



SCOTTISH POLICY GROUP

BRITISH ECOLOGICAL SOCIETY

Stability and Simplicity – proposals for rural funding transition period.

A response from the British Ecological Society Scottish Policy Group to the Scottish Government's consultation.

15th August 2018

The British Ecological Society: 'A world inspired, informed and influenced by ecology'

Founded in 1913, we are the world's oldest ecological society, with over 6,400 members worldwide. As the voice of the UK's ecological community, we communicate the value of ecological knowledge to policymakers and promote evidence-informed solutions.

The [Scottish Policy Group](#) (SPG) is a group of British Ecological Society (BES) members promoting the use of ecological knowledge in Scotland. We act as a focal point to provide robust ecological evidence to the Scottish Government, Scottish Parliament and wider society.

The BES Scottish Policy Group welcomes the opportunity to comment on the Scottish Government's consultation on *Stability and Simplicity – proposals for rural funding transition period*. Given the expertise of our membership, we have responded to a select number of questions.

Key message

This consultation is the start of the Scottish Government's process to develop a new rural support policy for Scotland. In our view, it presents both an opportunity and a challenge to create a sustainable agricultural system that is better balanced for farming, food production, the countryside, wildlife, and the delivery of public goods. Public goods connected to the environment include for example, clean air and water, healthy and stable soils, improved/enhanced carbon sequestration, biodiversity and healthy ecosystems.

Question 5: Do you have any suggestions for straightforward changes that would improve the environmental outcomes achieved through greening payments in Pillar 1?

Permanent grassland

Permanent grassland payments are aimed at preventing the overall loss of grassland at the national scale i.e. the ratio of permanent grassland to total agricultural area in Scotland must not decrease by more than 5 %¹. Because the target is an accumulated figure and includes rough grazings (much of it extensive upland grazing), it masks underlying changes which may occur and those which run against the fundamental goals for a greening payment. For example, it does not prevent losses of improved grasslands at the local level in the more intensively-managed lowlands. This in turn could increase habitat loss and fragmentation with a knock-on impact on biodiversity in areas which are seeing continuing biodiversity declines². The measure also does not go far enough to protect carbon stocks in improved grasslands³.

A suggested solution by an expert review panel⁴ is that future iterations of guidance should recognise that increased fragmentation and habitat loss in the lowlands could impact on a range of groups of organisms such as pollinators and certain ground nesting birds such as lapwing.

Beyond the loss of permanent grassland area being masked by the accumulated target, there is also a risk of declines in the state and quality of grassland. For instance, removal of grazing would be deleterious for ground feeding birds and low-growing plant species. Guidance should cover, where relevant, the benefits of maintaining appropriate levels of grazing to maximise biodiversity or to benefit specific plants or animals⁵. Going forward, land managers need to be incentivised to keep long-term grassland and if grassland is ploughed and re-sown it should be sown with mixtures designed to benefit biodiversity and grazed at the appropriate levels.

Question 6: Considering how funding is currently distributed across CAP schemes, do you have initial views about how the balance between these schemes should change in future to maximise outcomes?

General points

Studies have shown soil organic carbon levels are declining in arable soils and soil erosion rates are significantly higher in those parts of Scotland where the majority of arable farming is located^{6,7,8,9}. Land use incentivised by schemes that focus on food production alone will fail to maximise multiple outcomes because such schemes do not deliver other public goods (e.g. ecosystem services) such as clean air, clean water, healthy and stable soils, improved/enhanced carbon sequestration, wildlife and biodiversity.

As just over 70 per cent of Scotland's land is used for agricultural activities, farmers are fundamental to protecting and improving the quality of Scotland's natural resources, contributing to a low-carbon rural economy, and reversing the decline of critically important species such as pollinators, and boosting wildlife populations in general.

Specific points

Practices which farmland managers should be encouraged to apply to help maximise outcomes alongside sustainable food production (e.g. through future 'cross compliance' type measures and redistribution of funding amongst schemes – see also answer to Q 26 below) include:

- Reducing the use of synthetic inputs through integrated pest management (IPM)¹⁰, IPM weed management¹¹, conservation biological control¹² and carefully planned nutrient regimes to avoid the loss of nutrients, ammonia, greenhouse gases and pesticides to air and water, as well as reducing the impacts of pesticides (e.g. neonicotinoids and mectins) on non-target organisms such as bees, butterflies and birds¹³.
- Undertaking suitable grazing at levels to meet desired local conservation and climate change objectives, and to avoid grasslands becoming either scrub dominated due to lack of grazing or limited to a few grazing tolerant species due to over-grazing^{14,15,16}.
- Protecting and building soil organic matter (SOM) and improving soil structure through diverse cropping rotations such as cover cropping, intercropping, zero-till/no-till/direct drilling systems and setting appropriate stocking levels (usually sheep) on peatlands (to prevent localised erosion¹⁷).
- Reducing barriers to and encouraging the adoption of farming methods that have demonstrable environmental benefits (such as High Nature Value Farming¹⁸) and are low carbon options.

There should also be a well-designed two-tier scheme to give the right prescriptions in the right places such as:

- A lower tier offering payments for positive wider countryside management. In an arable context this means improving the functional and species diversity of landscapes, significantly improving wider habitat networks and increasing provision of habitats for pollinating insects.
- Upper tier offering more targeted prescriptions with longer term agreements. Significant funding provided for local priorities and incentivising farming system change (agro-ecology, organic farming, agro forestry, improving soil quality).

Question 14: Do you support the use of regional pilots to help tailor schemes to local circumstances?

Yes.

