relu
Rural Economy and
Land Use Programme

Rural Economy and Land Use Programme
Centre for Rural Economy
School of Agriculture, Food and Rural Development
Newcastle University
Newcastle upon Tyne NE1 7RU

Telephone: 0191 222 6903
Fax: 0191 222 5411
Email: relu@ncl.ac.uk

www.relu.ac.uk

Is wildlife conservation compatible with arable farming? Evaluating the options for sustainable agriculture.

A Rural Economy and Land Use programme research project that investigates how different policies are likely to influence farming decisions and lead to consequences for food and conservation.

Policy and Practice Notes

Note No. 23
October 2010

The Rural Economy and Land Use Programme is a UK-wide research programme carrying out interdisciplinary research on the multiple challenges facing rural areas. It is funded by the Economic and Social Research Council, the Biotechnology and Biological Sciences Research Council and the Natural Environment Research Council, with additional funding from the Scottish Government and the Department for Environment, Food and Rural Affairs.

We need a much better understanding of how a broad mix of economic, social and environmental factors influence land management decisions made by farmers. These decisions affect both the amount and quality of food produced and the environment. So it is essential to understand what drives them in order to assess the likely impacts of agricultural and environmental policies on wildlife, farm incomes and rural livelihoods, especially in the light of forthcoming Common Agricultural Policy reforms.

How do farmers' actions impact on wildlife?

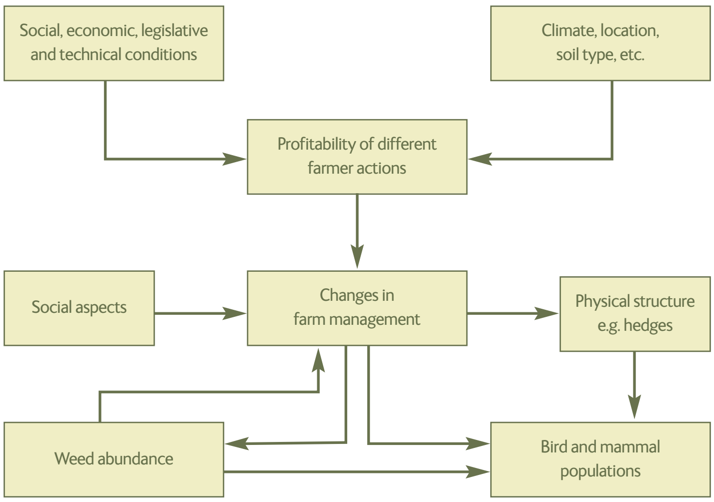
Many species are dependent upon farmland and the way that farmland is managed is thus key to their survival. Farming decisions affect both flora and fauna, as can be seen by the impacts on weed and bird populations shown here. Weeds are important as an indicator of the effect of farming on wildlife, because they provide an important source of food for many birds.

The way arable land is managed has a variety of environmental impacts, for example:

— Different crops differ in their importance for wildlife. For instance, yellow wagtails are strongly dependent upon potatoes within arable landscapes.

— Management practices affect weed populations, which therefore has an impact on seed eating birds.

— Crop rotations affect the quantity of stubble on farms, impacting on farmland birds which are heavily dependent on the availability of stubble



What factors influence farmers' decisions?

The decisions that farmers make depend on a range of factors. These include environmental issues (such as soil type and weather), economic factors (such as cereal and fuel prices), legislation and regulatory frameworks (such as the pesticide controls), technology and their own attitudes and lifestyle preferences (such as interests in shooting and/or conservation).

