



Department of  
**Agriculture, Fisheries and Food**  
An Roinn  
**Talmhaíochta, Iascaigh agus Bia**

**Research Stimulus Fund**

**Final Report**

**A review of evidence for agri-environmental measures to create and enhance farmland habitats.**

**DAFF Project Ref No: RSF 07 520**

**Start date: 01/12/08**

**End date: 30/05/2010**

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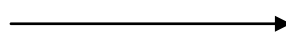
**Other Principle Collaborating Researchers:**

John Finn, Teagasc;

Mike Gormally, NUIG.

**Please tick below the appropriate area on the research continuum where you feel this project fits**

BASIC/FUNDAMENTAL



APPLIED/PRE COMMERCIAL

		✓
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**Key words: (max 4)**

Agri-environment; biodiversity; agriculture, habitats

## **1. Rationale for Undertaking the Research**

Habitats associated with traditional farming practices are in poor condition, under pressure and in need of urgent conservation action (EEA 2008). The need for improved conservation actions in Ireland was emphasised by the frequent inadequate conservation status of wetlands, grassland and coastal farm habitats, as highlighted in the Irish report on priority habitats and species (NPWS 2008).

Many farmland species depend on a mosaic of habitats, which they may use in different ways at different times of the year. Ecological research has an extensive literature on the creation and enhancement of such farmland habitats. Unfortunately, this information and understanding is not in a readily available format, which frequently inhibits its transfer to policymakers.

This project aimed to collate the evidence base from ecology journals and research reports, with the aim of identifying methods for the creation and enhancement of multiple farmland habitats. Different habitat types are not of equal conservation value; therefore, the project also aimed to indicate the relative wildlife value of different habitats.

The overall aim of this study was to provide an overview of measures that can enhance farmland habitats and thus contribute to halting the loss of biodiversity in Ireland. This study addresses four objectives:

- Objective 1: assess the evidence for habitat creation, restoration, enhancement, management and protection
- Objective 2: review experience-based land management practices that can be applied to creating, restoring, enhancing, managing or protecting farmland habitats
- Objective 3: review measures to create, restore, enhance, manage or protect farmland habitats within selected agri-environment schemes in Europe
- Objective 4: suggest how novel techniques to create, restore, enhance, manage or protect farmland habitats might benefit farmland biodiversity associated with farm practices and farm habitats in Ireland.

In addition to outlining the more general ecological principles that inform good practice in management of selected habitats, we also conducted a more specific assessment of the wildlife value of current options in the Rural Environment Protection Scheme (REPS). Based on a novel methodology that utilised the judgement of agri-environmental experts, we identified strengths and opportunities for improvement in current habitat management recommendations in the REPS.

In summary, this study aimed to harness existing ecological knowledge to contribute to the identification of agri-environment measures that are appropriate to the biodiversity objectives of the existing REPS, and can contribute to future agri-environment schemes.

## **2. Research Approach**

The main body of this work consisted of a literature review. This review focused on the evidence base for management practices that aim to create or enhance a variety of farmland habitats. We constrained the scope of the study to key constituent elements of farmland biodiversity. Farmland biodiversity was broken down to refine the search criteria in two ways.

(i) Valuable components such as field margins, hedgerows, small woodlands, species-rich grasslands, ponds, wetlands, grain crops for birds and rotting timber were identified.

(ii) We also selected aspects of biodiversity that might benefit from a range of farmland management practices such as terrestrial and aquatic plants, invertebrates, amphibians and terrestrial vertebrates.

The features listed above (i & ii) were selected as search criteria. Searches of online databases were undertaken simultaneously to identify key publications written in English.

In addition to relevant publications, we searched through a variety of agri-environmental publications and research reports (published by statutory nature conservation organisations) to collate information on land management practices.