Land management practices impact not only at the farm level but also impact on the air, land and water environment beyond the farm gate, therefore schemes tailored to local/regional circumstances (either economic and/or environmental) and designed to address local/regional challenges (such as diffuse pollution, flooding issues) would help maximise outcomes in terms of delivering public goods.

Creating a network of regional land use partnerships across Scotland (which have been trialled as part of the Land Use Strategy in the Scottish Borders and Aberdeenshire) could help identify public good/ecosystem service priorities and preferences at the local/regional scale as well as determining those that could be delivered in the most cost-effective way. Cooperation among farmers, land owners and other rural stakeholders could also significantly extend the impact and capability of public money for public goods^{19,20}.

For instance, farmers have a crucial part to play in maintaining and improving water quality, increasing the ecological status of a river systems and mitigating flood risk and, by engaging in projects as part of river basin management planning (e.g. the Eddleston Water Project²¹ and the Dee Catchment Partnership²²), they can make a valuable contribution to catchment scale improvements in the water environment and biodiversity.

As part of this regional approach, land managers would be given a menu of environmental benefits to choose from, with the menu differing between areas, depending on local priorities^{23 24}, and which benefits can most cost-effectively be provided in any given location²⁵. It is important to note however, that there would be both winners and losers if those managing certain areas are paid more or less, based on the different levels of benefits they are able to provide society.

An alternative option that could be combined with the above, is to supplement public funding for the provision of environmental benefits with private funding via Payments for Ecosystem Services schemes, such as the Woodland Carbon Code²⁶ and the Peatland Code²⁷. Place-based schemes have the potential to integrate payments for multiple services and habitats to provide payments at higher levels over longer periods than are currently available for similar work under EU funding²⁸. For example, Landscape Enterprise Networks (LENs)²⁹ integrate funding from private beneficiaries to deliver benefits for the environment, farmers and businesses. The LENs approach is currently being researched in the Global Food Security Programme's Resilient Dairy Landscapes project³⁰.

Question 19: If new schemes seek to encourage collaboration, enhance skills development, help with capacity building, facilitate wider integration into the supply chain, promote carbon audits and monitoring of the soil health, how might pilot projects be best designed to help test and develop new approaches?

Ideally, pilots are themselves best designed in a participatory manner, including a diverse range of stakeholders to decide upon relevant monitoring and evaluation criteria and then deliver the pilot as a collaboration. This has been shown to increase buy-in of groups who may otherwise see development of approaches as a purely top-down process: if one stakeholder exerts its interests over another, then this can lead to conflict and less durable conservation outcomes³¹. If integration of all stakeholders at the planning level is not possible, it is imperative that views and preferences of stakeholders are considered prior to the pilot test stage. For example, research at the University of Stirling into the decision-making of farmers with respect to land management and geese, uses novel game technology³² alongside detailed questionnaires on farmers' preferences, to understand what factors are more or less likely to encourage collaboration of farmers surrounding goose and land management. Designing pilot projects to minimise and avoid stakeholder conflict may improve the long-term efficacy of interventions.

In addition, pilot projects could focus on areas which have not been the subject of previous pilots. By targeting areas which have had no past history of collaborative working it would ensure that new approaches are fit for purpose and workable throughout the country. Additionally, pilot projects could also focus on a range of farm sizes, including those where the farm income is supplemented by external work.

Question 20: Many of the measures described in this consultation will have co-benefits for both agricultural productivity and for reducing Scotland's Greenhouse Gas Emissions. Are there other practical and feasible measures that would have similar co-benefits that you feel should be considered?

Rural transport is an area that has major effects both on the viability of rural businesses and also on greenhouse gas emissions. The use of internet, mobile and GPS technology to enable journey sharing should be investigated. The relationship between livestock transport and siting of slaughterhouse/processing plants also requires examination. The loss of local facilities contributes to increased transport demands and has serious animal welfare implications. (See also response to Q6.)

Question 21: Do you agree to expanding the number and role of Monitor Farms or similar during the transition period? Do you have any ideas as to how Monitor Farms could be refined or adapted to better meet future needs?

Rather than expanding the number or role of Monitor farms, it may be more important to ensure that the existing operations are able to provide data relevant to other operators. As with Pilot Projects, it is important to engage the relevant constituency in selection of questions to be asked and in the dissemination of results.

Questions 22- 23: Do you agree with the proposal to look at moving towards a more performance-based approach to compliance, using key performance indicators and better information? Do you have views on the types of indicator that should be used or areas of priority action within the operation of current CAP schemes? Scottish Rural Development Programme (Pillar 2)

General points

The current Agri-Environment Climate Scheme (AECS) rewards farmers for undertaking and delivering certain management options (prescriptions) rather than delivering outcomes. Presently, the monitoring system for delivery is vague, making up less than 0.1% of the AECS budget, consequently monitoring does not measure the full impacts of AECS (in terms of what the prescriptions are achieving), making it difficult to repeat or improve performance³³. There are very little data to demonstrate whether the public money being spent is achieving the putative aims of the schemes. This has made it very difficult to consider how schemes can be improved or how we might want to design new ones.

Specific points

Moving towards a more performance-based approach to compliance, using key performance indicators and better information is essential if environmental outcomes are to be achieved in the most effective manner, and for support schemes to be seen to provide value for public money. Key performance indicators must be easily measurable and must be seen to relate to desired outcomes. Timeliness is also essential; indicator values must be available within the timescales of management decision making.

Paying farmers on the basis of delivering public goods (i.e. to maximise outcomes as described in Q6 above) would require a different monitoring regime, with associated indicators, and a substantial increase in investment to ensure that the environmental information collected as part of the monitoring process is robust and useful.