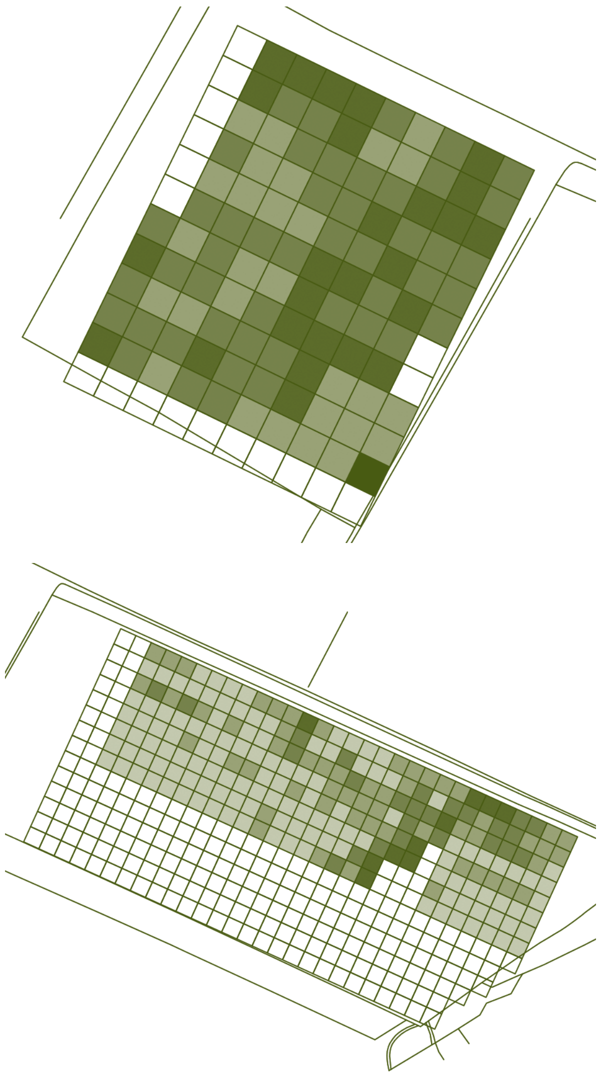
The research identified that:

- Satisfactory level of income is the primary objective for most farmers.
- Lesser objectives include maximising free time and minimising risk.
- Simplicity is a major driver: farmers prefer fewer crops or agri-environment measures.
- Biodiversity promotion is important, although skylark plots are disliked because of their negative impact on field appearance.
- Farmers who stated a high preference for maximising income use more herbicide and nitrogen.
- Farmers who stated high preference for birds or biodiversity do not translate this into lower use of herbicides.

How can we measure the impact of farmers' actions?

The project developed a new approach for mapping weeds, as these examples (right) show. The approach enables a much greater range of environments and management regimes to be covered than was previously possible. Researchers collected data repeatedly over three years for seven common weed species in 500 fields, down to a fine scale, within 48 farms typical of UK lowland arable agriculture across Bedfordshire, Lincolnshire, and Norfolk. These encompassed a range of farm sizes, soil types and farmer attitudes.

- As expected, the greater the number of herbicide applications, the lower the density of weeds, but the latter was surprisingly variable. For example, at least 10 herbicide applications are required to ensure eradication of two pernicious grass weeds: blackgrass and wild oats (*Alopecurus myosuroides* and *Avena fatua*). Fewer applications create a significant risk of high weed densities.
- There is enormous variation in weed densities at all levels: from patches within fields, to between fields in farms, and between farms.
- Farmer behaviour is extremely important in generating this variation: the highest densities of one key weed species were on those fields used for shooting, for example. Social information is therefore important for understanding weed populations.
- Other factors include cropping, past history and possibly herbicide resistance. The last is likely to become critical as pesticide regulations are changed.
- Results highlight the practicability of large-scale weed mapping at national scales. Even though weeds are important in management and biodiversity, no national mapping scheme currently exists.



Example maps of blackgrass (*Alopecurus myosuroides*) in study fields. Weed density in each 20 x 20 m cell in a large grid is assigned a category from absent, low, medium, high, or very high density. Darker colour indicates greater weed density.

How does wildlife respond to changes in the landscape or land management?