Coupled with the Literature Review, agri-environment schemes in twelve European countries were reviewed, based on information available from their Rural Development Plans. A total of 54 different agri-environment options were identified, and categorised as follows:

- Protection (measures intended to protect existing elements of conservation value)
- Sustainable management (measures that encourage a type of farming system to achieve/retain a desired impact)
- Habitat creation and enhancement
- Restoration (measures to remedy degraded habitats)
- Prevention (measures to limit, restrict or control an impact)

The second major component of the project investigated the environmental performance of the Rural Environment Protection Scheme (REPS). The environmental performance of many agri-environmental schemes (AESs) in the EU is not clearly known. Very often, this is due to the absence of relevant monitoring of the environmental impacts. In other cases, however, it is due to the short time in which measures have been implemented. The latter reflects the case for the recently introduced REPS options in REPS 4. In the absence of a significant body of empirical evidence, we consulted with a group of eight Irish agri-environmental experts. The aim of the

consultation was to solicit their judgements (using a defined set of criteria) of the wildlife value of current supplementary measures and options in the REPS 4 scheme.

The assessment utilised a novel methodology which used experts' judgements of the effectiveness of the REPS options and supplementary measures that are relevant to biodiversity. Agri-environmental experts combined an evidence-based approach and their experience to assess features of scheme design and implementation as indicators of the environmental effectiveness of the REPS options. Key criteria influencing design and implementation were identified as:

- validity of the cause-and-effect relationship between the intended objective and the prescribed management,
- degree of institutional implementation,
- degree of farmer compliance,
- the extent to which the measure achieved an appropriate match between the distribution of environmental issues and participation (targeting) and,
- the extent to which participation was sufficient to achieve the environmental objective.

The assessment occurred in two stages. Experts scored each option using a scoring scale for each of the above five criteria. The scores were then collated and a group meeting of the experts allowed them to discuss each option, elaborate on the justification for their decisions and achieve consensus. The geometric mean of each option was calculated, with higher scores indicating higher effectiveness.

### **3. Research Achievements**

#### **Main results from Literature Review**

There is likely to be a greater onus on agri-environment schemes to target farmland habitats and species of highest conservation concern and value. In general, conservation efforts will be most effective (and cost-effective) if they target extensively farmed areas that support high levels of biodiversity.

The effectiveness of agri-environment measures can be significantly assisted through design that is informed by available evidence. Generally, there is scope for environmental effectiveness to be increased through a greater contribution of ecological evidence to the design phase of agri-environment schemes (e.g. Primdahl *et al.* 2010).

The objectives and measures for agri-environment schemes should be developed in a way that ensures good linkages among biodiversity research outputs, legislative obligations, national targets for biodiversity policy and delivery of targets. This can be facilitated by consultation with the appropriate state and non-governmental organisations.

The design, implementation and assessment of agri-environment measures can be greatly facilitated by clear statements about their intended impact, and how the proposed management prescriptions are intended to achieve this impact. This will also assist farmers and land managers to achieve the biodiversity objectives.

Depending on the environmental status of farmland, appropriate options may include measures to safeguard priority habitats, create new habitats, restore and enhance existing habitats and prevent negative impacts from damaging farmland habitats.

Greater consideration should be given to opportunities to maximise the biodiversity value of agri-environment schemes through the 'bundling' of complementary measures to create an appropriate mosaic of habitats.

The associated report is: Carlin, C., Gormally, M., Ó hUallacháin, D. and Finn, J.A. 2010. *Experts' assessments of biodiversity options and supplementary measures in REPS 4*. NUIG/Teagasc.

Research report to DAFF. (Teagasc RMIS 5768)

[http://www.nuigalway.ie/applied\\_ecology\\_unit/farmlandhabitatsguide.html](http://www.nuigalway.ie/applied_ecology_unit/farmlandhabitatsguide.html)

#### Main results from Experts' Evaluation

In relation to agri-environment measures/options, the experts recommended that the aims and objectives of the scheme and individual options should be stated with greater clarity and precision. The objectives should clearly identify the type of biodiversity to be benefited/targeted, and better explain how this will be achieved by the management prescriptions.