In addition, a payment by outcome approach would still require justification for the payments. Current prescription-based schemes justify the payments purely on the prescriptions being followed, yet in most EU countries it is very difficult to show cause and effect in terms of direct impacts on biodiversity. So, although payment by outcome still needs thinking through, such schemes are being trialled (e.g. a 'results-based trial' in North Yorkshire³⁴ and the Burren Programme³⁵ in Ireland where, each participant is assessed yearly on the basis of measurably improved conditions for biodiversity, and for ecosystem services - like clean water- on their land) and importantly, there is annual monitoring and feedback of results to the farmers concerned. There is no reason payment by outcome schemes (which is a performance-based approach) could not be developed in Scotland.

To support delivery, new environmental schemes would need a large-scale, high-quality, scientifically robust monitoring system to underpin understanding of key ecological components by land managers^{36,37}.

Another point to consider going forward, is that many semi-natural habitats need to be managed more specifically than can be achieved using Scotland wide rules (for example, cutting dates for grassland for wading birds are the same across Scotland, but grass condition can vary widely, depending on local weather conditions), therefore it would be sensible to trial a more bespoke (i.e. specific for local conditions) management and performance-based system.

The administration and expertise needed in a more complex monitoring system would require more staff across the country to provide additional advice and support for delivery of the schemes that work at a local/regional scale^{38,39}.

New schemes could therefore consider:

- Access for monitoring being a condition of payment and monitoring could be developed to include that by land managers.
- Monitoring (at least) two aspects of performance:
 - Are land managers doing what they are paid to do? i.e. compliance monitoring.
 - Are the actions carried out achieving the desired aims?
- Monitoring budgets being increased to provide useful data for scheme improvement.
- In conjunction with the above, there should be a regular evidence review to ensure option design is modified in the light of new knowledge.
- Setting up long-term monitoring using indicators such as:
 - Biodiversity indicators which cover a broader range of landscapes and wildlife to more effectively monitor different regions in Scotland.
 - Indicators for ecosystem service outcomes or natural capital assets.
 - Integration of environmental and agricultural data collections with national indicators such a natural capital asset index and ecosystem health indicators (however these are a long way off being developed for local/regional use).
- Being publicly accountable by setting out the benefits that are being delivered. Data from monitoring could be consolidated into a searchable database and made publicly available (on a platform such as Scotland's Environment).

It is also important to ensure that selected performance indicators are appropriate to the desired outcome and not just those which can be measured most easily.

Question 24: Given the importance of continuity of support for the forestry sector and that the target for new woodland is to increase to 15,000 hectares by 2025, should the current the Forestry Grant Scheme continue broadly in its current form until 2024 or can you suggest other short-term changes that would better achieve these policy aims?

General points

Regarding the target for increasing new woodlands, careful thought is required as to where new woodland should be planted, because in terms of conservation and climate change objectives there will be trade-offs depending on how the land is used. For example, planting woodlands such as those dominated by birch, on what was formally heather moorland does not necessarily result in increased carbon storage⁴⁰. This emphasises the need for any payment system to sit within a wider cross-sector plan for the environment such as that promoted by the Land Use Strategy.

Specific points

The Forestry Grant Scheme (FGS) is the principal mechanism for resourcing the full range of the Scottish Government (SG) forestry-related objectives. Therefore, discussions concerning the need for changes to the FGS should take account of the wider value of forestry and place it in the context of the SG's wider objectives such as the Land Use Strategy, the Scottish Biodiversity Strategy, Peatland Action, Climate Change (emissions reduction targets) and the Climate Change Adaptation Programme and the proposed Environmental Strategy, currently out for consultation.

The transition period also provides an opportunity to test different methods of creating new native woodlands. Pilots to consider might be:

- Establishing new woodlands on sites where there is a greater potential for success, i.e. land neighbouring semi-natural habitats with woodland flora; land with bracken - planting within it rather than removing it.
- Reducing the use of long term slow release fertilizers in planted stock, and pesticides on site.
- Having a two-tier planting regime such that forest trees are planted first and after five years or longer an understorey of woodland shrubs is planted.
- Increasing the eligible size (currently 10 ha maximum) of areas of high altitude low-density planting, particularly when above existing woodland.

Agri-Environment Climate Scheme

Question 26: Given the importance of continuity of support for environmental outcomes, should the current Agri-Environment Climate Scheme (AECS) continue broadly in its current form until 2024 or are there short-term changes that could be introduced to i) simplify and streamline the scheme, ii) improve customer experience and/or iii) enhance the delivery of environment and climate change objectives?

General points

A key objective of Scotland's Agri-Environment Climate Scheme is to help reverse the decline in farmland biodiversity and ecosystem health by rewarding farmers for the provision of environmental services (i.e. public goods). Despite some progress being made in Scotland as a result of adoption of these schemes, many farmland species and associated habitats are still undergoing decline^{41,42,43,44,45,46,47,48,49}.

Agri-environmental policies and schemes could be better shaped to Scotland's ecological needs and address known gaps where certain taxa and habitats are presently under represented⁵⁰. For instance, coastal habitats and sand dunes are not included and, as the schemes are prioritised towards birds, vascular plants, butterflies and mammals, many invertebrate and lower plant species that are priority species on the Scottish Biodiversity list do not benefit from the current schemes⁵¹.

In addition, agri-environment schemes should retain mechanisms for land managers to receive payments in return for delivering environmental benefits at the farm scale but could also go further to include the delivery of public goods at the regional scale (particularly if local priorities have been identified by regional land use partnerships – see response to Q14)^{52,53}.

