Natural England Research Report NERR079

Agri-Environment Monitoring and Evaluation Programme Annual Report 2017/18

A summary of findings from recently published projects

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Agri-Environment Monitoring and Evaluation Programme Annual Report 2017/18: A summary of findings from recently published projects

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Executive Summary

This annual report highlights recent work of the Agri-environment Scheme Monitoring and Evaluation programme. The six projects featured in this report provide evidence relevant to a range of Agri-environment schemes and outcomes. Projects looked at the effectiveness of schemes on plants, birds, pollinators, soils and air quality. Additionally, this report also includes a large assessment of the implementation of Countryside Stewardship.

Evaluating environmental effectiveness at different spatial scales

The effectiveness of Agri-environment schemes was assessed at the field, farm, regional and national scales. This was done through using field surveys, agreement monitoring, modelling and reviewing previously published research. At the field scale, projects generated evidence that Agri-environment options for legume and herb rich swards were associated with increased plant diversity and increased abundance of target species. At the agreement scale a resurvey of Higher Level Stewardship (HLS) agreements found some small positive changes in habitats and plant communities, for example a shift to characteristic heathland flora under lowland heathland options. Additionally, in this survey of HLS agreements 72% of all Indicators of Success were fully or partially met. A further study of agreements in lowland wet grasslands showed differences between regions in how plant communities have responded to management over 25-30 years. Additionally it highlighted that options to favour birds may lead to management which does not optimise outcomes for plant communities. This may have implications when a site's SSSI designation addresses both plant and bird communities.

At the national and landscape scale, one study highlights the potential for Agri-environment options to reduce ammonia air pollution. Overall, 16% of Agri-environment options, across schemes, were thought likely to contribute to a reduction in ammonia emissions, although such options only covered 5% of land under Countryside Stewardship (CS) and 0.4% of land under Environmental Stewardship (ES), but 100% for the small number of options under the Farming Ammonia Reduction Grant scheme. Although, estimates of the reduction in ammonia emissions brought about through Agri-environment options only equated to 0.6% of total agricultural ammonia emissions, this was in part due to the unquantifiable effects of some options. Modelling suggested that for specific designated sites, the use of Agri-environment options surrounding the site, reduced the area of land which exceed critical levels of ammonia pollution.

As shown in the 2016-17 Annual Report, it can be difficult to determine if the direct effects of Agri-environment options at the field scale provide additional benefits at a larger scale. This difficulty remains in this years' report. For example, options for providing seed-rich habitats throughout the winter were heavily foraged by granivorous bird species and when heavily foraged led to better winter bird condition. However, despite this, there was no increase in target species' breeding abundance, suggesting further work is needed to understand the potential benefits of Agri-environment schemes at a larger scale.

This annual report highlights that Agri-environment schemes can bring about benefits at the option, agreement and national scale and contribute to ecosystem services, such as air quality. However, in some cases the challenge remains to demonstrate how options effective at the field scale results in spillover benefits for the wider landscape.

Evaluating scheme design and implementation

The Monitoring and Evaluation programme carried out a large-scale assessment of CS implementation in 2016 and 2017. The project interviewed stakeholders, agreement holders and non-applicants, coupled with an analysis of agreement and option uptake data. Overall, perceptions

improved between the first and second year of CS. Specifically in 2016, 94% of respondents suggested improvements, however in 2017 this had dropped to 61%. Barriers to uptake were seen to be the scheme's application paperwork, bureaucracy, confusion regarding targeting, and concerns regarding inspections. However applicants were positive about CS objectives and some of the options, while over half of unsuccessful applicants were either re-applying or would consider re-applying. Successful applicants generally considered the options in CS a better fit with their current management than those without a CS agreement.

The uptake of CS options was variable, with a small number of common options. Specifically, 26 options, out of a total 241, accounted for 75% of first year payments. Of these 26 options, six capital items accounted for 40% of first year payments. The most common options were primarily those for low-diversity grassland, arable land and water and soil protection. Targeting of options to priority habitats showed, at minimum, 77% of the area of priority habitat land under agreement had relevant CS options, with the highest percentage for reedbeds, coastal sand dunes and coastal saltmarsh.

Overall, perceptions of CS improved over the first two years, although scheme complexity potentially reduced attractiveness to applicants. However applicants were positive about the scheme's aims, while agreement data shows that a small number of options are very common and account for a large proportion of payments.