A number of recommendations were more relevant to design and implementation choices at the scheme-scale:

- The experts recommended a move away from a 'one-size-fits-all' approach, and toward one that better facilitates spatial targeting.
- There is scope for the design stage to consider the additional environmental effectiveness that may be achieved from spatial targeting or incentivised participation of groups of farmers. This approach should also consider the level of participation that is required to achieve specific environmental objectives.
- Experts suggested a reduction in the choice of measures within the agri-environment scheme. A tiered approach was recommended, with the choice of options being more strongly guided toward those best suited to the farm conditions and its environmental priorities.

Further details are available in the associated report: Carlin, C., Gormally, M., Ó hUallacháin, D. and Finn, J.A. 2010. *Overview of methods to create and enhance farmland habitats in Ireland*.

NUIG/Teagasc. Research report to DAFF. (Teagasc RMIS 5768)

[http://www.nuigalway.ie/applied\\_ecology\\_unit/farmlandhabitatsguide.html](http://www.nuigalway.ie/applied_ecology_unit/farmlandhabitatsguide.html)

Note; a technology update relating to this project will be uploaded on the Teagasc website once it has been approved by senior management.

#### **4. Impact of the Research**

##### Outcomes of Literature Review

Three key issues arise when applying the outcomes from scientific literature to the design and implementation of an agri-environment measure.

- a. Many (but certainly not all) habitat management techniques require implementation for longer than the five year duration of an agri-environment measure before their effectiveness is apparent.
- b. Given that available funding is limited, agri-environment measures must be effective, meet priority objectives and demonstrate value for money.

Novel agri-environment measures have been identified that could be applied to:

- a. Maintain existing habitats of good ecological value (this should always be a priority)
- b. restore or enhance existing habitats of good ecological value e.g. species-rich grassland
- c. assist intensive farmers to create new biodiverse habitats within their farms: e.g. creation of ponds, field margins or log piles, and;
- d. control invasive alien species.

##### Outcomes of Experts' Assessment

The use of expert groups proved to be an efficient and effective method to:

- (i) assess the likely environmental effectiveness of biodiversity options
- (ii) identify specific aspects of options that are in need of improvement
- (iii) highlight modifications which should improve environmental effectiveness.

Most (but not all) biodiversity options in REPS 4 were associated with high scores for both the cause-and-effect and compliance criteria. Nevertheless, many measures are unlikely to be as effective as expected. Several options were expected to have little or no environmental effect, and some of these were associated with medium to very high participation levels.

The experts identified clear reasons why specific options were not expected to be wholly effective. Many options are likely to have low or no effectiveness (at the scheme scale) because of insufficient participation levels. The experts identified how the environmental effectiveness of several measures could be improved, which would only require relatively minor modification in several cases.

##### Benefits to end-users

Details from the literature review and the experts' assessments will aid policy-makers with the design of future agri-environment schemes and measures.

The literature review highlights several potential measures for the conservation of biodiversity, and indicates sources of associated evidence on their effectiveness.

The experts' assessments offers a method to get high-quality and relevant information on environmental effectiveness within a short timeframe. In the absence of relevant empirical data, the use of expert groups proved to be an efficient and effective method with which to learn how to improve agri-environment measures. This approach could be especially useful at the design stage of agri-environment measures (or schemes) as a structured approach for eliciting expert comments on the likely ecological and environmental effectiveness of proposed measures. In this way, it could contribute a methodology for use in *ex ante* (and *ex post*) evaluations.

## References

European Environment Agency (2008). *Habitats Directive Article 17 report (2001-2006)*. This paper is part of the web-based Article 17 Technical Report (2001-2006) <http://biodiversity.eionet.europa.eu/article17> compiled by the European Topic Centre on Biological Diversity for the European Commission (DG Environment)

NPWS (2008). *The Status of EU Protected Habitats and Species in Ireland*. National Parks and Wildlife Service.