Summary of key problems associated with the current AECS^{54,55}:

- The application process is seen as tortuous and time-consuming.
- The rules are complex.
- The above two combined points means that there is a need for the applicant to engage help, usually from a consultant (which can cost between £1-3K) – this is seen as a big risk.
- The funds available are generally inadequate for the number of projects and sometimes entry into a scheme is down to good fortune of location or size of unit, not the ability for the measure to protect or improve habitats or species.
- For small units, crofters and farmers need more than financial help to carry out measures; they need machinery, access to capital and conservation advice to help them make the best choice in managing habitats.
- Regarding income forgone payments:
 - For small units and crofts, due to scale, the compensation is insufficient. For example, for a crofter with no tractor, discs, drill or fertiliser spreader, to employ a contractor to sow out an area of wild bird seed will cost multiple times the payment from an agri-env scheme. Likewise, for introducing native cattle, the costs of infrastructure required to keep cattle, and the cost of feed and vet as well as the capital cost of purchasing cows, is far in excess of the payment.

- Measures are often generic - based on a 'one-size fits all approach' (i.e. it assumes that the same management is appropriate in all situations) and are also those that are easiest to carry out (all of which hasn't benefited biodiversity well).
- There is a lack of monitoring, so the success of the measures is unknown (see answer to Q22-23 above).
- There are 'gaps' in funding for certain taxonomic groups and habitats (see above).
- Most schemes have a short-term commitment to funding which is not compatible with some ecological restoration processes which take decades.
- There is a lack of funding to continue to conserve habitats that are already in reasonably good condition.

In addition to the above points, it is difficult for farmers and landowners to commit to implementing ecological initiatives without long-term financial security. However, most of the practices which need to be implemented to reverse biodiversity decline, create more and better-connected habitats, restore soil health, improve air and water quality, to name a few, are likely to take decades to achieve and are not in keeping with the current AECS cycles. Coupled with this, these land management practices can also be very costly (as mentioned above), particularly at the start.

Therefore, the Scottish Government could commit to longer-term payment contracts⁵⁶. These need to be offered to align with ecological processes and cycles regarding ecosystems, habitats and species restoration (or in some cases habitat creation) This will also give reassurance to the landowner regarding commitment to a long-term project. However, long-term payment contracts, even if they are linked with outcome based payments, need to offer annual payments for the land owners.

In support of the above, the following should be also considered:

- AECS linked with long-term restoration will need shorter term milestones and goals so that payment can be linked to these.
- A basic annual payment will need to be paid, but 'bonus' higher payments should be linked to meeting the milestone and targets. A cut-off for deciding the restoration is not working will need to be identified.
- In some cases, there may need to be a big upfront payment to initiate the scheme.

Given the problems that have been identified above with the present AECS, the Scottish Government should be considering both short term fixes and longer-term improvement measures.

A summary of measures that would improve agri-environment schemes to benefit biodiversity and ecosystem health, some of which may require longer term fixes, but need to be considered during the transition period to ensure the mechanisms are in place to deliver them at the appropriate time⁵⁷:

- Being better targeted to specific species/habitats/ecosystem services to deliver maximum benefit.
- Adopting a payment by results approach. In this case the farmer is given a target, and then is left to decide how to manage their land to achieve the target. It also taps into indigenous knowledge. Farmers are often capable of delivering measures that improve biodiversity, so this would allow a more flexible, tailored approach which better reflects ecological complexity than a "one size fits all" approach.
- Integrating policies regarding all forms of land use e.g. environment, forestry, farming, water, sporting interests.
- Creating more low production landscapes through incentivising: extensive/appropriate grazing and other forms of High Nature Value Farming, peatland restoration or native woodland creation/restoration/enhancement.
- In combination with the above, incentivising measures and land management practices that deliver for biodiversity in the longer term. For example, prioritising habitat restoration of peatlands, native woodlands or montane scrub over short-term schemes.
- Incentivising and targeting cooperation between farm-holdings through landscape-scale coordination to achieve catchment scale goals/priorities.
- And in addition to above, being joined up beyond the farm unit to work at a regional/catchment scale (see answer to Q 14).

- Containing good advisory schemes that follow through for the life time of the scheme to help deliver a payment by results approach.
- Containing good monitoring and evaluation schemes some of which could be done by the farmer.
- Improving monitoring for designated areas and creating management strategies for those not reaching their potential for habitats and ecosystem services, amongst others.
- Having a funding model that enables a long-term approach (e.g. long-term habitat restoration) while at the same time maintaining a regular payment to farmers.
- In combination and recognising the points above, being more simplified and streamlined. Any new scheme should be thought through in association with representatives of the land management community, who have the best understanding of the issues and potential solutions.

Specific interventions regarding ‘short term fixes’⁵⁸:

Q26 i)

- There should be provision of machinery-lending groups, and simpler application forms to encourage small farm units and crofters to apply.
- Regarding existing measures, there should be integration of the white-tailed sea-eagle and goose schemes into the wider AECS which would benefit biodiversity and simplify application.

Q26 ii)

- Scoring should focus on the quality of the application rather than its breadth of coverage, which presently biases funding away from small farms.
- Scoring should be more focussed on outcomes rather than on meeting regulations.
- The overall scheme should include training for farmers and other land managers in assessing opportunities for conservation action and using their knowledge where appropriate.