Evaluating the Monitoring and Evaluation Programme

As highlighted in the 2016-17 Annual Report, there is a need to use robust counterfactuals to appropriately determine the effect of Agri-environment schemes. Projects commonly use existing Agri-environment uptake when assessing effectiveness of options as implemented by agreement holders. For some projects counterfactuals can be very difficult to establish, such that external datasets have been used to allow comparisons to be made, although this can lead to challenges in reconciling different methodologies and timings of surveys.

Where studies do not detect changes over time, it can be difficult to determine if there was no change, insufficient time between surveys to detect change, or insufficient power to detect change. Together, this suggests the need to ensure sufficient replication, appropriate survey methodology and robust counterfactuals.

The 2016-17 Annual Report highlighted gaps in knowledge regarding the effectiveness of Agri-environment options, particularly regarding contribution to carbon storage, use by pollinators, potential use of remote sensing for monitoring, impact on invertebrates and impacts of pulse grazing. This report includes initial information from projects which have looked at pollinators, with current projects looking at remote sensing and Agri-environment impacts on invertebrates and carbon storage.

Background - Agri-Environment Schemes

Agri-environment schemes encourage farmers and other landowners to protect and enhance the environment on their land by paying them for the provision of environmental services. Each scheme offers a range of options to deliver target outcomes for specific features. The schemes referenced in this report are:

- Environmentally Sensitive Areas (ESA) – introduced in 1987 and replaced by Environmental Stewardship in 2005. There were 22 ESAs in England.
- Classic Countryside Stewardship Scheme (CSS) – open to applications between 1996 and 2004.
- Environmental Stewardship (ES) – open to applications between 2005 and 2014, it consisted of two tiers, Entry Level Stewardship (ELS) aiming for high coverage of basic options, and Higher Level Stewardship (HLS) with more demanding options targeted to features of high environmental value.
- New Countryside Stewardship (CS) – the current AES for England. The first agreements started 1st Jan 2016. Like ES, the scheme consists of two tiers, a Mid-Tier (MT) and a Higher Tier (HT).

Introduction to the Agri-Environment Monitoring and Evaluation Programme

England's Agri-environment schemes receive funding from the Rural Development Programme for England (RDPE), and a condition of this funding is that schemes are continually assessed through a planned national programme of monitoring and evaluation, which also feeds into Europe-wide evaluation of Rural Development Programmes. The Agri-Environment Monitoring and Evaluation Programme is a joint programme delivered by Natural England and the Environment Agency on behalf of Defra, with input from the Forestry Commission and Historic England. The programme is funded through the RDPE Technical Assistance Fund.

A small number of Natural England specialists and project managers, led from the Evidence Services Team, design the programme and provide support and guidance for the monitoring and evaluation work, which is generally carried out by external contractors.

The programme delivers evidence to:

- Evaluate the delivery of Agri-environment schemes and their effectiveness in achieving their intended policy objectives.
- Inform current and future Agri-environment policy, scheme delivery and development.
- Fulfil domestic and European reporting requirements.

Purpose of this report

This report aims to summarise and synthesise findings from projects in the Agri-Environment Monitoring and Evaluation Programme that were published during 2018 and 2019. It also includes findings from a relevant Research and Development project that sit outside the Agri-Environment Monitoring and Evaluation Programme.

Natural England aims to work with Defra to understand these findings and interpret what they could mean for AES development and delivery. Additionally, key messages are shared internally to inform Natural England staff and ensure the organisation remains evidence-based. We also aim to share this report with key partners who contribute to and have an interest in the performance of AES.

Each project referenced in this report has a unique code which is used to identify it. A list of the project codes and their titles can be found in the list of projects below. The 2016-17 Annual Report covers 18 previously published projects (Oatway 2018).

Project reports 2017-2018

This annual report summarises the following projects funded by the Monitoring and Evaluation programme in 2017-2018.

LM0421 Effectiveness of ES in conserving lowland wet grassland

- What has been the impact of Agri-environment schemes on conserving the botanical interest of lowland wet grasslands? A total of 99 grassland sites under HLS were surveyed in 2012, including sites previously under ESAs and those newly under an agreement.

LM0445 Agreement Scale Monitoring of HLS

- How have habitats changed under HLS and are changes influenced by agreement or agreement holder characteristics? A total of 173 HLS agreements were resurveyed in 2015 and 2016 which were widely distributed across England and followed a baseline survey in 2009-2011. Additionally, 137 agreement holders were interviewed face-to-face using a semi-structured questionnaire.