Primdahl, J., Vesterager, J.P., Finn, J.A., Vlahos, G. Kristensen, L. and Vejre, H. (2010). Current use of impact models for agri-environment schemes and potential for improvements of policy design and assessment. *Journal of Environmental Management* 91: 1245-1254.

## **5. Exploitation of the Research**

A booklet "Farmed Biodiversity: Measures to create and enhance farmed habitats" has been published. It is aimed at farmers and others involved in land management and related advisory and support activities.

The main outcomes of this research have been provided to the Mid-Term Evaluation of the RDP.

See also Section 6(e) and Section 11 of this report.

## **6. Summary of Research Outputs**

- (a) Intellectual Property applications/licences/patents
- 1. N/A

- (b) Innovations adopted by industry
  - 1. N/A
  
- (c) Number of companies in receipt of information
  - 1. A copy of the published booklet “Farmed Biodiversity: Measures to create and enhance farmed habitats” has been sent to a number of institutions (e.g. NPWS, Teagasc Advisory, National Biodiversity Centre, TCD, DAFF, UCD, UCC). Copies of the booklet were also handed out at a recent Workshop held in Johnstown Castle (Workshop on “Field and Watercourse Margins in Agri-Environment Schemes”. September, 2010).
  
- (d) Outcomes with economic potential
  - 1. **N/A**
  
- (e) Outcomes with national/ policy/social/environmental potential
  - 1. Outcomes that have national/ policy /environmental potential have been included in Sections 3, 4 and 5 of this report. Some main points are summarised here.

To meet the new EU target of halting biodiversity loss by 2020, it will be necessary to further strengthen the links between the biodiversity objectives of Irish agri-environment schemes and national priorities for biodiversity conservation. This will likely require greater geographical targeting of agri-environment schemes for the conservation of protected or vulnerable habitats and named species.

There is insufficient monitoring and measurement of the environmental effectiveness of agri-environment schemes. As a consequence, both the schemes and the participant farmers get insufficient credit for their successes. Conversely, schemes are restricted in identifying underperformance and taking corrective action. Most importantly, learning lessons from previous environmental assessments would ensure that the outcome of future assessments would be to demonstrate the environmental benefit of well-designed measures and options.

According to the experts, most of the REPS 4 measures were considered to be well-designed and implemented as prescribed by participant farmers. Based on both the experts’ judgements and a review of evidence, however, several of the REPS 4 biodiversity options would be expected to deliver little or no benefit for biodiversity. For most of this group of options, the primary reason is that participation levels are too low to achieve an environmental impact. Some other options in this group, however, were associated with medium to very high participation levels. The experts suggested how the environmental effectiveness of several measures could be improved, which would only require relatively minor modification in several cases.

There is considerable overlap between the REPS measures and options that were addressed by this study, and those included in the Agri-Environment Options scheme (AEOS) and Natura 2000 scheme. Thus, environmental assessment of the environmental impacts of REPS 3 and REPS 4 can be used to more quickly assess the environmental effectiveness of measures in the AEOS. This would provide necessary information to confirm the environmental benefits of effective measures, and to identify any required improvements to other measures.

The use of pilot projects offers an efficient mechanism to assess the environmental effectiveness of a new or proposed agri-environment measure. Pilot projects should be integrated with applied research programmes. For example, an agri-environment scheme might pay 50 farmers to implement a new agri-environment measure/option on their farm for a 3-year period. At the same time, an associated research award would facilitate a research study of the environmental effectiveness of the measure. Following assessment (and possibly some modification for improvement), effective measures could then be implemented on a wider geographical scale.

