European Commission

Science for Environment Policy

New method of developing agri-environment schemes proposes €3 million saving in Germany

A method for developing more cost-effective agri-environment schemes is outlined in a recent study. The procedure can be used over large areas, accounts for hundreds of management regimes and several different endangered species. The model is one of the first to account for the timing of measures and, when applied to Saxony in Germany, proposed savings of over €3 million, while also improving some conservation outcomes.

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Source: Wätzold, F., Drechsler, M., Johst, K., Mewes, M. & Sturm, A. (2015). A novel, spatiotemporally explicit ecological-economic modeling procedure for the design of cost-effective agri-environment schemes to conserve biodiversity. *American Journal of Agricultural Economics*, 98 (2): 489–512. DOI: 10.1093/ajae/aav058.

Contact: waetzold@b-tu.de

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Agri-environment schemes (AES), under which farmers are compensated for forms of land use that benefit wildlife, help to protect the environment from the harmful effects of agriculture across Europe.

Yet there remains room for improvement within these schemes, which some research suggests are only partially successful and could make better use of funds. With limited conservation budgets, how to design more cost-effective schemes has become a major focus for research. This study presents a new modelling tool to design cost-effective schemes to conserve grassland biodiversity, defining a cost-effective AES as one that "either maximises the level of conservation of endangered species and habitats for a given budget or achieves the desired conservation aims for a minimum budget".

The model covers a range of endangered grassland species (including 13 bird species and 14 butterfly species) and seven different types of grassland. It also accounts for the effects of 475 types of mowing regimes, grazing regimes and combinations of both. Importantly, the procedure accounts for differences in the cost and effect of these measures depending on *where* (spatial variation) and *when* they are applied (temporal variation).

The model is informed by various pieces of information, such as species and habitat characteristics, how land use measures affect biodiversity, and information on the local landscape. A simulation stage assesses the conservation impact of existing schemes, while the optimisation stage identifies more cost-effective options.

The procedure was applied to the German Federal State of Saxony, where 17% of all land used for agricultural production is comprised of grassland. After calculating the ecological effects of the different land use measures in the Saxony AES (which is entitled *Extensive grassland use, nature conforming grassland management and conservation* and contains several mowing and grazing measures), optimisation was used to analyse cost effectiveness.

The model identified major cost improvements. The procedure suggested that all species and grassland types that are conserved by the existing scheme (which costs €11 127 000 to implement) could be conserved for €7 974 000 — resulting in a €3 153 000 saving. What's more, the new scheme also improved conservation, with moderate improvements in protection for birds and significant improvements for butterflies.

The researchers say the model is able to identify these improvements because it accounts for the changing effects of land use over time. It is important to consider timing (for example, mowing dates and frequency) because it influences the reproduction of many species. For example, butterfly reproduction requires flowering plants that only occur in specific types of grassland, whose development depends on when certain land use measures are applied. The researchers say that measures in the existing Saxon scheme fulfil the habitat requirements of the majority of the endangered bird species, but not for the butterfly species or grassland types.

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In some cases the modelling procedure also proposes lower compensation payments for the same measures, which means that a measure can be applied on a larger area for the same cost. The researchers say this is because their method bases payments only on the farmer participating in the measure with the highest conservation cost to be compensated by the payment and not on the average conservation cost of farmers as it is done in the Saxon scheme.

The researchers say their model is a major improvement on past models, which have generally not considered the timing of land use measures, and that it may provide a useful template for how to design cost effective AES to conserve species and habitats in large areas. As grassland AES in many EU countries do not currently consider the timing of measures, there is vast potential for improving the cost-effectiveness of existing AES, suggest the authors.

The results also provide practical recommendations, suggesting that cost-effective schemes to protect grassland should include many different land-use measures applied at various different times — which is broadly in line with calls to generate more diverse habitats in agricultural landscapes, and to develop more diverse agri-environment schemes that support various land use measures.

The model provides the basis for a decision-support software, DSS-Ecopay, to design ecologically effective and cost-effective AES in grasslands. The software is available free of charge at http://www.inf.fu-berlin.de/DSS-Ecopay/ecopay_main_eng.html.