LM0464 Implementation of CS in England

- What has been the perception regarding CS implementation? This project uses, a) interviews with 416 people who either have agreements or had registered interest in the scheme; b) analysis of CS option uptake nationally and compared with ES; c) 20 interviews with stakeholders considering their views of CS implementation, d) synthesis of all interviews and data analysis.

LM0468 Evaluating new legume and herb rich sward options

- How effective are options to increase the plant diversity in grasslands with legumes and herbs? Plant and soil data was collected from 76 parcels on 54 holdings, coupled with face-to-face interviews.

LM0475 CS and air quality

- Do CS options help reduce ammonia emissions? This was assessed for CS, ES, Countryside Productivity Scheme, Farming Ammonia Grant Scheme and England Woodland Grant Scheme. The project evaluates the potential of different options for reducing ammonia emissions and models their impact at national scale and relative to sensitive designated sites.

Additionally, this report includes a recent research project which looked at the effectiveness of AES schemes. This project is included to highlight relevant research which was not part of the main Agri-environment Monitoring and Evaluation programme.

BD5210 Effects of winter-long provision of seed rich habitats on seed eating farmland birds

- Does the provision of seed rich habitats help the targeted bird species survive the so-called 'hungry gap' during late winter and early spring? This study, based in in North Wales, looked at the effect of wild bird seed mixture and seeded ryegrass options on seed abundance and the winter condition and abundance of bird species, specifically reed buntings and yellowhammers.

Environmental Effectiveness

Agreement level

Plant community

The effectiveness of Higher Level Stewardship (HLS) was assessed in 2015 and 2016 following baseline surveys in 2009 to 2011. In total, 173 HLS agreements widely distributed across England were resurveyed. Over the 6-7 years between surveys, many botanical variables showed little or no change. Out of all the Indicators of Success, 63% were achieved, 9% partially met and 28% failed, while 86% of planned capital items appeared to be complete. Where change in variables such as species richness did occur they were mainly positive, but often small in scale and limited to particular areas or habitats. Furthermore, the extent of most broad and priority habitats under HLS management did not change between the two surveys, apart from when creation or restoration options were being used on certain habitats (LM0445).

Indicators of Success **fully met** for all HLS options:

63%

Indicators of Success **partially met** for all HLS options:

9%

Indicators of Success **not met** for all HLS options:

28%

Despite limited changes in plant community composition, particularly in the uplands, there were differences between the two surveys. Changes in habitat condition were most strongly affected by the baseline habitat (Farm Environment Plan habitat feature) present and its condition. Woodland ground flora under the HLS maintenance option indicated reduced disturbance at the resurvey. Changes in plant communities under lowland heathland options were indicative of a move towards characteristic heathland flora. Grasslands, already of priority habitat quality but not in good condition, were less likely to improve in condition between the two surveys than semi-improved or improved grasslands. Furthermore, the timescales required for grassland restoration to achieve conservation priority grassland status may be greater than the time that elapsed between these two surveys (LM0445).

Lowland wet grasslands were surveyed in:

Somerset Levels with 31 repeat surveys.

Test Valley with 9 repeat sites.

Derwent Valley with 9 new sites.

Avon Valley with 19 repeat and 3 new sites.

Itchen Valley with 7 new sites.

Broads and Nene Valley with 5 repeat and 5 new sites.

Upper Thames with 8 repeat and 4 new sites.

The effectiveness of HLS and former Environmentally Sensitive Areas (ESA) schemes was also assessed specifically for lowland wet grasslands. A total of 99 sites were surveyed in 2012 to record their botanical interest, of which 71 of the sites had been monitored under ESA management prior to HLS. For five of the seven regions these surveys were repeats of periodic surveys initiated in either 1988 or 1993. The changes in plant communities differed across the regions surveyed. In the Somerset Levels and Test Valley there was a shift away from species suited to grazing, but with no equivalent change in such species seen in the Norfolk Broads or Avon Valley. Additionally, the Somerset Levels and Avon Valley showed increases in species suited to wet conditions, particularly in the Somerset Levels where the majority of sites were in areas under raised water level management. In relation to nutrients, some sites in the Somerset Levels showed increases in the Ellenberg soil nutrient score and reduction in species richness, while in contrast in the Norfolk Broads species richness increased as soil fertility decreased (LM0421).

