CONSULTATION

Response Document

Agricultural transition in Scotland

(Scottish Government)

17 November 2021

Introduction to CIEEM

The Chartered Institute of Ecology and Environmental Management (CIEEM), as the leading membership organisation supporting professional ecologists and environmental managers in the United Kingdom and Ireland, welcomes the opportunity to comment on this consultation.

CIEEM was established in 1991 and has over 6,000 members drawn from local authorities, government agencies, industry, environmental consultancy, teaching/research, and voluntary environmental organisations. The Chartered Institute has led the way in defining and raising the standards of ecological and environmental management practice with regard to biodiversity protection and enhancement. It promotes knowledge sharing through events and publications, skills development through its comprehensive training and development programme and best practice through the dissemination of technical guidance for the profession and related disciplines.

CIEEM is a member of:

- Scottish Environment Link
- Wildlife and Countryside Link
- Northern Ireland Environment Link
- Wales Environment Link
- Environmental Policy Forum
- IUCN – The World Conservation Union
- Professional Associations Research Network
- Society for the Environment
- United Nations Decade on Biodiversity 2011-2020 Network
- Greener UK
- Irish Forum on Natural Capital (working group member)
- National Biodiversity Forum (Ireland)
- The Environmental Science Association of Ireland

CIEEM has approximately 670 members in Scotland who are drawn from across the private consultancy sector, NGOs, government and SNCOs, local authorities, academia and industry. They are practising ecologists and environmental managers, many of whom regularly provide input to and advice on land management for the benefit of protected species and biodiversity in general.

This response was coordinated by Members of our Scotland Policy Group.

We welcome the opportunity to participate in this consultation and we would be happy to provide further information on this topic. Please contact Jason Reeves (CIEEM Head of Policy) at JasonReeves@cieem.net with any queries.

Key Messages

- We need a shift to agriculture support for public goods including the protection and restoration of biodiversity, access to nature, clean air and water, and good soil health.
- Farmers and crofters must be supported through this transition, with funding, high-quality farm advice and training, so they can adapt.

- CIEEM creates industry standard guidance for assessments of biodiversity and has recently developed guidance on farm advice alongside a competency framework. We would welcome working with the Scottish Government and NatureScot to generate such guidance for monitoring and assessment of future agricultural transition schemes.
- Some agricultural businesses will already be near the optimum and should not be penalised for failing to do even better. We need to reward farmers for the delivery of environmental benefits.
- The Biodiversity Net Gain principles can be implemented in a wide range of land uses, from farming to forestry to deliver Positive Effects for Biodiversity. Links between farmers and developers delivering off-site gains can also offer a stable income source.
- A commitment for all agri-funding in Scotland to be biodiversity-proofed, as is referred to in the EU Biodiversity Strategy, would have a huge impact on protecting remaining ecosystems from further damage.
- Strategic planning has to be done at the landscape scale for this to be successful and this is where Regional Land Use Partnerships have an important role.
- A 'one size fits all' scheme fits no-one - A scheme must operate at a local level, with bespoke flexible options.

General Comments

Addressing the biodiversity crisis and climate emergency requires a radical change to the way we manage and use land in Scotland. We need a visionary approach focussed on land use that provides public goods, recognising the need for a diversity of approaches to suit the diversity of agricultural situations around the country and greater engagement of communities of interest in addition to farmers. There is a need for a whole ecosystem approach to land use, based on halting biodiversity loss and securing Positive Effects for Biodiversity and natural resource management. Farmers and crofters will need to be supported to adapt so that Scotland's farmers produce wider environmental outcomes in addition to agricultural products. 70% of Scotland's landscape is covered by some form of agricultural production so there is significant potential to make a big difference and build on the skills and knowledge that farmers hold.