Q26 iii)

- There should be more focus on supporting ecological networks at appropriate scales.
- Local priorities should be used to develop local ecological networks but also to vary management to cope with local constraints such as weather and the availability of livestock to graze (see also answer to Q14 - regional priorities).
- Upland options should focus on wide ranging management rather than specific species or habitats because of the mismatch in the scale of intervention with the scale of the target.
- Options for wading birds need to account for both breeding and feeding requirements that cross the enclosure line (often requiring collaborative working) and options need to consider variations between species and regions.
- Options need to take account of future climate and potential land use changes.
- A more flexible approach is needed to develop appropriate management for habitat mosaics.
- A holistic approach for wetland management that integrates ditches, ponds, wader scrapes and other wetland types.
- Restoring/rehabilitating existing habitats is more cost-efficient rather than creating new ones.
- There should be long-term commitments on both sides where natural processes are slow to protect investments. For example, restoring peatland vegetation takes many years and a newly created species rich grassland should be protected from ploughing, fertiliser and pesticides.
- Redefinition of eligible land to allow for management of non-agricultural land such as patches of scrub or dune systems.
- Actions under Pillar 1 should be used to improve basic environmental standards (see also answer to Q6).
- Options should be funded only if they are joined up, for example if a pollinator strip is funded, then there must be reduced pesticide use in an adjacent buffer zone.
- Agriculture and forestry need funding in the same scheme to enhance integration at the farm level.
- Forestry options need to include action for wider woodland biodiversity, e.g. through management for woodland ground flora.

- Access for monitoring must be a condition of payment and monitoring could be developed to include that by land managers.
- Monitoring budgets should be increased to provide useful data for scheme improvement.
- The scheme ought to be analysed to remove perverse incentives.

Question 27: Are there new emerging environment or climate change priorities that need particular focus under the Agri-Environment Climate Scheme in the next three-five years?

General points (See also answer to Q26 above)

Landscapes with greater structural complexity can improve ecosystem function for farms by increasing pest suppression and supporting pollinators⁵⁹. Therefore, prioritising perennial habitats such as native woodlands, hedgerows, riparian woodland corridors, peatlands, montane scrub and semi-natural grasslands should be part of long-term environmental management planning, as this will contribute to creating more complex landscapes to allow for greater biodiversity⁶⁰.

Regarding climate change, given the widespread concern about greenhouse gas emissions from the livestock sector, it is probably a priority to investigate the realities of this in Scotland and encourage adoption of any available mitigation measures into ruminant management.

Short term priorities

Priority short term actions (to note, these are existing options available in other countries which could be quickly adopted in Scotland to broaden the coverage of AECS for biodiversity) include⁶¹:

- Pollinator specific options designed to provide nectar and pollen through the summer, which may benefit other invertebrates as well.
- More emphasis on winter stubbles to shift growers to spring-sown crops to benefit biodiversity and reduce erosion and nutrient loss.
- Payments to manage coastal systems through grazing (dunes, grasslands) to combat shrub/tree encroachment and the impacts of pollution.
- Widening the options available to manage peatlands based on knowledge gained from SNH's Peatland Action project.
- Adapting options to benefit invertebrates through leaving areas of bare ground.
- Adapting arable options, such as field margin management and pollinator options for fruit growing areas.

Questions 39 - 41: Do you have any thoughts on the form, content and delivery methods for future advice? Do you have any views on the balance of advice delivered by one-to-one and one-to-many methods? Question 41: Do you have any views on how delivery of advice can be better linked to delivery of results?

General points

Compliance with rules and the implementation of practices which increase habitats, protect wildlife, increase biodiversity, reduce greenhouse gas emissions and maintain or enhance ecosystem services, require extensive knowledge. For better results for the environment, it is important that farmers and land managers have access to good advice regarding the range of issues that they are expected to address^{62,63,64,65}.

A more comprehensive advisory service would be beneficial because the effectiveness of AECS is highly variable, and depends on the level of engagement, experience and skill of the farmer⁶⁶. All agri-environment payments could be contingent on taking good quality advice from appropriately qualified professionals. The cost of this could be covered as part of the payments. Ideally, this would involve a publicly funded extension service, with a set of accredited qualified advisors. Such a service does not necessarily divert money away from the rural economy. For better results for the environment, it is important that farmers and land managers have access to good advice regarding the range of issues that they are expected to address (and ensuring better targeting of schemes)^{67,68,69,70}.

The environmental effectiveness of agri-environment management has been shown to improve (in terms of actual biodiversity outcomes) when farmers and landowners received training, compared to farmers and landowners who did not receive training^{71,72}. Training could look at specific ideas for environmental improvements with repeatable, measurable outcomes.

Ongoing contact between a certified, professional advisor and the landowner from the start of the scheme will improve the likelihood of success. An advisor can ensure that the indicators of success are on track and being met but also identify the causes of any negative changes that may occur at a site.

It is important also to capture indigenous knowledge which will be beneficial when prioritising and delivering schemes at the local/regional scale.

Specific points

Q39

Mobile phone and internet technology offer a range of new opportunities for delivery of advice, but do not represent a panacea. Provided issues of confidentiality can be overcome, then the use of digital data gained on farm could greatly enhance advice networks. Additionally, increasing the use of digital data should offer rapid feedback and learning, although this potential is however restricted by poor connectivity in some areas of rural Scotland (in support of proposals for new schemes listed below).

Q40-41

New schemes could therefore consider:

- Including expert advisory services to promote cooperation, compliance and the achievement of environmental goals⁷³.
- Facilitating learning and knowledge exchange, capturing indigenous knowledge, to connect land managers.
- Having classes/courses on legislation and good practice.
- Ensuring knowledge exchange between the devolved nations.
- Training, including continuous professional development, for farmers and landowners on specific ideas for environmental and technological improvements (to help farmers move towards low-carbon productive systems) with measurable outcomes.

