



BTO Research Report No. 219

**BIRDS-EYE WALLS:
Partnership for Sustainability**

**A Resume of the Usage of Winter Stubbles
by Birds on Arable Farmland in the UK**

Author

I. G. Henderson

A report by the British Trust for Ornithology

April 1999

© British Trust for Ornithology

CONTENTS

	Page No.
1. INTRODUCTION	3
2. THE INTRODUCTION OF SET-ASIDE	5
3. EVALUATING WINTER STUBBLES WITH PARTICULAR REFERENCE TO SKYLARKS	7
3.1 Skylark Habitat Preferences.....	7
4. CONCLUSIONS.....	9
5. REFERENCES.....	11

1. INTRODUCTION

In recent years a large number of ecological studies have been carried out in an attempt to identify the causative factors underlying the now well established decline of a range of farmland birds, both in Britain and elsewhere (Fuller *et al.* 1995, Gibbons *et al.* 1996, Pain & Pienkowski 1997). The vast majority of studies have focussed on factors operating in the breeding season and as a result winter ecology has been largely neglected. This is despite the fact that winter ecology has been highlighted as a key information need for several Biodiversity Action Plan species (Anon 1995a, 1995b & 1998). A small number of studies have considered farmland birds in winter, mainly in relation to a particular agricultural issue or management practice, such as organic farming (Wilson *et al.* 1996) or set-aside (Buckingham *et al.* in press). One study, focusing on Corn Buntings *Miliaria calandra* (Donald & Evans 1994) has examined a species' ecology across a broad range of habitats in winter. The Skylark *Alauda arvensis* too has recently received attention in winter (see below).

Among the winter farmland habitats, stubble fields are recognised as one of the most important for providing food to seed-eating passerines in particular, many of which, such as Tree Sparrow *Passer montanus*, Linnet *Carduelis cannabina*, Yellowhammer *Emberiza citrinella* and Corn Bunting, have experienced serious long-term declines in population size (Evans 1997a & b). However, winter stubbles are themselves only a small proportion of the arable landscape, and the displacement of spring-sown cereal by winter-sown cereals has seriously depleted this valuable resource (O'Connor & Shrubbs 1986).

2. THE INTRODUCTION OF SET-ASIDE

In 1992, under reforms to the Common Agricultural Policy, set-aside was introduced on a large scale to the UK as a control measure against over-production. Under the set-aside scheme (see Henderson *et al.* 1998) harvested fields are removed from production for a year or more, and in their first winter remain as uncultivated stubble fields. Winter stubbles during the set-aside era are largely recognised as having had a major role in preventing the Cirl Bunting *Emberiza cirius* from extinction in the UK. Cirl Buntings make extensive use of stubble fields in winter in Devon.

More recently, a further RSPB study of winter set-aside, compared the use of winter stubbles by a range of ground-foraging birds to (1) cultivated crops, and (2) between various types of stubbles fields (Buckingham *et al.* in press). Their work concentrated on 20 farms in Devon and 20 in East Anglia, covering 2,500 ha in all on 40 farms in East Anglia and Devon. From over 49,000 registrations of birds (including 11,000 Skylark counts), they found strong selection for cereal stubble and avoidance of winter cereal crops by Grey Partridge *Perdix perdix*, Skylark, Cirl Bunting and Yellowhammer. Interestingly, there were differences between stubble types in their usage by birds according to the previous crop grown in the field. Thus, between stubble types, barley was preferred to wheat stubble, but there was also positive selection for “other” types of stubbles, that is, a catch-all category including peas, rape and flax and sugar beet. The inference here is that the previous crop rather than current management regimes influence the choice of stubbles utilised by birds, and that abundance is related to seed loads.

3. EVALUATING WINTER STUBBLES WITH PARTICULAR REFERENCE TO SKYLARKS

In a recent study, Gillings & Fuller (in press) report on a national survey of wintering Skylarks *Alauda arvensis* undertaken by the British Trust for Ornithology (BTO) between November 1997 and February 1998, on 562 1-km squares selected from within the Skylarks' winter range. Arable and pastoral landscapes held up to 90% of the winter population of Skylarks. Skylarks preferred larger fields and used cereal stubbles and root stubbles significantly more than expected based on a randomisation test. Weedy cereal stubbles were preferred over clean cereal stubbles and grazed grasslands were avoided. These results have important implications for the conservation of Skylarks because the area of cereal stubble in lowland Britain in early winter was only 750,000 ha out of a potential 2,700,000 ha. Management to retain overwinter stubbles is highlighted for the conservation of Skylarks. New agri-environment schemes must promote the retention of stubbles, especially weedy stubbles, on a wide scale if they are to benefit Skylarks and other declining farmland bird populations. We recommend further work on stubble management (herbicide spraying, straw chopping and cultivation) and its effects on grain availability, arable weed regeneration and Skylark usage. Furthermore, monitoring and ecological studies are still needed for a range of resident and migratory farmland birds in winter.