Major land use changes will be required to sequester more carbon and thereby offset the emissions that will continue to be associated with our food production even if the levels are reduced. As outlined in a SRUC article farming must be a part of the climate change solution[1]. Ammonia from farms still continues to be a big issue with a study just published showing that ammonia from farms is behind 60% of the particulate air pollution[2]

As professional ecologists we welcome the approach being adopted to develop ways for moving forward to a sustainable future for agriculture and other land uses. As with the climate transition, this must be a democratic and just process. Farmer-led groups

[1] https://www.sruc.ac.uk/all-news/farming-must-be-part-of-the-climate-change-solution/

[2] Gi, B., Zhang, L., van Dingenen, R. (2021). Abating ammonia is more cost-effective than nitrogen oxides for mitigating PM2.5 air pollution. *Science*, **374**, 758-762. https://www.science.org/doi/10.1126/science.abf8623

recommendations should act only as a starting point for wider citizen-centred discussions to guide the development of the next Scheme.

CIEEM creates industry standard guidance for assessments of biodiversity, such as our Guidelines for Ecological Impact Assessment[3], and would welcome working with the Scottish Government and NatureScot to generate such guidance for monitoring and assessment of future agricultural transition schemes. CIEEM has also recently worked with Plantlife and other members of the Back from the Brink partnership to produce new guidance for farm environment advice[4] covering undertaking farm visits and communicating effectively with farmers and land managers, management and monitoring of environmental interventions and developing a directory of habitat and species management advice. In addition, CIEEM has developed a Farm Environment Adviser Competency Framework[5] that covers sixteen key areas of expertise including farm management practice, economics, advice and funding for environmental land management as well as ecological surveying, assessment and mapping skills. CIEEM would be happy to work with the Scottish Government and NatureScot to develop appropriate training.

Process

The process underway is helpful with farmer led groups with other interests represented, but it does mean that the main producer interests of arable and livestock remain dominant and take a largely traditional approach. The model, approach and outcomes from the Farming 1.5 degrees inquiry[6] is a much more focussed and outcome orientated approach.

We would like to see more links to other major Scottish Government policies and action areas. There is no mention of the ethical basis as set out in the Statement and Principles of Land Rights and Responsibilities and no mention of codes of practice already in existence which are necessary for safeguarding environmental functionality. Also, there is no reference to the land reform agenda particularly encouraging greater community ownership of land.

Funding

We need a radical switch in thinking so that public money goes to public goods and services which farmers provide. Improved outcomes for nature must be achieved both via increased environmental conditionality on any continuing support and a complementary agri-environment scheme to provide the biodiversity benefits that cannot be achieved by conditionality alone[7]. Comprehensive whole farm plans are important as a contractual basis for public support.

The current model of agricultural support has unintended consequences as the long-term effects of subsidies are to raise rents and increase costs as the price of inputs is related to

[3] https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/
[4] https://cieem.net/i-am/current-projects/farm-environment-advice/
[5] https://cieem.net/resource/farm-environment-adviser-competency-framework/
[6] https://www.farming1point5.org/
[7] Moxey, A., McCracken, D. & Thomson, S. (2020). Environmental Conditionality on Direct Payments to Land Managers. https://pure.sruc.ac.uk/en/publications/environmental-conditionality-on-direct-payments-to-land-managers

what the market will bear. During discussions on the review of the EU's Common Agricultural Policy about 15 years ago, it was proposed that all support should be conditional on the production of particular services with additional payments where some income from agricultural produce was forgone to provide a higher level of benefits for biodiversity, for example. This model has much to commend it. Moreover, the economics of farming have been distorted by the prices for land depending on its possible use for housing or other non-agricultural purposes. As a result, much of the land around towns and cities that used to provide food for these places is no longer used for that purpose. One of the consequences of climate change is likely to be a reduction of food available from major agricultural exporting countries both because of adverse climatic effects on crop yields and from the carbon costs of transporting that food. Increasing self-sufficiency and enhancing the protection of farming land that may be needed in the future will be important. The Less Favoured Area Support Scheme needs to be replaced. Many of these areas provide valuable services and are important for biodiversity. Moving to a system of paying for services could be beneficial for farmers there.

Agro-ecology in agricultural systems

Biodiversity will tend to be greatest where the intensity of production is low and there is a mosaic of semi-natural habitats as part of the overall farm, agroecological practices need to be incorporated into all farming systems.