In the Somerset Levels many sites were being managed under ‘bird’ options such as HK9 (‘maintenance of wet grassland for breeding birds’). However, the findings suggest that these options

may not be optimal for maintaining target plant communities, specifically species-rich, semi-natural grasslands, such as those classified as NVC communities MG8 and M22. As such, some Somerset Levels SSSIs with notified features for species-rich grasslands and birds may fail condition assessments on the grassland features. There was a similar situation on Avon Valley sites where delivering options primarily for birds and target features (i.e. HK11/12 and HK15) on semi-improved grasslands were not leading to enhanced sward diversity. Additionally, in the Upper Thames, options for breeding and wintering birds maintained species-rich swards, but without enhancing species richness. Overall the project suggests that there may be some conflict between management needed to maintain and enhance species-rich plant communities and delivery of optimal management for wading birds (LM0421).

Option level

Plant community

Out of 5 targets:

64% of parcels under EK21, OK21, HK21 and OHK21 options met at least **three of the targets**.

9% of **counterfactual parcels** met at least **three** of the targets.

The Monitoring and Evaluation programme assessed the effectiveness of introduced options: EK21, OK21, HK21 and OHK21. These options aim to increase grassland plant diversity and support pollinators, through sowing and maintaining specific grasses, legumes and herbs in the sward. Plant surveys were carried out on areas under the options, and also counterfactual areas not under the particular management. Plant communities were assessed against five targets: 10% *Trifolium pratense* cover, 10% cover of other forbs (excluding injurious weeds), presence of 5 grass species, presence of 3 legume species and presence of at least 5 other forb species. Under the options, 78% of parcels contained at least 5 non-legume forb species while without the options only 43% of parcels met this target. Furthermore, all other targets were more likely to be met under the options than in counterfactuals and 64% of land under the options met at least three targets, while this was only 9% for counterfactuals (LM0468).

The increased plant diversity under these legume and herb rich sward options is intended to enhance food resources for wildlife by encouraging more flowers and seeds. In particular, the number of flowers and seedheads likely to benefit pollinators was 10-fold higher under the option than without, while for organic farming the number of flowers and seedheads was 3-fold higher under the option than without. Under the option, the species which contributed most to the increase in flowers were *Trifolium repens*, *Chichorium intybus*, *Trifolium pratense* and *Lotus corniculatus*, while without the option the species was primarily *T. repens*, and *T. pratense* on organic parcels. Although the benefits to soil fertility and structure of leys are well known, this study revealed no significant difference when measured using the Visual Evaluation of Soil Structure (VESS) test, but improved aggregate stability was detected using the soil dispersion ratio test (LM0468).

Birds

Despite widespread uptake of options to provide seed to farmland birds in winter, research has suggested that many seed resources become depleted by mid winter. This leads to a ‘hungry gap’ which may limit survival over winter and could possibly have follow-through effects on breeding condition and, hence, productivity. The contribution of two land management practices in alleviating this seed shortage was assessed in North Wales. The options of ‘wild bird seed mixture’ and ‘seeded ryegrass’ are designed to provide seed for granivorous birds through the winter: for example ‘seeded ryegrass’ is an area of grassland which is not cut for silage after the 31 May and the grass is allowed to go to seed. The combination of the two options accounted for 60% and 90% of winter foraging records in the survey area for yellowhammers and reed bunting respectively, while body condition of yellowhammers increased with greater proportions of seed remains in birds’ faeces. Additionally, seeded ryegrass was particularly important during late winter when seed resources on wild bird seed mixture had been exhausted. Despite this, seed-rich habitats had no effect on the abundance of breeding yellowhammers, using standard breeding bird surveys. The research suggests that

individual options which assist with food shortages in winter may not be sufficient for increasing breeding populations and that, instead, option packages which also assist with nesting habitat and spring/summer food (eg invertebrate chick food) may be needed (BD5210).