- (f) Peer-reviewed publications, International Journal/Book chapters.
1. Carlin, C., Finn, J., Ó hUallacháin, D. and Gormally, M. 2010. Biodiversity options in agri-environment schemes in Ireland: Doing the job right or doing the right job? *Aspects of Applied Biology 100*, Agri-environment schemes - What have they achieved and where do we go from here?, pp. 449-454. (Reviewed and published, paper as part of International Conference.) 27<sup>th</sup>- 29<sup>th</sup> April, 2010.
- (g) Scientific abstracts or articles including those presented at conferences
1. Carlin, C., Finn, J., Ó hUallacháin, D., & Gormally, M. (2010). Biodiversity options in agri-environment schemes in Ireland: Doing the job right or doing the right job? Fourth Annual Environmental Change Institute/MRI Conference. 17<sup>th</sup> June, 2010.
  2. Carlin, C., Gormally, M., and Finn, J (2009). Bridging the researcher-user interface: Reviewing the evidence for agri-environmental measures to create and enhance farmland habitats. 19<sup>th</sup> Irish Researchers' Colloquium. 9th -11th February, Waterford Institute of Technology, p. 71.
  3. Carlin, C., Gormally, M., O hUallacháin, D and Finn, J (2009). Identification of agri-environment measures to improve farmland biodiversity. Johnstown Castle Research booklet, Teagasc, p. 84-85.

4. Carlin, C.M., Finn, J.A., Ó hUallacháin, D. and Gormally, M.J. (2009). Using experts to judge the effectiveness of an agri-environment scheme. Book of Abstracts. Third Annual Environmental Change Institute Research Open Day, NUI Galway. 24<sup>th</sup> June, 2009
5. Carlin, C.M., Finn, J.A., Gormally, M.J. and Ó hUallacháin, D. (2009). Do mammals in Ireland benefit from agri-environment schemes? Book of Abstracts. Inaugural All-Ireland Mammal Symposium, Waterford Institute Technology. 6<sup>th</sup> -8<sup>th</sup> November, 2009

**(h) National Report**

1. Carlin, C., Gormally, M., Ó hUallacháin, D. and Finn, J.A. 2010. *Experts' assessments of biodiversity options and supplementary measures in REPS 4*. NUIG/Teagasc. Research report to DAFF. (Teagasc RMIS 5768)

[http://www.nuigalway.ie/applied\\_ecology\\_unit/farmlandhabitatsguide.html](http://www.nuigalway.ie/applied_ecology_unit/farmlandhabitatsguide.html)

2. Carlin, C., Gormally, M., Ó hUallacháin, D. and Finn, J.A. 2010. *Overview of methods to create and enhance farmland habitats in Ireland*. NUIG/Teagasc. Research report to DAFF. (Teagasc RMIS 5768)

[http://www.nuigalway.ie/applied\\_ecology\\_unit/farmlandhabitatsguide.html](http://www.nuigalway.ie/applied_ecology_unit/farmlandhabitatsguide.html)

**(i) Popular non-scientific publications**

1. Carlin, C., Gormally, M., Ó hUallacháin, D. and Finn, J.A. 2010 *Farmland Biodiversity: Measures to create and enhance farmed habitats*. NUIG/Teagasc. 32 pages. ISBN 978-0-9537544-2-7

[http://www.nuigalway.ie/applied\\_ecology\\_unit/farmlandhabitatsguide.html](http://www.nuigalway.ie/applied_ecology_unit/farmlandhabitatsguide.html)

2. Ó hUallacháin, D. and Finn, J.A. 2010 *Creating and enhancing farmland habitats: a review of options and evidence*. Teagasc Technology Update. 3 pages.

**Note; a technology update relating to this project will be uploaded on the Teagasc website once it has been approved by senior management.**

**(j) Workshops/seminars/ open days at which results were presented (excluding those in (g))**

1. Two seminars on 'Agri-environment schemes and their effectiveness' provided to 4<sup>th</sup> year Environmental Science students at NUI Galway in 2009
2. A number of seminars (six hours in total) on 'Agri-environment schemes and their effectiveness' presented to 4<sup>th</sup> year Environmental Science students at NUI Galway in 2010.