There are numerous measures that should become mandatory:

- Increasing the amount of semi-natural habitat (woodland copses and new riparian woodland, shrubs, ponds, field margins, hedgerows) as a mosaic within agricultural land.
- Livestock excluded from watercourses and river margins which would provide water quality and biodiversity benefits.
- Winter cover crops to reduce soil erosion issues and resilience to flooding.
- Reduction in sheep numbers where there are biodiversity and erosion issues (detailed example below).
- A move back to mixed farming systems with greater heterogeneity.
- Maintaining appropriate grazing and cutting regimes for the benefit of invertebrates and farmland birds, abandonment is equally a risk.
- Support to tackle invasive non-native species on a landscape scale.

Chronic grazing pressure and resultant loss of ground cover plants and soil cohesion is of great concern contributing to direct losses of soil/carbon via erosion. One notable example of this is the ongoing landslide risk at the A83 Rest and Be Thankful; a report by Forest Research in 2012 acknowledged overgrazing (sheep and deer) as a significant factor in the instability of the slopes of Beinn Luibhean - this case also outlines concurrent impacts to human safety, travel disruption and reduced connectivity of rural communities that can occur as sequelae to poor land management dominated by inappropriate long-term grazing management. Given the huge intrinsic importance of soil for plant growth, and the considerable potential for carbon sequestration, restoration of soil should be prioritised over long standing exploitative land uses - this may not necessarily require removal of sheep

from the land, but regenerative grazing principles should be mandatory for use by livestock farmers.

Reducing pesticides and fertilisers in the environment

We need to address on an industry level the climate change and biodiversity impacts of widespread pesticide use. In addition to the well-documented invertebrate declines correlated with agricultural pesticides, there is emerging evidence that soil ecosystems (including keystone species such as earthworms, springtails and mycorrhizal fungi) are being disrupted as well; counter-productively this could drastically limit future yields but also clearly risks reducing the soil's capacity to sequester carbon. Given the land area affected, ignoring the detrimental effect of pesticides on carbon sequestration risks neglecting our climate change commitments as a country.

http://foe.org/wp-content/uploads/2019/08/PecticidesSoilHealth_Final-1.pdf

Many farmers are effective in their use of fertilisers but there remains examples of inefficient use leading to pollution. There is an urgent need to address these cases and advice may need to be fine tuned for the future. There are significant landscape effects and GHG emissions related to pollution from nitrogen fertilisers, risks to irreplaceable ecosystems (e.g. ancient woodland, atlantic oakwoods/rainforest) and freshwater pollution. Larger-scale farmers have the resources to optimise fertiliser use and conduct thorough assessments of soil mineral content, however smaller farmers may not have access to these. Best practice should be encouraged and supported for these farmers.

Agro-forestry

Funding should be directed to allow the integration of trees into farming systems and not a wholescale replacement of farms by woodland and forestry. We are pleased to see in the Programme for Government a commitment to ensure funding within a post-CAP system is ring-fenced for tree planting, orchard creation, and woodland regeneration, as well as support for the development of rural businesses linked with forestry, with the provision that planting does not put open habitats important for biodiversity and carbon sequestration at risk, and an assessment of the carbon losses and gains is made.[8]

At one time, Scotland was a major exporter of orchard fruits to the rest of the UK and could do so again. There is also a significant area of land around towns and cities used for grazing horses. These fields generally have a very low biodiversity value. Food-producing trees planted as part of an agroforestry approach should receive far greater support and be implemented more widely - with particular emphasis on adopting these systems in areas where they would maximally enhance landscape connectivity for wildlife. There is also the need to increase support for the preservation of heritage orchard fruits and the genetics of our native apple trees (*Malus sylvestris*).

Diversification and changing markets

[8] https://cieem.net/wp-content/uploads/2021/08/Carbon-and-Habitats-Position-Statement-FINAL.pdf

The crops grown will change due to climate change. Already several vineyards have been established in Scotland and maize is now grown further north. Other sectors may become unviable. The future of hill sheep farming in its current form, for example, is doubtful for a range of reasons including shortage of new entrants and a lack of demand for mutton and wool. Initially this sector depended on high inputs of labour and as a result had a relatively high output of lambs and wool. However, few staff are now employed on farms with a consequent reduction in output and poor control of grazing. Many areas are now without sheep which may benefit other ecosystem services. There is scope, however, for some sheep farms to survive by focussing on increasing the productivity of individual sheep as has been demonstrated in the past.