Additional benefits: Ecosystem Services

Air quality

Within the context of evaluating the impact of Agri-environment schemes on ecosystem services, the Monitoring and Evaluation programme assessed the potential impact of options on ammonia emissions, a key element of air quality. This was done by reviewing appropriate options and modelling their potential to reduce emissions. Out of 794 total options across ES, CS and Farming Ammonia Reduction Grant (FARG) schemes, 128 could potentially reduce ammonia emissions. The FARG scheme is targeted at ammonia reduction and although it only has two options, both were assessed as directly reducing ammonia emissions. In contrast, across all schemes, only 12% of options were found to directly reduce emissions, 2% gave potential reductions, 2% provided recapture of ammonia by woodlands, while 1 option provided potential reduction and recapture (see box). In total, 16% of options (128) were considered relevant for ammonia, 65% of options only had negligible effects, while the remaining 18% were unquantifiable (LM0475).

Out of **794 options** in ES, CS and FARG schemes:

94 options provided **direct emission reductions**

15 options provided **potential reductions**

18 options provided **potential recapture**

1 option provided **potential reduction and recapture**

Despite the large area of land under Agri-environment options and the 16% of options which were considered relevant for ammonia, only 5% of the land under CS was in ammonia-relevant options, whilst for ES it was only 0.4%. Additionally, 4 CS and 13 ES options considered relevant for ammonia had not been taken up. In part this was due to some options under the Farming Ammonia Reduction Grant scheme being more attractive than equivalent option under CS, for example items such as slurry store covers (LM0475).

Options which quantifiably altered ammonia emissions were used to estimate the overall effect of Agri-environment schemes on ammonia emissions. The overall change in emissions due to Agri-environment options was a relatively small decrease (0.75 kt N), equivalent to 0.6% of agricultural ammonia emissions in England. However as 18% of options were classified as providing unquantifiable changes, the actual reduction in emissions is likely to be higher. The contribution of schemes to these reductions differed: CS accounted for two-thirds of reductions, ES accounted for 23% and Farming Ammonia Reduction Grant scheme accounted for 10%. The options which contributed most to the reduction in ammonia emissions were those including buffer strips, slurry store covers, arable reversion, legume and herb-rich swards and unharvested cereal headlands (LM0475).

Although only a small percentage of land under Agri-environment options was relevant for ammonia reduction, virtually all options were within 10km of at least one Site of Special Scientific Interest (SSSI). Furthermore, ammonia relevant options implemented within 2km of a SAC covered over 200km^2 of land. Due to the overall small reduction in ammonia emissions resulting from Agri-environment options, there were only small changes in critical loads for designated sites. However for particular sites the area of land which exceeded levels was reduced, due in part to the vicinity of relevant options. The project also estimated the benefits and costs of existing options if they were implemented across the country. For the FARG scheme the covering of slurry tanks was estimated to be able to reduce ammonia by 6.2kt at a cost of £200-240M, while the use of low-emission land spreading equipment could reduce ammonia emission by 14kt at a cost of £60M (LM0475).

Scheme Development

Advice, Guidance and Training

The CS implementation project assessed the role of advice during the roll-out of CS in 2016 and 2017. The role of NE advisers decreased over time while the use by applicants of their own advisers increased. In HT, the proportion of applicants identifying NE advisers as the primary source of advice dropped from 67% in 2016 to 43% in 2017, while in MT the proportion dropped from 52% to 32%. In contrast, the proportion of applicants using their own advisers increased from 17% in MT in 2016 to 47% in 2017. Although this points to greater importance being placed on applicants' own advisers, it does not necessarily mean that there was a reduction in the advice provided by NE, Catchment Sensitive Farming Officer (CSFO) and Forestry Commission advisers. Additionally, applicants within Severely Disadvantaged Areas (SDAs) who would not have proceeded with their CS applications without the advice they received dropped from 75% in 2016 to approximately 50% in 2017. However agreement holders joining in 2017 were more positive about the advice they received regarding option choice than those from phase 1, while advice was strongly linked to option choice regardless of the type of agreement or whether it was successful. The online guidance material was generally well received with 79% of applicants describing it as 'very useful' or 'fairly useful' (Obj 1, LM0464).

Geographical targeting

77% of priority habitat under agreement was co-located with **relevant CS options**.

The CS implementation project also looked at targeting of CS options, particularly against priority habitat and historic features. Overall, 77% of priority habitat area under agreement had relevant CS options. Targeting worked particularly well for reedbeds, coastal sand dunes and coastal saltmarsh with over 90% of the priority habitat under CS agreement co-located with relevant options. Furthermore, options found in Higher-Tier were more likely to be appropriately located on priority habitat than Mid-Tier options, likely due to greater access to advice and the availability of more specific higher tier options. However these estimates of relevant option targeting are likely to be underestimates due to challenges when linking CS option data to priority habitat data (Obj 2, LM0464).