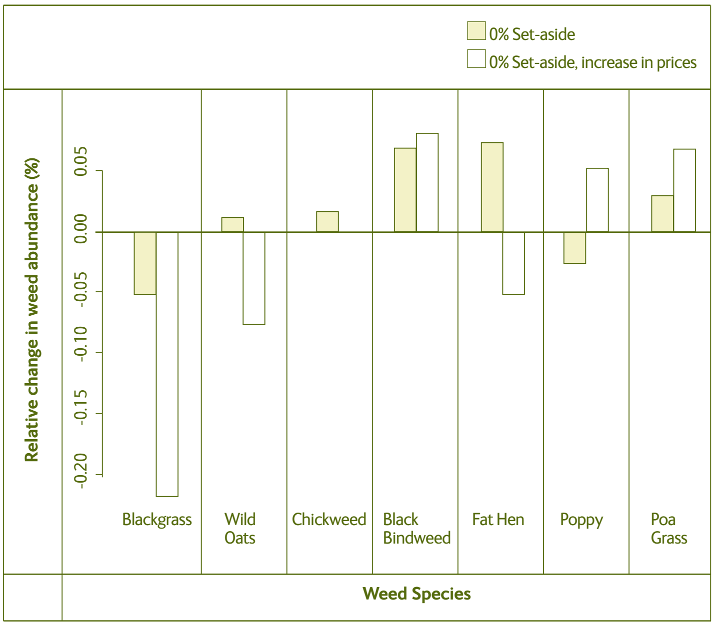
— Farmers' management decisions drive differences in flora and fauna within and between farms. The integrated model developed by the project predicts cropping well, but interactions between animals and plants make predicting their responses difficult.

— Crop type influences bird abundance, but is less important than landscape composition or field boundary structure. Cropping is, however, more susceptible to change. Winter cereals, oilseed rape and spring crops are the most influential across species.

— The scale at which habitat features relate to bird abundance differs between species. For example, grey partridge and skylark respond most to local variation (within $1km^2$), bullfinch and lapwing to the $9km^2$ scale while chaffinch and corn bunting show the strongest relationship to large scale patterns ($25km^2$ landscapes).

Two scenarios showing the change (%) in area of crops grown if set-aside is removed, compared with the recent position of 8% set-aside. The first column shows prices remaining constant, the second shows prices increasing.

	0 % Set-aside	
Crop	**Prices Constant**	**Prices Increase**
Winter Wheat	0.06	0.11
Winter Oilseed Rape	0.11	0.63
Potatoes	0.08	0.48
Winter Barley	0.02	-0.07
Spring Barley	0.02	1.90
Set-aside	-0.37	-0.97
Sugar Beet	0.00	0.00
Spring Beans	0.08	-0.83
Winter Beans	0.12	-0.44



Predicted change in the abundance of seven weed species relative to present day, in the two different set-aside scenarios.

What are the implications for policy?

This research has developed tools that specifically link farmer decision-making with ecological models in order to identify potentially cost-effective, targeted actions that can balance agricultural and environmental outcomes on arable farms.

There are important implications for government policy:

— Understanding the decisions that farmers make requires knowledge, not just about profit maximisation and the economic environment, but also about social attitudes and preferences, such as the importance of free time, risk and simplicity of crop management. This is critical for the appraisal of agri-environment policy options.

— It is possible, through modifications to current farming practices, to balance farming and wildlife objectives in ways that can appeal to farmers and to address, for example, the decline over the past 40 years of farmland birds.

— However, background data on key wildlife groups (e.g. economically or ecologically important weeds) is lacking at a national scale. A national mapping scheme would address this.

— The government's proposed tree planting campaign has a range of potential benefits in terms of amenity, carbon storage and biodiversity. This research demonstrates that farm woodland significantly enhances the capacity of the arable landscape to support wildlife.

— Economic, social and technological change will result in changes in the cropped landscape with impacts on crop production and the environment. This research shows that it is possible to create integrated models that encompass this variation, to provide policy guidance on how both arable farming and wildlife conservation objectives can be met from lowland arable farms.

Further information

The research has been carried out at the universities of Cambridge, Cranfield, East Anglia, Reading, and Sheffield as well as the British Trust for Ornithology.

Key contact:
Professor William Sutherland, University of Cambridge

Useful resources:
http://www.relu.ac.uk/research/projects/SecondCall/Sutherland.htm