Consultation Questions

1. Should agricultural businesses receiving support be required to undertake a level of baseline data collection?

Yes, to allow thorough evaluation of the impact of changes in agricultural methods baseline data collection is important. Quite a lot of data is already collected, this needs to be considered as a whole farm evaluation rather than considered in isolation. Any baseline data requirements should not be onerous to collect at the expense of making progress but build on the existing data collected. The baseline audit will help inform where actions should be taken to improve biodiversity, sustainability especially soil and water management and greenhouse gas emissions. These baseline evaluations can feed into regional land use partnerships so that farms and agricultural businesses are not considered in isolation but a crucial component of overall regional land use strategies as well as measuring progress against national levels and targets. This farm level data could be used by the Scottish government to inform schemes and payments to help address the dual biodiversity and climate crises.

2. Should collected data be submitted for national collation?

Yes, but following normal practice, data should be anonymised.

As mentioned in question 1, a lot of data is already collected but is often considered in isolation for the purpose it was collected. In considering data collected as part of a wider package of data evaluation will help inform which farm management measures are particularly beneficial in reducing greenhouse gas emissions and improving outcomes for nature. An audit of what data is collected by farmers and other data holders is essential e.g. SRUC[9], James Hutton Institute soil maps[10], Centre for Ecology and Hydrology land cover maps[11], the long-running Countryside Survey[12], BTO's Breeding Bird Survey[13] and much more collected by statutory organisations such as NatureScot and SEPA. Improved mechanisms and infrastructure for 'recording, managing, sharing and using wildlife data'

[9] https://pure.sruc.ac.uk/en/datasets/
[10] https://www.hutton.ac.uk/learning/soilshutton/soil-data-and-maps
[11] https://www.ceh.ac.uk/ukceh-land-cover-maps
[12] https://countrysidesurvey.org.uk/
[13] https://www.bto.org/our-science/projects/bbs

was highlighted in the Scottish Biodiversity Information Forum (SBIF)[14]. The need for monitoring, up to date and accessible data is crucial to guide management decisions and evaluate the success of these so can continually adapt based on shared good practices. The data will support Scotland's Third Land Use Strategy, Scottish Biodiversity Strategy, Scotland's Forestry strategy and can guide regional land use frameworks and partnerships. Integrated, cross-sectoral working will be key to drive improvements.

3. What are the next steps that can be taken to commit businesses to continuous improvement utilising the information presented by carbon, soil, biodiversity auditing?

Linking payments to services provided should act as an impetus for this. Some agricultural businesses will already be near the optimum and should not be penalised for failing to do even better. We need to reward farmers for the delivery of environmental benefits. Whole farm evaluation and plans supported by farm advisors should be made available. The level of support that different farmers will need will vary widely and this should be acknowledged. Some farmers may need support in assessing water quality and management, others looking at soil management and how to reduce erosion and effective fertiliser usage, others how to improve practices to benefit nature, others how to improve their emissions through nature-based solutions.

Farm advisors are crucial to supporting farmers transition where required. This may be providing one-to-one advice, linking farmers up to share ideas and best practices, highlighting training and grant schemes that are available. Farm advisors need to listen and learn as much from farmers as vice versa for collaborative success.

The role of a person carrying out the initial assessment creating a farm plan would carry significant responsibility. The range of skills and experience staff must have in order to support this work properly is broad, and CIEEM strongly recommends that this be conducted by qualified professionals with expertise in each subject area. For example, anyone assessing the condition of existing habitats in terms of biodiversity, identifying those which are in good or poor condition, and subsequently advising on how to improve condition, would require input from a competent ecologist in each relevant habitat. Natural England have recently recruited 55 farm advisors to guide catchment sensitive farming. CIEEM would be happy to work with the Scottish Government and NatureScot to develop appropriate training.

The success of any new regulations will rely on the provision of adequate monitoring and enforcement. NatureScot and other regulatory bodies must be fully funded to deliver these.