In contrast, the targeting of options for historic features was generally less successful. In some cases this may have been due to the quality of the historic environment dataset, for example options for maintaining traditional farm buildings were only rarely co-located. However, options to take archaeological features out of cultivation and reduce depth/inversion of cultivation were both appropriately co-located in 90% of cases (Obj 2, LM0464).

Links between schemes

For CS applicants, 45% thought the new agreement was "an exact fit", although this was reduced to 15% in SDAs. This may be due, in part, to a number of options not continued in CS, which were available under ES. Overall, few CS applicants were new to Agri-environment schemes and a relatively small amount of land was new to an Agri-environment scheme. The main route by which land entered Agri-environment management for the first time was through ELS transferring to CS with additional land included under agreement (Obj 1, LM0464).

For **CS applicants**:

45% thought new agreement was an "exact fit".

But in **Severely Disadvantaged Areas** only **15%** though new agreement was an "exact fit".

Option uptake

The CS implementation project carried out a large assessment of the uptake of CS, including analysing which options have been commonly included in agreements. The pattern of CS option uptake was characterised by a small number of popular options, with the majority of scheme options rarely included in agreements. Out of 241 options, only 19 were present on at least 5% of agreements. Additionally, 26 options accounted for 75% of payments in the first year of the agreement. Of these, six capital items accounted for 40% of all first year payments. The most common options were primarily those for low-diversity grassland, arable land and water and soil protection (Obj 2, LM0464).

26 options accounted for **75%** of first year payments.

Of these options, **6 capital items** accounted for **40%** of first year payments.

As expected the pattern of uptake varied across farm type, for example, arable options more common on cereal farms and stone wall restoration more common on grazing livestock farms in Less Favoured Areas (LFAs). Additionally, uptake was greatest for options with biodiversity and landscape objectives, while 53% of multi-annual agreements had more than one high level objective, helping to meet scheme aspirations of being 'multi-objective'. The implementation and uptake of options in CS was also compared to ES. Despite ES having a far greater number of agreements than CS, some options were proportionally more common in CS. In particular, options associated with arable and temporary grassland available in the Mid-Tier strand were more common than equivalent options in ES (LM0464; Objective 2).

Overall, analysis of the uptake of CS options shows how delivery is dominated by a small number of common options. Additionally, uptake reflects the differing demands of farm types, but with biodiversity as a key high level objective.

Perspective of stakeholders and agreement holders

As part of evaluating the first two years CS implementation, the project interviewed 20 stakeholders on the scheme's implementation, including 2 Natural England advisers. Although a small sample, the responses gave the following key conclusions (LM0464; Objective 3):

- There was recognition of improved information available for 2016 applications compared to 2015. Positive activities were one-to-one clinics, webinars and CS events as they allowed interaction and questions. However stakeholders thought much more detailed and individually specific advice was required throughout the application, with three quarters believing advisers were needed to ensure strong applications.

- According to stakeholders, income was the primary reason for farmers to apply to the scheme, followed by environmental/conservation reasons, replacement for ES and agronomic reasons. Conversely barriers included: "*having too much paperwork, confusion around targeting and eligibility, a perceived increase in bureaucracy, concerns of Inspections or penalties and uncertainty around Brexit*". Specifically, the IT systems supporting scheme applications and advice were viewed negatively by two-thirds of stakeholders, while they also reported a reduction in staff resources, including specialist staff.

- Stakeholders recognised the scheme (CS) was more targeted than ES and attempted to get better value for money, although targeting was not always considered appropriate or that it had sufficient flexibility.

- Almost half of stakeholders thought there was a lack of options and flexibility. Specifically stakeholders thought there were few grassland options, although they thought it positive that more upland grassland options were included under Mid-Tier (MT) from Higher-Tier (HT).

- The inclusion of woodland grants under CS was confusing (these were previously administered under a separate grant scheme). Stakeholders suggested scheme delivery would benefit from improvements around processes and clearer language, with more advice and more staff with expertise.