¹ Taken from CAP Greening Review – Part 4 – Expert Panel Review. Dave Miller, Keith Matthews (eds.) James Hutton Institute 2017

² <https://www.gov.scot/About/Performance/scotPerforms/indicator/naturalcapital>

³ Taken from CAP Greening Review – Part 4 – Expert Panel Review. Dave Miller, Keith Matthews (eds.) James Hutton Institute 2017

⁴ Expert panel for CAP greening review Part 4: Geoff Squire, Cathy Hawes, Robin Pakeman, Rob Brooker, Iain Brown, Willie Towers, Jason Owen, Andy Vinten, Kit MacLeod

⁵ Directly taken from: ⁵ Expert panel for CAP greening review Part 4: Geoff Squire, Cathy Hawes, Robin Pakeman, Rob Brooker, Iain Brown, Willie Towers, Jason Owen, Andy Vinten, Kit MacLeod

⁶ NA11: Soil carbon concentration in arable soils available at: <https://www.climateexchange.org.uk/research/indicators-and-trends/indicators/na11-soil-carbon-concentration-in-arable-soils/>

⁷ NA10 Soil erosion risk available at <https://www.climateexchange.org.uk/research/indicators-and-trends/indicators/na10-soil-erosion-risk/>

⁸ Lord Krebs, Chair of the Adaptation Sub-Committee of the UK Climate Change Committee speaking to Scottish Parliament Environment, Climate Change and Land Reform Committee, September 2016 available at: <http://www.parliament.scot/parliamentarybusiness/report.aspx?r=10552&mode=pdf>

⁹ Committee on Climate Change (2016) Scottish Climate Change Adaptation Programme: An independent assessment for the Scottish Parliament

¹⁰ For more information regarding research see: <http://ipm.hutton.ac.uk/topics/details/what-ipm>

¹¹ For more information regarding research see: <http://ipm.hutton.ac.uk/topics/weed-management>

¹² For more information regarding research see: <http://ipm.hutton.ac.uk/topics/details/ecological-engineering-and-conservation-biological-control>

¹³ Kovács-Hostyánszki, A., Espíndola, A., Vanbergen, A.J., Settele, J., Kremen, C., Dicks, L.V. (2017) Ecological intensification to mitigate impacts of conventional intensive land use on pollinators and pollination. *Ecology Letters*, 20(5): 673-689.