3.1 Skylark Habitat Preferences

Within occupied 1-km squares there was a strong tendency for Skylarks to be found in large fields. This was in agreement with other studies showing avoidance of feeding near boundaries (Donald pers. comm). However, the probability of occupancy increased at a steeper rate for fields of cereal stubbles and root crop stubbles than for other habitat types indicating a relative preference for these two stubble types. This test of habitat preference was confirmed by a randomisation procedure that compared usage of crops with the usage expected from a random null model in which birds used habitats in proportion to their availability. Cereal stubble fields were the most preferred farmland habitat type in agreement with an earlier small scale study in Oxfordshire (Wilson *et al.* 1996). Preference was strongest for weedy stubbles rather than clean stubbles. Weedy stubbles were defined as fields with arable weeds and some crop volunteer regrowth whereas clean stubbles have often received a post-harvest application of herbicide to eradicate problematic weeds such as Black Grass *Alopecurus myosuroides*. Weedy stubble fields therefore offer greater foraging opportunities for seed-eating passerines because they support seed-bearing plants and fresh vegetation. Donald & Evans (1994) reported a similar preference for weedy stubbles by Corn Buntings. It is possible that stubble fields that remain unsprayed may be present on farms with a more relaxed approach to weed control so weed seeds may be more available in the soil than on intensively sprayed farms. A further way in which food availability in cereal stubbles may be altered by management is the method of straw disposal. During harvesting waste straw is either baled for use elsewhere (e.g. animal bedding) or it is chopped finely and spread over the field. On stubbles retained through the winter (e.g. as set-aside), chopping straw can decrease seed availability for birds because it forms a dense mat that may suppress broad-leaved weeds and trap moisture that promotes germination of unharvested grain (P.N. Watts pers. comm.).

In winter Skylarks consume a variety of small seeds, they graze fresh vegetation and uproot germinating seedlings (Green 1978). These dietary requirements may explain the extensive use of young cereal crops. This was the agricultural habitat most utilised by Skylarks (20-25% of birds) although its use was only in proportion to its availability (20-30% of area). The finding that cereal stubbles are preferred by Skylarks has important implications for their conservation. The

habitat data collected by this survey highlights the rarity and ephemeral nature of stubbles in winter. One consequence of the switch from spring-sowing to autumn-sowing of cereals (Chamberlain *et al.* submitted) has been to decrease the availability of stubbles during winter but this has not previously been quantified. Here we can estimate that in November/early December there are 750,000 ha of cereal stubble present on lowland farmland in Britain. The accuracy of this figure is difficult to assess due to a lack of published statistics. However, the area of autumn-sown cereal estimated by the survey (2.7 million hectares) corresponds well to an estimated 3 million hectares of autumn-sown cereal calculated from the June Agricultural Census (source: MAFF June 1997; Scottish Office June 1997). We can therefore be fairly confident that our estimate of 750,000 ha of cereal stubble is reliable. This is only 30% of what potentially could be turned over to stubble based on the area of cereal grown. Furthermore, the area of stubble decreases rapidly through the winter as more is ploughed and sown with the next crop. A substantial area of this stubble is rotational set-aside which was only present on a large scale following its introduction in 1992 as part of the reform of the Common Agricultural Policy. Therefore immediately prior to 1992, the amount of stubble present may have been considerably less than that available in the mid and late 1990s. Farmland passerines may have gone through a serious bottleneck during the 1980s and early 1990s when suitable winter habitat was extremely scarce.