Perspectives of land managers

In addition to interviewing stakeholders, the project also interviewed land managers, including: agreement holders, unsuccessful applicants and non-applicants. In total the project completed 416 interviews in two phases in 2016 and 2017. Overall, these groups found implementation of CS was challenging. In the first phase 94% of respondents had suggested improvements, while this dropped to 61% in phase 2 –suggesting the improvements made between the first and second years of CS addressed some applicant requirements. Despite the challenges, 76% of applicants were positive about the scheme's environmental aims (Obj 1, LM0464).

For successful applicants the CS options generally fitted well with their current management, so that they anticipated fewer changes to their management. In contrast, for non-applicants, CS was viewed as requiring significant changes to their land management. For applicants who did not end up with CS agreements, the main reasons were due to timing and overall complexity of the scheme, with these reasons being consistent across 2016 and 2017. To encourage non-applicants to apply in the future, the key factors seen as needing to change were the structure of the scheme and a move to a simpler process. Of those applicants who were not successful and those who did not apply, over half are either in the process of re-applying or would consider doing so (Obj 1, LM0464).

To summarise the reasons for CS uptake, the implementation project modelled the likelihood of land managers participating in CS. The model suggests that participation in the scheme was more likely when: 1) land managers thought the scheme fitted well with their management systems; 2) land managers were influenced by scheme priorities and targeting; 3) holdings were over 200ha of land compared with less than 50ha; 4) holdings were lowland grazing livestock and dairy farms; and 5) holdings were owned as opposed to rented. However, this modelling does not include land owners who were unaware or uninterested in the scheme, which may impact the results, potentially by underestimating the differences between applicants and non-applicants (Obj 4, LM0464).

Legume and herb rich swards

The Monitoring and Evaluation programme has also looked in more detail at the uptake of and perception of agreement holders for a number of options, particularly newer options to promote legumes and herb rich swards. The options to create legume and herb rich sward were associated with increased plant diversity and increased resources for pollinators through greater flower numbers. Additionally, face-to-face interviews with farmers evaluated the reasons for option uptake and option success, or failure. The option was primarily chosen by over three-quarters of agreement holders because it fitted with current farm management and because of the wildlife benefits. A total of 18% of agreement holders thought there was no negative element to the option, while a third of the negative comments were due to management restrictions. Overall 84% of agreement holders would apply the option again (LM0468).

Agreement design (appropriate option selection/targeting, setting prescriptions and indicators of success)

Achieving Indicators of Success

The success of HLS agreements was investigated through assessing how confident agreement holders were in meeting Indicators of Success (IoS). In the national resurvey of HLS, 137 agreement holders were interviewed face-to-face using a semi-structured questionnaire. Agreement holders were often found to be over confident about achieving IoS, which were more likely to be met on agreements with SSSI land present. By looking at a range of variables, agreement holder characteristics could be related to botanical outcomes for several HLS options. For grassland,

woodland and moorland options, an agreement holder rating management as easy or very easy was linked to improved botanical outcomes between the two surveys. At the larger agreement-scale, agreement holder characteristics did not relate to outcomes for habitat condition, IoS or botanical characteristics (LM0445).

Linked to this, the potential for experts to predict which agreements would be successful was also assessed as part of the HLS re-survey project. After the baseline survey, a panel of experts assessed agreements predictively on the basis of feature targeting, use of options and use of management prescriptions. In some cases the expert scores correlated with changes in botanical measures, but generally, the predictions of the expert panel were not a "consistently reliable guide" to assessing botanical outcomes, suggesting challenges in understanding agreement design and option selection as well as reflecting imperfect knowledge about the 'effectiveness' of management delivered (LM0445).

Agri-Environment Monitoring and Evaluation Programme Development

Counterfactuals

As highlighted in the 2016-17 Annual Report, there is a need to use robust counterfactuals to appropriately compare the effect of Agri-environment schemes to areas without equivalent intervention. It is important for studies to monitor Agri-environment options as implemented in agreements, rather than how they might be used in experiments. As such, studies often use previously established options and make a comparison with areas without options in place. For example, the project looking at the effect of winter seed provision on farmland birds used areas with varying levels of relevant Agri-environment uptake (BD5210). In some cases alternative sources of data are required to establish counterfactual comparisons. For the HLS re-survey project there was no specific HLS counterfactual comparison, such that a counterfactual was constructed using various datasets. This allowed some valid comparisons, such as the finding that HLS woodland management had a positive effect on species richness as opposed to counterfactual datasets that revealed long-term declines in woodland species richness. But because counterfactuals used different methodologies, any comparisons must be made carefully given the reduced confidence in the comparison (LM0445).