- ¹⁴ Mitchell RJ, Hewison RL, Britton AJ, Brooker RW, Cummins RP, Fielding DA, Fisher JM, Gilbert DJ, Hester AJ, Hurskainen S, Pakeman RJ, Potts JM, Riach D (2017) Forty years of change in Scottish grassland vegetation: increased richness, decreased diversity and increased dominance. *Biological Conservation* 212, 327-336
- ¹⁵ Mitchell RJ, Hewison RL, Britton AJ, Brooker RW, Cummins RP, Fielding DA, Fisher JM, Gilbert DJ, Hester AJ, Hurskainen S, Pakeman RJ, Potts JM, Riach D (2017) Forty years of change in Scottish grassland vegetation: increased richness, decreased diversity and increased dominance. *Biological Conservation* 212, 327-336
- ¹⁶ SAC, 2008. Farming's Retreat from the Hills.
- ¹⁷ Lilly, A., Grieve, I.C., Jordan, C., Baggaley, N.J., Birnie, R.V., Fitter, M.N. et al. 2009. Climate change, land management and erosion in the organic and organo-mineral soils in Scotland and Northern Ireland. Scottish Natural Heritage Commissioned Report No.325 (ROAME No. F06AC104 - SNIFFER UKCC21).
- ¹⁸ To find out about High Nature Value Farming see: <http://www.highnaturevaluefarming.org.uk/hnv-in-scotland/>
- ¹⁹ Lastra-Bravo, X. B., Hubbard, C., Garrod, G., Tolón-Becerra, A. (2015). What drives farmers' participation in EU agri-environmental schemes?: Results from a qualitative meta-analysis. *Environmental Science & Policy*, 54: 1-9.
- ²⁰ De Krom, M. (2017). Farmer participation in agri-environmental schemes: Regionalisation and the role of bridging social capital. *Land Use Policy*, 60: 352-361.
- ²¹ Eddleston Water Project see: <http://www.tweedforum.org/projects/current-projects/eddeleston>
- ²² See: <http://www.deepartnership.org/>
- ²³ Christie, M., Rayment, M., 2012. An economic assessment of the ecosystem service benefits derived from the SSSI biodiversity conservation policy in England and Wales. *Ecosyst. Serv.* 1, 70–84.
- ²⁴ Christie, M., Hyde, T., Cooper, R., Fazey, I., Dennis, P., Warren, C.S., Hanley, N., 2011. Economic valuation of the Benefits of Ecosystem Services delivered by the UK Biodiversity Action Plan. Defra, London.
- ²⁵ Reed, M.S., Moxey, A., Prager, K., Hanley, N., Skates, J., Evans, C., Glenk, K., Scarpa, R., Thompson, K. et al. (2014) [Improving the link between payments and the provision of ecosystem services in agri-environment schemes in UK peatlands](#). *Ecosystem Services* 9: 44-53.
- ²⁶ See: <https://www.forestry.gov.uk/carboncode>
- ²⁷ See: <http://www.iucn-uk-peatlandprogramme.org/node/325>
- ²⁸ Reed MS, Allen K, Dougill AJ, Evans, K, Stead SM, Stringer LC, Twyman C, Dunn H, Smith C, Rowcroft P, Smith S, Atlee AC, Scott AS, Smyth MA, Kenter J, Whittingham MJ (2017) A Place-Based Approach to Payments for Ecosystem Services. *Global Environmental Change* 43: 92-106
- ²⁹ <https://iale.uk/landscape-enterprise-networks-lens-creating-business-value-healthy-landscapes>
- ³⁰ Resilient Dairy Landscapes (Accessed 2018) <https://www.resilientdairylandscapes.com>
- ³¹ Redpath et al., 2013. Understanding and managing conservation conflicts. *Trends in Ecology & Evolution*, 28(2), 100-109
- ³² Redpath et al., 2018. Games as tools to address conservation conflicts. *Trends in Ecology & Evolution*, 33(6), 415-426
- ³³ Tziliavakis, J., Warner, D.J., Green, A., Lewis, K.A., Angileri, V. (2016). An indicator framework to help maximise potential benefits for ecosystem services and biodiversity from ecological focus areas. *Ecological Indicators*, 69: 859-872.
- ³⁴ See: <https://www.gov.uk/government/publications/results-based-agri-environment-payment-scheme-rbaps-pilot-study-in-england>
- ³⁵ See: <https://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/locallyledschemes/TermsConditionsBurrenSchemeTrancheV2061016.pdf>
- ³⁶ Batáry, P., Dicks, L.V., Kleijn, D., Sutherland, W.J. (2015). The role of agri-environment schemes in conservation and environmental management. *Conservation Biology*, 29(4): 1006-1016.
- ³⁷ Mark S. Reed, Andrew Moxey, Katrin Prager, Nick Hanley, James Skates, Aletta Bonn, Chris D. Evans, Klaus Glenk, Ken Thomson. (2017). Improving the link between payments and the provision of ecosystem services in agri-environment schemes. *Ecosystem Services*, 9: 44-53.
- ³⁸ Dicks, L.V., Hodge, I., Randall, N.P., Scharlemann, J.P.W., Siriwardena, G.M., Smith, H.G., Smith, R.K., Sutherland, W.J. (2014). A Transparent Process for "Evidence-Informed" Policy Making. *Conservation Letters*, 7(2): 19-125.
- ³⁹ Westerink, J., Jongeneel, R., Polman, N., Prager, K., Franks, J., Dupraz, P., Mettepenningen, E. (2017). Collaborative governance arrangements to deliver spatially coordinated agri-environmental management. *Land Use Policy*, 69: 176-192.
- ⁴⁰ Mitchell R.J, Campbell C.D., Chapman S.J., Osler G.H.R., Vanbergen A.J., Ross L.C., Cameron C.M., Cole L. (2007) The cascading effects of birch on heather moorland: a test for top-down control of an ecosystem engineer *Journal of Ecology*, 95, 540-554.
- ⁴¹ Boatman, N.D., Parry, H.R., Bishop, J.D. & Cuthbertson, G.S. (2007) Impacts of agricultural change on farmland biodiversity in the UK. *Issues in Environmental Science and Technology* 25
- ⁴² T.G. Benton, et al. Linking agricultural practice to insect and bird populations: a historical study over 3 decades *J. Appl. Ecol.*, 39 (2002), pp. 673-687
- ⁴³ Uitto, J.I. (2016) Evaluating the environment as a global public good. *Evaluation*. 22(1) 108–115.
- ⁴⁴ Carvalheiro, L.G., Kunin, W.E., Keil, P., Aguirre-Gutiérrez, J., Ellis, W.N., Fox, R., Groom, Q., Hennekens, S., Van Landuyt, W., Maes, D., Van de Meutter, F., Michez, D., Rasmont, P., Ode, B., Potts, S.G., Reemer, M., Roberts, S.P.M., Schaminée, J., Wallis DeVries, M.F., Biesmeijer, J.C. (2013) Species richness declines and biotic homogenisation have slowed down for NW-European pollinators and plants. *Ecology Letters*, 16: 870-878.
- ⁴⁵ Robinson, R. A. and Sutherland, W. J. (2002), Post-war changes in arable farming and biodiversity in Great Britain. *Journal of Applied Ecology*, 39(1): 157–176.
- ⁴⁶ SNH Trend Note: Trends of Breeding Farmland Birds in Scotland (2013) Available at <https://www.nature.scot/sites/default/files/A1075307%20-%20Trend%20note%20-%20biodiversity%20-%20Farmland%20Birds%20in%20Scotland%20-%202013.pdf>
- ⁴⁷ Albon, S.D., Brewer, M.J., O'Brien, S., Nolan, A.J. & Cope, D. (2007) Quantifying the grazing impacts associated with different herbivores on rangelands. *Journal of Applied Ecology* 44 (6), 1176-1187