There will also be lessons to be learned from previous work. For example, work on reducing energy requirements of agriculture was carried out in the aftermath of the oil crisis of 1973. Earlier, Fraser Darling's 1955 West Highland Survey showed how productivity of agricultural land could be increased sustainably in marginal areas.

[14] https://nbn.org.uk/about-us/where-we-are/in-scotland/the-sbif-review/

4. How can baselining activities be incorporated into common business practices across all farm types?

It is important that such activities take account of the extreme diversity of the sector. As outlined in question 3 the level of support required will vary. Relevant information provision in an easily accessible format and support from farm advisors is crucial.

5. Should capital funding be limited to only providing support for capital items that have a clear link to reducing greenhouse gas emissions?

No. There is also a need to support climate change adaptation, carbon sequestration and general ecosystem health. There is a biodiversity and climate emergency and these must be considered together otherwise neither will be addressed. Nature can contribute to more than 30% of our net zero targets. Scotland has a Biodiversity Intactness Index[15] of just 56%[16]. Capital funding will be needed to improve outcomes for nature which will in turn help address the climate emergency. Many nature-based solutions such as peat restoration and encouraging natural regeneration of native tree species along rivers will benefit biodiversity as well as absorb carbon and mitigate impacts of climate change such as rising river temperatures and extreme flow events. For example, at a river in Aberdeenshire, average temperatures in April have risen by 1.46 degrees between 1970 and 2000 with associated impacts observed on many iconic species such as Freshwater Pearl Mussel and Salmon Capercaillie and Dwarf Willow[17]. Capital investment such as fencing to exclude livestock to allow regeneration where appropriate and native tree sapling sourcing and establishment would be welcomed.

The new Common Agricultural Policy proposals in the EU include enhanced conditionality with 3-7% requirement of arable land to be in eco-schemes and at least 25% of the direct payments budget allocated to ecosystem schemes, and there is strong linkage to the EU Biodiversity strategy for 2030. The latter includes reference to ensuring the EU funding is biodiversity-proofed so that EU funding contributes to, and does not cause harm to biodiversity. A commitment for all agri-funding in Scotland to be biodiversity-proofed like this would make a huge impact. This would ensure that farming activities are not allowed to impact adversely on water quality or reduce habitat connectivity, for example, and that the remaining funding is targeted at enhancement and restoration rather than being used to address harm caused by farming activities supported by direct payments.

We are pleased to see the recent announcement on the continuation of the Agri-Environment-Climate Scheme. Around 3,000 land managers have had 5-year contracts under AECS, delivering sustained positive management on around 30% of Scotland's agricultural land (1.6 million hectares)[18]. Building on the success of these initiatives and the

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[15] Scholes, R.J. & Biggs, R. (2005). A Biodiversity Intactness Index. *Nature*, **434**, 45-49. https://www.nature.com/articles/nature03289

[16] https://www.rspb.org.uk/globalassets/downloads/about-us/48398rspb-biodivesity-intactness-index-summary-report-v4.pdf

[17] Morris, T. 2018. Scotland's Nature on Red Alert. Scottish Environment LINK and WWF Scotland. https://www.scotlink.org/publication/scotlands-nature-on-red-alert-climate-change-impacts-on-biodiversity/

[18] https://www.nature.scot/naturescot-biodiversity-duty-report-2018-2020

relationships built up will sustain success allowing a gradual transition to farming for public good that delivers for nature and climate as well as sustainable food production. Some of the highlights from the AECS are outlined in the RSPB report 'The importance of agri-environment-climate payments for addressing the nature and climate emergency'[19]

Agriculture will need to reduce emissions from its production activities and increase its potential to sequester carbon.[20] There will also need to be support for shifting to net-zero compatible fertiliser, e.g. switching to green manures and other 'slow-release' systems, and to support best practice application as mentioned in our general comments. Many of the recommendations to cut airborne nitrogen pollution from agriculture outlined in the Plantlife report should be implemented, such as targeted use of fertilisers, matched to specific crop requirements at the right time to have maximum benefit. The role of nature-based solutions should be highlighted here also. Pollutant interception can be an effective means of reducing ammonia emissions from agricultural sources. The use of pollutant interceptors such as scrubbers have been shown to reduce emissions by 70 – 90%[21]. Similarly, inclusion of tree shelterbelts has been modelled to show a maximum of 27% ammonia capture from livestock housing[22].