Furthermore, where studies do not detect change over time, it can be difficult to understand if there was no change or if the study design provided insufficient statistical power to detect change. Additionally the period of time between surveys may be too short to detect long-term ecological change. Together with the use of appropriate counterfactuals, this highlights the need to ensure there is sufficient statistical power and sufficient time between surveys to detect the change expected from Agri-environment options. As such, projects will need to consider experimental design, replication, survey methodology and the use of appropriate counterfactuals.

Future evidence needs

The 2016-17 Annual Report highlighted gaps in current knowledge, specifically regarding carbon storage, management for pollinators, the use of remote sensing, management of grassland mosaics for invertebrates and the use of pulse grazing. This annual report highlights recent projects which have looked at pollinators, with current projects looking at Agri-environment impacts on carbon storage and invertebrates and use of remote sensing. Furthermore, projects in this report also point to areas where further evidence is needed.

Birds

- Where the effect of Agri-environment options was assessed on bird abundances across a region, there is a need to understand if the results found in one region represent different areas and the picture nationally. For example, work in North Wales showed that for seed eating bird species, individual options which assist with food shortages in winter may not be sufficient for increasing breeding populations, and that instead option packages which also assist with nesting habitat and spring and summer food might be beneficial. The effectiveness of combined options ideally requires assessment across more regions to understand how effective they could be if implemented nationally (BD5210).

Air quality

- In assessing how Agri-environment options may impact ammonia emissions, 16% of options had unquantifiable effects. This therefore limits understanding of the combined effects of Agri-environment options on ammonia emission and points to the need for further evidence (LM0475).

References

BD5210: RSPB. 2017. Effects of winter-long provision of seed rich habitats on seed eating farmland birds. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=18177

LM0421: Wheeler, B.R., Wilson, P.J. & Bealey, C.E. 2014. The long-term effectiveness of Environmental Stewardship in conserving lowland wet grassland: Botanical survey of permanent plots in seven Wet Grassland Areas in 2012. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=18832

LM0445: Staley, J.T., Lobley, M., McCracken, M.E., Chiswell, H., Redhead, J.W., Smart, S.M., Pescott, O.L., Jitlal, M., Amy, S.R., Dean, H.J., Ridding, L., Broughton, R. & Mountford, J.O. 2017. The environmental effectiveness of the Higher Level Stewardship scheme; Resurveying the baseline agreement monitoring sample to quantify change between 2009 and 2016. Natural England project ECM 6937. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=19360

LM0464 Obj 1: Short, C., Lewis, N. & Reed, M. 2018. Initial Evaluation of the implementation of Countryside Stewardship in England in 2015/16: Applicant and Non-Applicant survey. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=19803

LM0464 Obj 2: Jones, N., Macarthur, R., Boatman, N. & Crowe, A. 2018. Initial Evaluation of the Implementation of Countryside Stewardship in England: Objective 2 Analysis of scheme uptake. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=19803

LM0464 Obj 3: Turner, C. & Tweedie, F. 2018. Initial Evaluation of the Implementation of Countryside Stewardship in England: Objective 3 Stakeholder interviews. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=19803

LM0464 Obj 4: Cao, Y., Elliott, J., Tweedie, F., Jones, N. & Short, C. 2018. Initial Evaluation of the Implementation of Countryside Stewardship in England: Objective 4 Initial Evaluation of CS Implementation. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=19803

LM0468: Jones, N., Newell-Price, P., Macarthur, R., Micklewright, K., Conyers, S. & Forster-Brown, C. 2018. Monitoring of EK21, OK21, HK21 and OHK21 Options: Legume and herb-rich swards. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=20015

LM0475: Carnell E.J., Misselbrook T.H., Tomlinson S.J., Thomas I.N., Sawicka K., Rowe E., Sutton M.A. & Dragosits U. 2018. AROMA – Agri-Environment Reduction Options for Mitigating Ammonia: Assessment of the effects of RDPE environmental land management schemes on air quality. Report to Natural England. URL: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&ProjectID=20022

OATWAY, R. (2018). Agri-Environment Monitoring and Evaluation Programme Annual Report 2016/17 - A summary of findings from recently published projects. Natural England Research Reports, Number NERR074. URL: http://publications.naturalengland.org.uk/publication/4556121339068416

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