This shortage of preferred feeding habitat during winter, as a result of the switch from spring to autumn sowing in the 1970s and early 1980s, could have affected Skylark demography by increasing winter mortality. Such changes in mortality have been shown to be capable of driving population declines in the Song Thrush *Turdus philomelos* (Thomson *et al.* 1997). Furthermore, Siriwardena *et al.* (submitted) demonstrated that survival rates for a suite of farmland birds were lower in periods of population decline than at other times, indicating that winter mortality was probably an important additive factor in their declines. Survival rates for Skylarks were not presented because there were so few ringing recoveries (n=21) but survival rates were lower in periods of decline compared to periods of stability or increase, although the difference was not significant (G.M. Siriwardena pers. comm.). Therefore there is a suggestion that Skylark survival rates may have decreased but we really need more targeted ringing of declining farmland birds to help with demographic studies such as this.

4. CONCLUSIONS

Given the importance of stubbles for farmland birds (Evans 1997a) it is likely that increased retention of stubbles, especially weedy ones, may have positive benefits for these populations. Under current legislation farmers must take an annually set percentage of their land out of production. This has been successful in retaining stubbles through the winter and has been hailed as a farmland conservation success. However, set-aside is set to be phased out under Common Agricultural Policy reform by 2000 and consequently the small areas of cereal stubble currently present will be reduced further. There is a need for future agri-environment schemes to include options for the retention of winter cereal stubbles as well as the provision of suitable breeding habitat for farmland birds. It is encouraging that the Arable Stewardship Scheme, currently being piloted by MAFF, includes an option for stubbles but its success as a conservation measure will depend on its uptake. Set-aside was a success because it was compulsory; new voluntary agri-environment schemes must be rewarding to farmers if they are to occupy sufficient land to have a positive impact on farmland birds.

Further work could consider in more detail the relative merits of different management techniques on stubbles. Particularly useful would be an investigation of straw disposal methods, post-harvest herbicide applications and stubble disturbance (e.g. partial cultivation to promote weed regeneration) and their effects on grain availability, arable weed regeneration and subsequent usage by Skylarks for example. However, there are several other declining farmland bird species for which knowledge of winter habitat needs is still sparse (e.g. Tree Sparrow *Passer montanus*, Linnet *Carduelis cannabina* & Yellowhammer *Emberiza citrinella*).

5. REFERENCES

Main source: Gillings and Fuller, in press.

Anon (1995a) *Biodiversity: The UK Steering Group. Vol. 1, Meeting the Rio Challenge*. HMSO, London.

Anon (1995b) *Biodiversity: The UK Steering Group. Vol. 2, Action plans*. HMSO, London.

Anon (1998) *UK Biodiversity Group Tranche 2 Action Plans. Vol. 1 - vertebrates and vascular plants*. English Nature, Peterborough.

Buckingham, D.L., Evans, A.D., Morris, A.J., Orsman, C.J. & Yaxley, R. (in press) Use of set-aside land in winter by declining farmland bird species in the UK. *Bird Study*.

Chamberlain, D.E., Fuller, R.J., Bunce, R.G.H., Duckworth, J.C. & Shrubbs, M. (submitted) Changes in the abundance of farmland birds in relation to changes in agricultural practices in England and Wales, 1962-1996. *Journal of Applied Ecology*.

Donald, P.F. & Evans, A.D. (1994) Habitat selection by Corn Buntings *Miliaria calandra* in winter. *Bird Study*, **41**, 199-210.

Evans, A. (1997a) The importance of mixed farming for seed-eating birds in the UK. In: Pain, D.J., Pienkowski, M.W. (eds) *Farming and birds in Europe: the Common Agricultural Policy and its implications for bird conservation*, pp 331-357. Academic Press, London.

Evans, A.D. (1997b) Seed-eaters, stubble fields and set-aside. In: *Proceedings of the 1997 Brighton Crop Protection Conference*, pp 907-914. British Crop Protection Council, Farnham.

Fuller, R.J., Gregory, R.D., Gibbons, D.W., Marchant, J.H., Wilson, J.D., Baillie, S.R. & Carter, N. (1995) Population declines and range contractions among lowland farmland birds in Britain. *Conservation Biology*, **9**, 1425-1441.

Gibbons, D.W., Avery, M., Baillie, S., Gregory, R., Kirby, J., Porter, R., Tucker, G. & Williams, G. (1996) Bird Species of Conservation Concern in the United Kingdom, Channel Isles and Isle of Man: revising the Red Data List, pp 7-18. *RSPB Conservation Review No 10*. RSPB, Sandy, Bedfordshire.

