Rattle	1.0	0.5	1.0
Knautia arvensis	Field Scabious	1.3	1.5	-
Leontodon hispidus	Rough Hawkbit	1.0	1.0	-
Plantago media	Hoary Plantain	-	1.0	0.6
Malva moschata	Musk Mallow	1.5	-	2.0
Rumex acetosa	Common Sorrel	1.0	-	1.0
Anthyllis vulneraria	Kidney Vetch	-	1.5	-
Centaurea scabiosa	Greater Knapweed	-	1.0	-
Origanum vulgare	Wild Marjoram	-	1.0	-
Pimpinella saxifraga	Burnet-saxifrage	-	1.0	-
Reseda lutea	Wild Mignonette	-	0.5	-
Sanguisorba minor ssp. minor	Salad Burnet	-	2.5	-
Echium vulgare	Viper's Bugloss	-	-	1.5
Linaria vulgaris	Common Toadflax	-	-	0.5
Ranunculus bulbosus	Bulbous Buttercup	-	-	1.4
Silene vulgaris	Bladder Campion	-	-	2.0
Vicia cracca	Tufted Vetch	1.5	-	-

Management
Management treatments began in 2003 to allow establishment of the seed mixtures. Dates of treatments are detailed in **Error! Reference source not found.**.

1. **Cutting**. The treatment was mown to a height of 15 cm using a flail mower, target date was early March , at the start of spring growth. Cuttings were left in situ.

2. **Scarification**: A power harrow was used to scarify this treatment. The power harrow was set at a suitable depth to cultivate the top 2.5 cm of the soil, with the aim of creating 60% soil disturbance. Scarification was done in early spring when the ground was fit to travel. Five metre buffers between plots provided room for the lifting of machinery.

3. **Graminicide**: Fluazifop-P-butyl (As Fusilade Max, Syngenta Crop Protection Ltd) was applied at half rate (0.8 l/ha) in 200 litres of water/ha, at 2 bar pressure with a farm sprayer. This rate was selected to suppress susceptible grass species.

The three sites each had nine treatments and five replicates. Plot size was 25 m x 5 m, with the long edge running parallel to the field boundary. A 5 m buffer zone was included between plots to both prevent cross contamination between treatments and to allow entry of machinery to the plots (**Error! Reference source not found.**). An example of plot layout in relation to field boundaries can be seen in **Error! Reference source not found.**.

Assessments

Agronomic
Weed populations at the crop/margin interface.
Vegetation
Species cover, vegetation structure, invertebrates.
Bumblebee and butterfly monitoring
Standard transect walks, flower abundance counts

Birds
Habitat data, transect counts, nest finding, foraging.