

# **Attitudes and drivers of behaviours of landowners/land managers towards Land use change associated with Climate Change Plan targets**

24 June 2021

**Lee-Ann Sutherland, Kit MacLeod, James Koronka, Laure Kuhfuss and Kirsty Blackstock**

**The James Hutton Institute, Craigiebuckler, Aberdeen.**



# Contents

<b>1. Executive Summary</b> .....	4
<b>Key Findings</b> .....	4
<b>Specific topics: Woodlands, peatlands and biofuel production</b> .....	10
<b>Policy Recommendations</b> .....	11
<b>Research Gaps</b> .....	13
<b>Limitations</b> .....	14
<b>2. Introduction</b> .....	16
<b>3. Methods</b> .....	17
<b>4. Land Manager Perspectives on Future Land Use</b> .....	20
<b>4.1 Demographic Trends</b> .....	20
<b>4.2 Behavioural and Psychological Factors</b> .....	22
<b>4.3 The Role of Education</b> .....	23
<b>4.4 Cultural Approaches: Identity as a ‘good farmer’</b> .....	24
<b>4.5 From Multifunctional Transitions to Ecosystem Services</b> .....	25
<b>4.6 Types of Land Manager</b> .....	26
<b>4.6a Farmer typologies</b> .....	27
<b>4.6b Forester typologies</b> .....	29
<b>4.7 Future Intentions and Land Use Scenarios</b> .....	30
<b>5. Approaches to Influencing Land Use Change</b> .....	32
<b>5.1 Path Dependency and Room for Manoeuvre</b> .....	32
<b>5.2 Triggering Change in Decision-Making</b> .....	33
<b>5.3 Planning to Make Changes</b> .....	35
<b>5.4 The Role of Advice</b> .....	36
<b>5.5 The Role of Private Sector Actors</b> .....	38
<b>5.6 Nudges: Incentivising Incremental Shifts</b> .....	38
<b>5.7 Climate Smart Agriculture Initiatives</b> .....	40
<b>6. Business Models</b> .....	41
<b>6.1 Farmer-led Climate Change Groups</b> .....	41
<b>6.2 Payments by Results</b> .....	42
<b>6.3 Payments for Ecosystem Services (PES) and Natural Capital Accounting</b> .....	42

<b>6.4 Partnership Working</b> .....	44
<b>6.5 Considerations for Regional Land Use Partnership Pilots</b> .....	45
<b>6.6 Quantifying the Design of Contracts</b> .....	45
<b>6.7 Quantifying the Outcome of Interventions</b> .....	46
<b>7. Issues for Specific Land Uses</b> .....	48
<b>7.1 Peatland Restoration</b> .....	48
<b>7.2 Woodland Expansion</b> .....	49
<b>7.3 Biofuels</b> .....	51
<b>7.4 Regional Differences</b> .....	51
<b>7.5 Commodity Production Differences</b> .....	52
<b>8. Policy Recommendations and Research Gaps</b> .....	53
<b>8.1 Policy Recommendations</b> .....	53
<b>8.2 Research Gaps</b> .....	55
<b>References</b> .....	58
<b>Appendix A: Keyword Search Terms</b> .....	69
<b>Appendix B: Triggering Change – COVID and Brexit Briefing Note</b> .....	70

# 1. Executive Summary

Achieving Scotland's targets for addressing the Global Climate Emergency will require major changes to Scotland's land use. These changes will be largely dependent on the actions taken by Scotland's landowners and land managers. This report summarises the findings of recent research on the attitudes and drivers of land manager behaviours in relation to climate change in the UK.

Attitudes and behaviours towards land use change have been topics of social research for several decades. This report focuses on research conducted within the past 10 years, particularly in relation to land managers located in the United Kingdom. Scottish Government has been – and continues to be – one of the largest funders of research into land manager attitudes and decision-making in the United Kingdom, through its RESAS Strategic Research Programmes and associated Centres of Expertise. This investment is reflected in the findings of this report, which integrate the expert knowledge of scientists working within the Strategic Research Programme with a literature review of academic and grey literature. A number of recent literature reviews, particularly the 2018 AHDB report on Understanding How to Influence Farmers' Decision-making Behaviour and the 2018 Forest Research report on Influencing behaviour for Resilient Treescapes have also informed the findings.