6. What role should match funding have in any capital funding?

Match funding should be required where the government wishes to increase the uptake of capital items needed to achieve climate and nature outcomes but when capital funding is also likely to improve the financial returns of a farm business though e.g. improved efficiency. The greater the level of private benefit likely to result from providing capital funding, the higher the requirement for match funding should be.

7. What capital funding should be provided to the sector to assist in transformational change, particularly given that in many instances the support called for was directly related to productivity or efficiency, that should improve financial returns of the business concerned?

Capital items required to deliver measurable biodiversity and climate outcomes should be made available. Funding should be focussed on transformations that will not produce a return in the short term but which will be important in the longer term. There may also be a need for medium term loans to cover the time lag between capital investment and returns on that investment.

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[19] https://www.rspb.org.uk/globalassets/downloads/row-scotland/drop-down-docs/rspb-scotland-aces-paper.pdf

[20] Eory *et al.* (2020) *Non-CO2 abatement in the UK agricultural sector by 2050.* Available at: https://www.theccc.org.uk/publication/non-co2-abatement-in-the-uk-agricultural-sector-by-2050-scotlands-rural-college-adas-and-edinburgh-university/

[21] Guthrie, S., Giles, S., Dunkerley, F., Tabaqchali, H., Harshfield, A., Ioppolo, B. and Manville, C. (2018). The impact of ammonia emissions from agriculture on biodiversity: An evidence synthesis. The Royal Society, London. https://www.rand.org/pubs/research_reports/RR2695.html

[22] Bealey, W.J., Loubet, B., Braban, C.F., Famulari, D., Theobald, M.R., Reis, S., Reay, D.S. and Sutton, M.A. (2014). Modelling agroforestry scenarios for ammonia abatement in the landscape. Environmental Research Letters, 9, 125001. https://doi.org/10.1088/1748-9326/9/12/125001

8. Should all farm and crofting businesses be incentivised to undertake actions which enhance biodiversity?

Yes, but some businesses will be able to do much more than others without affecting productive capacity. It is also important that owners of farms and holdings that already have high levels of biodiversity are encouraged to keep that level.

9. What actions would be required by the farming and crofting sectors to deliver a significant increase in biodiversity and wider-environmental benefits to address the biodiversity crisis?

This will depend on where the farm or croft is situated and the type of agricultural practice. There are a wide range of activities already being carried out by some farmers, community groups and by NGOs with clear benefits to biodiversity. It is important not to be over-prescriptive to encourage innovative and creative solutions that allow biodiversity objectives to be met. Intensification in some areas may allow extensification or re-wilding of others. Planning has to be done at the landscape scale for this to be successful and this is where Regional Land Use Partnerships have an important role. A 'one size fits all' scheme fits no-one - A scheme must operate at a local level, with bespoke flexible options.

There is useful literature on the success or otherwise of agri-environmental schemes. Continued funding through the Agri-Environment Climate Scheme has to be directed at enhancing, restoring and creating wildlife habitats on farms as well as effective catchment management measures. Current agricultural support has not encouraged the degree of change that is needed to address the biodiversity crisis. Although some actions to address greenhouse gas emissions and wider climatic issues will also have biodiversity benefits, there will also be a continued need for more targeted actions to improve outcomes for nature. It will be essential to ensure that improving farmland biodiversity is delivered by all farming sectors in Scotland.

Note that it is important not to penalise land managers for failing to meet targets due to factors outside their control such as the effect of climate change on successful dispersal of species, the impact of dog walking on ground nesting birds and the actions of neighbouring land owners, for example tree planting on the edge of otherwise suitable wading bird habitat.