Gillings, S. & Fuller, R.J. (in press) Distribution and habitat preferences of Skylarks *Alauda arvensis* wintering in Britain in 1997/98. *Bird Study*.

Green, R.E. (1978) Factors affecting the diet of farmland Skylarks, *Alauda arvensis*. *Journal of Animal Ecology*, **47**, 913-928.

Henderson, I.G., Cooper, J. & Fuller, R.J. (1998) *Spatial and temporal utilisation of set-aside by birds in summer on arable farms in England*. Institute of Terrestrial Ecology, Merelwood.

O'Connor, R.J. & Shrubbs, M. (1986) *Farming and birds*. Cambridge University Press, Cambridge.

Pain D.J. & Pienkowski, M.W. (eds) (1997) *Farming and birds in Europe: the Common Agricultural Policy and its implications for bird conservation*, pp 150-177. Academic Press, London,

Siriwardena, G.M., Baillie, S.R., Crick, H.Q.P. & Wilson, J.D. (submitted) The importance of variation in the breeding performance of seed-eating birds in determining their population trends on farmland. *Journal of Applied Ecology*.

Thomson, D.L., Baillie, S.R. & Peach, W.J. (1997) The demography and age-specific annual survival of Song Thrushes during periods of population stability and decline. *Journal of Animal Ecology*, **66**, 414-424.

Wilson, J.D., Taylor, R. & Muirhead, L.B. (1996) Field use by farmland birds in winter: an analysis of field type preferences using resampling methods. *Bird Study*, **43**, 320-332.

6. APPENDIX

PREDICTING THE INFLUENCES ON FARMLAND BIRDS OF THE PEA-FIELD MANAGEMENT REGIME IN WINTER

Stubble fields are clearly a key attribute of winter farmland for birds, but within the field management calendar of pea fields, two major points emerge.

First, all stubbles support higher densities of foraging birds than winter cereals (including seed-eating finches and buntings, and gamebirds (partridges and pheasants)). Stubbles which follow a barely crop appear to be used in preference to other types (Buckingham *et al.* 1999) but non-cereal stubbles and especially sugar beet, attract higher numbers of insectivorous species, such as Meadow Pipits, Fieldfares, Mistle Thrushes and Blackbirds, than other crop types.

Second, because food resources are not replenished, but instead are depleted over the winter period, food for birds, in the form of weed-seeds and spilt grain, becomes increasingly scarce on farmland in late winter. At this time, access to late winter stubbles may prove vital to the survival of many individuals which become low on fat reserves and are especially vulnerable to starvation if the weather during February is severe.

On light soils, pea fields are prepared for sowing between January and March, leaving crop stubbles intact and providing birds with an exploitable resource throughout the winter. However, only around 10-20% of pea fields fall into this category. On the majority of farms, especially on heavier clay-land, most stubbles which precede the pea crop are cultivated in autumn, with the idea that frost action helps to fragment the tilth and produce a more workable seed-bed. Clearly, early cultivation in October or November, will reduce the potential area of exploitable stubbles by as much as 80 or 90%. Bare soil on large (>10 ha) fields has some value as habitat for mixed flocks of Lapwing and Golden Plover in winter, but these species prefer older grassland pastures where they are available and in cultivated areas, beet stubble is valuable for the short duration that it is present in autumn and winter. Bare soil attracts finches, buntings, Skylarks and Meadow Pipits in very much lower numbers than cereal stubbles.

Ideally, then, to maximise the potential for the crop calendar to encourage the use of fields by birds during winter, pea fields should follow barley crops, and preparatory cultivation should be delayed until late winter (or as long as possible). In practice, most pea fields follow wheat crops, since wheat is the predominant form of cultivated land-use in arable areas. Wheat stubbles also support good numbers of seed-eating finches and buntings (and Skylarks) but again should be retained for as long a duration as possible over the winter period. Beet stubbles precede pea field less frequently than other crops, but are excellent habitats for many insectivorous species. Beet stubbles tend to be cultivated early in winter soon after the harvest, if this can be avoided then they would prove a valuable resource to birds and introduce heterogeneity into the arable farm landscape.

Thus, under the pea-field management process, the longer stubbles can be retained over winter the better, and late-cultivated fields will prove most valuable to birds species, particularly where they follow barley or beet crops. However, all stubble fields provide a superior resource to bare soil and in turn bare soil is generally superior to winter-sown crops.