## 7. Permanent Researchers

Institution Name	Number of Permanent staff contributing to project	Total Time contribution (months)	Average time contribution per permanent staff member
Teagasc	2	4.224	2.112
NUIG	1	0.438	0.438
<b>Total</b>	<b>3</b>	<b>4.662</b>	<b>1.554</b>

## 8. Researchers Funded by RSF

Type of Researcher	Number	Total Time contribution (months)	Average time contribution
Post Doctorates	1	18	18
Contract Researchers			
PhD postgraduates			
Masters postgraduates			
Temporary researcher			
Other			
<b>Total</b>	<b>1</b>	<b>18</b>	<b>18</b>

## 9. Postgraduate Research

Total Number of PhD theses: N/A

Total Number of Masters theses: N/A

## 10. Project Expenditure

Total expenditure of the project: **€68,852.86**

Total Award by RSF **€89,983**

Other sources of funding (specify) **N/A**

1.

Breakdown of Total Expenditure

Category	Teagasc	NUIG	Name Institution 3	Name Institution 4	Total
Contract staff		44,578.93			44,578.93
Temporary staff		821.5			821.5
Post doctorates					
Post graduates					
Consumables		548.61			548.64
Travel and subsistence	2,343.74	5,775.11			8118.85
Sub total	2,343.74	51,724.15			54,067.89
Durable equipment					
Other		1,268			1,268
Overheads	585.94	12,931.04			13,516.97
<b>Total</b>	<b>2,929.68</b>	<b>65,923.19</b>			<b>68,852.86</b>

## 11. Future Strategies

The main outcomes of this research have been provided to the Mid-Term Evaluation of the RDP. This is probably one of the most important ways for this work to be used.

In the absence of relevant empirical evidence, we have solicited experts' judgements of success factors for measures and options in the REPS. This can certainly help with learning how to improve the scheme, but is a substitute for empirical data from a national-scale monitoring of the environmental effects of the measures and options of the REPS. In a scoping study, Finn (2010\*) found that the majority of REPS payments are directed toward measures, supplementary measures and options with biodiversity

objectives and these should be highest priority for monitoring. Overall, the environmental monitoring of selected REPS measures, supplementary measures, biodiversity options and Measure A was estimated to cost about €3.4 million over a 4 year period. The average annual budget for the monitoring programme (~€0.86m) would be about 0.25% of the current annual expenditure on REPS (>€330m). There is a high degree of overlap of measures between REPS and the new Agri-Environment Options Scheme (AEOS) and NATURA 2000 Scheme. Thus, monitoring of selected measures and options in REPS 4 can be used to anticipate the environmental effectiveness of the new schemes. This would provide necessary information to confirm environmental benefits of effective measures, and to implement any required improvements to other measures.

Recent commentary suggests that public money from the proposed reform of the Common Agricultural Policy (CAP) will be more closely linked to support the delivery of public goods, mostly in the form of environmental benefits. Biodiversity conservation on farmland is critical to international, EU and CAP policy objectives of halting the loss of biodiversity, and will mainly depend on effective agri-environment schemes. Having failed to halt biodiversity loss by 2010, there will be increased focus on the contribution of agri-environment schemes to the EU target of halting biodiversity loss by 2020. A priority objective is to target agri-environment payments to areas of high biodiversity that occur outside of Natura 2000 sites. To this end, the spatial distribution of biodiversity outside of designated areas remains a major knowledge gap. At the same time, agri-environment expenditure has become increasingly focused on biodiversity objectives, and securing future payments will depend on delivery of targeted benefits that are clearly demonstrated. To address this knowledge gap, we have applied for a Walsh Fellowship from Teagasc, and also aim to apply for a research award from IRCSET (winter 2010).

\*Finn, J.A. 2010. Monitoring the environmental impacts of the Rural Environmental Protection Scheme: a scoping study. Research report. Teagasc.

## **12. Industry Collaboration**

N/A