Although there is a substantial body of literature on agri-environmental decision-making, specific research into land manager attitudes and drivers of behaviour in relation to climate change is relatively new. Climate change as a phenomenon is distinctive from issues such as biodiversity loss and soil degradation: it has impact at global scale to which many different types of actors contribute, and leads to extreme but largely unpredictable events.

## Key Findings

### Who is making decisions about land use

Approximately 80% of Scotland's land mass is under agricultural production, primarily managed by private landowners. A further 18.5% of Scotland's land is covered in forest, approximately one third of which is publicly owned. To achieve Scotland's targets, substantial changes thus need to occur on privately owned land.

- The bulk of the academic and grey literature on land manager attitudes and behaviours addresses 'farmers' (a catch all term which encompasses any holder of agricultural land e.g. including estates and crofts). As agricultural land managers often have forests on their holdings, there is substantial overlap between 'farmers', 'foresters' and other land managers.

- The attitudes and drivers of land management behaviour are diverse, often grouped into typologies for ease of description. Typologies typically distinguish between ‘commercial’, ‘environmental’, ‘recreational’ and ‘multifunctional types’, indicating the major orientations of land managers towards land use decision-making.
- Land management decision-making is influenced by a range of actors within the holding (e.g. family members, employees) and outside of the holding (e.g. agricultural advisors, planning officials, financial services, processors, supermarkets). All of these actors need to be involved in the cultural shift necessary for achieving Scotland’s land use change targets.
- Landscape scale management: collaborative decision-making, particularly through collaborative agri-environmental measures and Scotland’s Regional Land Use Partnerships is particularly important for achieving landscape scale outcomes (e.g. meaningful amounts of carbon sequestration, habitat preservation for mobile species).
- The interests of the public – consumers and citizens – in land use decision-making is increasingly recognised by land managers. Adapting to change (from post-EU, Covid-19, and responses to climate and ecological crises) is becoming more mainstream in public debates and this will influence land manager communities.

## **Land Manager Attitudes Towards Climate Change**

- There is strong evidence that most land managers see themselves as environmental stewards, regardless of the extent to which their land management practices meet scientific standards of environmental stewardship (i.e. this identity is culturally embedded). This belief is grounded in part in the long-term nature of land-based businesses; land managers are oriented towards protecting their resources for subsequent generations.
- Evidence from the early 2010s indicated that a substantial cohort of farmers and foresters were unconvinced about climate change projections, and saw limited roles for their holdings in mitigating climate change. A recent study in England has found that while farmers are conscious of extreme weather events, the uncertainties of climate change make it difficult for them to make changes in the short to medium term. Their emphasis is instead on general business resilience and successfully navigating the challenging economic environment.

## Influences on Behaviour

- Most land managers include economic considerations in their decision-making processes, but these vary from highly commercial enterprises, to those which are managed primarily for environmental protection or personal amenity.
- Education on sustainability issues is linked to attitudinal changes, but these do not necessarily lead to behaviour changes. Scotland's Curriculum for Excellence is unique in integrating sustainable development, global citizenship and outdoor learning in its Learning For Sustainability cross-curricular approach. There is considerable evidence that education on sustainable development leads to pro-environmental attitudinal shifts, but the relationship to behaviour change is more complex (i.e. less direct).
- Generational renewal is of key importance to environmental transitions in land use. Land managers who are younger and have higher overall educational achievement are more likely to engage in agri-environmental measures, espouse environmental values and convert to organic farming. Farms with successors are more likely to invest in the future of the farm, including in renewable energy production. A recent study in Scotland found that new entrants to farming are more globally engaged and innovative than established farmers.
- The tax concessions associated with particular land uses (particularly agricultural production) can reinforce path dependencies and maintenance of the status quo. For example, there is a widespread belief in Scotland that there are tax advantages to waiting until after the senior farmer's death to transfer farm ownership to a successor. This can reduce the investment in and innovation on the farm for decades previous to that event.
- The role of advisors and peer-based knowledge networks will be essential to the transmission of knowledge and opportunities within and between land manager networks, and to supporting transition processes. The establishment of trust and legitimacy with individual organisations over time has greater impact on the influence of those organisations, than the type of organisation (e.g. planning authority, charitable trust, NGO, publicly or privately funded advisory service).
- Farming as a profession is culturally embedded; a substantial volume of research has demonstrated that farmers seek to be recognised as 'good farmers' by farming peers, which can lead to resistance to activities which are not culturally valued (particularly forestry and biofuel production). However, 'good farmers' also keep up to date on progressive approaches and new technologies.