-
- ⁴⁸ Mitchell RJ, Hewison RL, Britton AJ, Brooker RW, Cummins RP, Fielding DA, Fisher JM, Gilbert DJ, Hester AJ, Hurskainen S, Pakeman RJ, Potts JM, Riach D (2017) Forty years of change in Scottish grassland vegetation: increased richness, decreased diversity and increased dominance. *Biological Conservation* 212, 327-336
- ⁴⁹ CAP Greening Review – Part 1 – Trends in Environmental Indicators. Willie Towers Dave Miller, Keith Matthews (eds.) James Hutton Institute 2017
- ⁵⁰ Robin Pakeman (2016) Identifying Gaps in the Current Agri-Environment and Climate Scheme (2014-2020). James Hutton Institute.
- ⁵¹ Robin Pakeman (2016). Identifying Gaps in the Current Agri-Environment and Climate Scheme (2014-2020) James Hutton Institute.
- ⁵² Anthony, S., Jones, I., Naden, P., Newell-Price, P., Jones, D., Taylor, R. et al. (2012) Contribution of the Welsh Agri-Environment Schemes to the Maintenance and Improvement of Soil and Water Quality, and to the Mitigation of Climate Change. Agri-Environment Monitoring and Technical Services Contract Lot 3: Soil, Water and Climate Change (Ecosystems). Welsh Government, Cardiff, UK.
- ⁵³ Westerink, J., Jongeneel, R., Polman, N., Prager, K., Franks, J., Dupraz, P., Mettepenningen, E. (2017). Collaborative governance arrangements to deliver spatially coordinated agri-environmental management. *Land Use Policy*, 69: 176-192.
- ⁵⁴ See the BES Scottish Policy Group Pie and a Pint (2017) Agri-environment schemes in Scotland post Brexit report. Available at: <https://www.britishecologicalsociety.org/policy/reports-publications/event-reports/>
- ⁵⁵ See the BES Scottish Policy Group Pie and a Pint (2018) What does biodiversity success in 2020 look like? Report. Available at: <https://www.britishecologicalsociety.org/policy/reports-publications/event-reports/>
- ⁵⁶ Notes from the BES Scottish Policy Group Pie and a Pint (2017) Agri-environment schemes in Scotland post Brexit. Available at: <https://www.britishecologicalsociety.org/policy/reports-publications/event-reports/>
- ⁵⁷ See the BES Scottish Policy Group Pie and a Pint (2017) Agri-environment schemes in Scotland post Brexit. Available at: <https://www.britishecologicalsociety.org/policy/reports-publications/event-reports/>
- ⁵⁸ Robin Pakeman (2016) Identifying Gaps in the Current Agri-Environment and Climate Scheme - Policy Brief. James Hutton Institute.
- ⁵⁹ Drieu, R., Rusch, A. (2017). Conserving species-rich predator assemblages strengthens natural pest control in a climate warming context, *Agricultural and Forest Entomology*, 19(1): 52-59.
- ⁶⁰ Concepcion, E. D., Diaz, M., Baquero, R. A. (2008). Effects of landscape complexity on the ecological effectiveness of agri-environment schemes. *Landscape Ecology*, 23: 135–148.
- ⁶¹ Robin Pakeman (2016) Identifying Gaps in the Current Agri-Environment and Climate Scheme (2014-2020) - Policy Brief. James Hutton Institute.
- ⁶² Xavier B. Lastra-Bravo, Carmen Hubbard, Guy Garrod, Alfredo Tolon-Becerra. (2015). What drives farmers' participation in EU agri-environmental schemes? Results from a qualitative meta-analysis. *Environment Science & Policy*. 54: 1–9.
- ⁶³ McCracken, M.E., Woodcock, B.A., Lobley, M., Pywell, R.F., Saratsi, E., Swetnam, R.D., Mortimer, S.R., Harris, S.J., Winter, M., Hinsley, S., Bullock, J.M. (2015). Social and ecological drivers of success in agri-environment schemes: the roles of farmers and environmental context. *Journal of Applied Ecology*, 52(3): 696-705.
- ⁶⁴ Steven B. Emery, Jeremy R. Franks. (2012). The potential for collaborative agri-environment schemes in England: Can a well-designed collaborative approach address farmers' concerns with current schemes? *Journal of Rural Studies*, 28(3): 218-231.
- ⁶⁵ A.P. Hejnowicz, M.A. Rudd, P.C.L. White. (2016). A survey exploring private farm advisor perspectives of agri-environment schemes: The case of England's Environmental Stewardship programme. *Land Use Policy*, 55: 240-256.
- ⁶⁶ McCracken, M.E., Woodcock, B.A., Lobley, M., Pywell, R.F., Saratsi, E., Swetnam, R.D., Mortimer, S.R., Harris, S.J., Winter, M., Hinsley, S., Bullock, J.M. (2015) Social and ecological drivers of success in agri-environment schemes: the roles of farmers and environmental context. *Journal of Applied Ecology*, 52: 696-705.
- ⁶⁷ Lastra-Bravo, X. B., Hubbard, C., Garrod, G., Tolon-Becerra, A. (2015). What drives farmers' participation in EU agri-environmental schemes? Results from a qualitative meta-analysis. *Environment Science & Policy*, 54: 1–9.
- ⁶⁸ McCracken, M.E., Woodcock, B.A., Lobley, M., Pywell, R.F., Saratsi, E., Swetnam, R.D., Mortimer, S.R., Harris, S.J., Winter, M., Hinsley, S., Bullock, J.M. (2015). Social and ecological drivers of success in agri-environment schemes: the roles of farmers and environmental context. *Journal of Applied Ecology*, 52(3): 696-705.
- ⁶⁹ Emery, S. B., Franks, J. R. (2012). The potential for collaborative agri-environment schemes in England: Can a well-designed collaborative approach address farmers' concerns with current schemes? *Journal of Rural Studies*, 28(3): 218-231.
- ⁷⁰ Hejnowicz, A.P., Rudd, M. A., White, P. C. L. (2016). A survey exploring private farm advisor perspectives of agri-environment schemes: The case of England's Environmental Stewardship programme. *Land Use Policy*, 55: 240-256.
- ⁷¹ E.E. Guillem, A. Barnes, (2013). Farmer perceptions of bird conservation and farming management at a catchment level. *Land Use Policy*, 31: 565– 575.
- ⁷² <http://www.conservationevidence.com/actions/113>
- ⁷³ E.E. Guillem, A. Barnes. (2013). Farmer perceptions of bird conservation and farming management at a catchment level. *Land Use Policy*, 31: 565– 575.