The Biodiversity Net Gain principles[23] can be implemented in a wide range of land uses, from farming to forestry[24] to deliver Positive Effects for Biodiversity. Also, a potential direct benefit for farmers is that where developers are unable to deliver gains in biodiversity on-site there is a market for farmers and landowners to deliver it for them. This will need partnerships between farmers, landowners, developers, ecologists and more which could be achieved through the Regional Land Use Partnerships. Funding via this route could aid native habitat restoration, and creation of habitats such as ponds and wetlands. As positive effects for biodiversity must secure long term arrangements similar to BNG, this is a potential income stream that could secure long-term investment for farmers. The knowledge that farmers hold about their own land alongside the skills and experience of

[23] https://cieem.net/i-am/current-projects/biodiversity-net-gain/

[24] https://cieem.net/wp-content/uploads/2019/06/Biodiversity-Net-Gain-in-Scotland-CIEEM-Scotland-Policy-Group.pdf

CIEEM members and farm advisors working with farmers could deliver genuine benefits for biodiversity and climate.

An important lesson from ecology is that site-specific solutions are needed, as farmers well know. For example, there are many proponents of no-till agriculture. However, work in the 1970s on its predecessor, direct drilling, identified those soils where this was a suitable practice and those where it was not. Similarly, moving away from animal production to reduce greenhouse gas emissions could be counter-productive if Scottish production was replaced by imports from countries with systems producing more greenhouse gases. Pigs and poultry are, of course, non-ruminants so do not emit methane but tend to be fed on cereals. Before humans started transforming the landscape for agriculture, wild ruminants and pigs played an important role in the health of woodlands and grasslands. To an extent pasture-fed beef is an equivalent system, which should be encouraged. Indeed conservation grazing is an important aspect of conserving many species of plant and habitats. The Scottish Wildlife Trust is currently raising funds to support its flying flock of sheep and hardy herd of cattle essential for grazing to ensure the conservation of species-rich grasslands.

Just transition

10. What do you see as the main opportunities for crofters, farmers and land managers in a Just Transition to a net zero economy?

The main opportunity is in the chance to make changes to a farm, holding or croft that lead to a more secure future. A just transition to both a net zero and nature positive economy will increase resilience and adapt to climate change. As with recent significant investment in carbon offsetting via tree planting schemes in Scottish upland estates there is the opportunity for businesses to invest in semi-natural grassland management and native tree planting on agricultural land to offset and mitigate for climate and biodiversity impacts. So, a new diverse market to reward farmers for farming for public good. However, this investment must not result in communities, farmers and local people losing their right/voice in how the land is managed and increasing community-owned land areas is important for empowering communities to reach net zero.

11. What do you see as the main barriers for farmers, crofters and land managers in a just transition to a net zero economy?

One of the barriers is the perceived risk from moving away from traditional ways of farming. Finding some way to insure against that risk would be helpful. Another barrier is the current economic fragility of local processing facilities, such as slaughterhouses. Another is the difficulty of young entrants from non-farming backgrounds being trained and taking over farms. Continued investment in agricultural education and training is important as well as addressing the economic barriers to young people entering the sector. Restrictive tenancy agreements may also be a barrier.

12. How best can land use change be encouraged on the scale required for Scottish Government to meet its climate change targets?

In delivering a wide range of public goods, there is a potential for unintended consequences, if not planned strategically. It is important to take a holistic view of the carbon balance so

that carbon sequestration from tree planting is not cancelled out by the carbon costs of importing food from outside Scotland or by impacting on peatland or semi-natural grasslands. The " right tree in the right place" is key and the use of nature-based solutions has to be considered across the board[25]. Strategic land use change needs to be considered at local, regional and national levels through Regional Land Use Partnerships and Frameworks embedded in NPF4. For the effectiveness of Land Use Partnerships to be assessed, as laid out in the Programme for Government, adequate resources and effective personnel are essential to coordinate strategic collaboration and cooperation. Decisions on individual parcels of land cannot be made in isolation if we are to create resilient ecological networks. should seek to prioritise landscape scale projects and nature-based solutions approaches.

It is important to remember that there are also important marine carbon sinks and the full suite of options available has to be considered to have any hope for addressing climate change targets.

13. Would incentives for farm plans specifically targeting flock/herd heath, soil health, & crop health (for example) demonstrate real improvements in productivity over time?

Farm plans that lead to targeted resourcing to help farmers and crofters transition to low carbon and nature positive farming is really important. Financial incentives should be offered to enable action to be taken but advice from other farmers (shared knowledge, skills and equipment) and farm advisors (advice and training) are equally important.

For some sectors such as upland sheep farming investment needs to be directed to the use of technology more to manage flocks as a group of individuals – and thereby deal with individual poor performance which will help improve the carbon footprint of the flock and just as importantly engage in more environmental management as part of a suite of measures whether that be peatland restoration, biodiversity management, wetland creation or especially integrating more trees on the farm to complement but not replace farming. Environmental management will be an essential output from our uplands in the future, especially with regard to managing water quantity.

Soil health is an area that needs more research and monitoring efforts, particularly as our knowledge of soil biota (i.e. not just the physical characteristics of soil, but the 'soil food web' or underground ecology) is still limited. Case studies of regenerative soil practices in other parts of the world suggest that increased yields can be significant and are readily achievable with the right approach.

14. Should future support be dependent on demonstration of improvements in productivity levels on farm?

No. Payments should relate to services provided and not to increases in productivity. The easiest places to increase productivity are those that have been badly managed in the past. It is thus production, whether of food or ecosystem services, that matters. However, an important aspect of productivity is the production per unit of external input. In the early

[25] Using Nature-Based Solutions to tackle the Climate Emergency and Biodiversity Crisis. CIEEM Briefing Paper https://cieem.net/wp-content/uploads/2020/07/Nature-Based-Solutions-designed.pdf

days of agri-environmental schemes, payments were made for establishing hedges and putting in ponds. This was unfair on the farmers who had already foregone income to do these things.

Research & Development

15. In light of ongoing research activities supported by the Scottish Government and the 2022-2027 research strategy, are additional measures needed to ensure research is supporting the agriculture sector to meet its climate change targets?

Yes, but it is important to reflect on research that has been carried out in previous years and is in danger of being neglected. There have been other times when agriculture has had to go through a rapid transition such as during and immediately after the two world wars. Since 1784, the Royal Highland and Agricultural Society has been encouraging, *inter alia* research whether in research institutes or by farmers themselves.

Knowledge & skills

16. What importance do you attach to knowledge exchange, skills development and innovation in business?

These factors are crucial and are well known in agricultural extension. Scottish agriculture has a long history of innovation. Certain agricultural sectors such as upland sheep farmer may need support to encourage innovation and diversification. Knowledge exchange between farmers must be encouraged and supported. Clear monitoring requirements and enforcement measures are essential to build credibility of regulations. Good practice guidance encouraging farmers and land managers to go above and beyond the bare minimum is also crucial. CIEEM creates industry standard guidance for assessments of biodiversity and would welcome working with the Scottish Government to generate such guidance for monitoring and assessment of schemes.

17. What form should tailored, targeted action take to help businesses succeed?

Support through the provision of well trained farm advisors as discussed above, as well as support for young people entering the agricultural sector. Farmers must have access to advice that is professional, objective and evidence-based from advisors who are competent to deliver this[26]. In our recently published competency framework[27] for Farm environment advisors, a suite of 16 areas of expertise covering farm management practice, economics, advice and funding for environmental land management as well as ecological surveying, assessment and mapping skills are outlined.

18. Should continuing professional development be mandatory for businesses receiving public support funding?

Effective CPD to help ensure better outcomes for nature and climate should be mandatory but retain flexibility to ensure that the training is fit for purpose to reflect the farmers specific needs and circumstances.

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[26] https://cieem.net/i-am/current-projects/farm-environment-advice ; https://farmwildlife.info

[27] https://cieem.net/resource/farm-environment-adviser-competency-framework/

Supply Chains

19. How can the green credentials of Scottish produce be further developed and enhanced to provide reassurance to both businesses and consumers?

They must be clearly auditable to provide reassurance both in terms of food quality, green credentials and carbon footprint. Efforts need to be made to address the whole supply chain and create a circular economy. Increased public understanding of food production in Scotland is crucial in transitioning farming and wider agricultural processes.

20. Should farm assurance be linked to requirements for future support?

Don't know. The answer will depend on the nature of future farm assurance schemes and how adherence can be assured.

21. How can ongoing data capture and utilisation be enhanced on Scottish farms and crofts?

Outlined in responses to questions 1-4.

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