- Land managers develop their businesses or holdings on a steady trajectory, changing incrementally (if at all). This pattern is well evidenced but should not be understood as ‘resistance to change’, because the pattern often reflects sound financial reasoning.
- Frequent changes to incentive structures can immobilise risk averse land managers, who fear losing future eligibility. For example, Scottish farmers in particular have experienced that acting ‘too soon’ can make their environmental actions ineligible for future compensation. These uncertainties lead to a ‘wait and see’ approach to decision-making.

## **Mobilising Major Transitions**

In general, there are two primary ways to influence environmental behaviour change: supporting major transitions through interventions aimed at capitalising on the change processes associated with trigger points, and complementary approaches which encourage incremental changes by modifying the context of decision-making. The former is more difficult to achieve, but has the potential to have much greater impact.

- The Triggering Change Model of decision-making was originally based on a series of UK agricultural research projects, and has subsequently been applied across Europe. It demonstrates that the major changes required of the land management sector are most likely to occur in response to ‘trigger events’ – points at which it becomes evident to land managers that a major change is required.
- These triggers include land holding succession, major alterations in holding income (including subsidies, market shifts, off-holding employment), and disease outbreaks (e.g. foot and mouth, BSE). Post-covid recovery and Brexit are potential triggers for major transitions (see Appendix B for further detail).
- Following trigger events, land managers actively appraise their options, representing a key period for influencing change through targeted supports, including advice. Land management decisions are influenced not only by what the land manager sees as important for the holding’s development, but also by social norms and practical limitations. Supports from advisory services and other actors can be particularly high impact at this point.
- Land managers may not be able to identify a viable alternative, or implement it successfully. They may then revert to the original pathway or exit the industry. Orienting supports towards implementation is therefore key. If a new approach has been successfully implemented,

becomes part of the holding's new trajectory (i.e. a durable transition has occurred).

- Some land managers are more innovative and risk averse than others. The well-established 'diffusion of innovations' approach demonstrates that there are typically a small number of innovators/pioneers, followed by 'early adopters', 'early majority', 'late majority' and 'laggards' in innovation up-take, typically distributed along a bell curve. Pioneers are actively experimental, and may not require a trigger to make a major change. Early adopters will respond the most quickly to trigger events, and often inspire their peers. However, there is controversy over whether to target supports towards early adopters (i.e. 'opinion leaders'), as this could be seen to disadvantage the land managers who would benefit most from assistance.
- Major transitions are restricted by land managers' 'room for manoeuvre', including, land capability, potential markets, household skills, and the financial and other resources available to the land manager.
- Supply chain actors, such as supermarkets and suppliers can strongly incentivise or restrict transitions through their procurement standards and processes.
- Education alone is unlikely to lead to major transition processes; land managers need to be motivated to actively consider their options, and have the resources and capabilities to make the transition work.

## **Incentivising Incremental Changes**

Land-based businesses typically make incremental changes to their practices on an ongoing basis. Incremental shifts in behaviour occur in response to new information, opinions of respected experts (e.g. agricultural advisors), peer practices and contextual changes (e.g. to regulations). According to well established social psychology research, these incremental changes are typically implemented with relatively little active consideration, and are therefore less durable than the more substantial changes made following active consideration. These changes can still be effective in achieving outcomes, and can be mobilised by influencing the context in which decisions are made.

- 'Nudge' approaches enable incremental shifts in land manager behaviour by making changes 'EAST' (Easy, Attractive, Social and Timely, e.g. requiring little effort, low risk/high reward, valued by peers and convenient). Nudge approaches are being explored at Defra but have yet to be specifically developed within the UK land use sector.



- Most agri-environmental schemes could be considered ‘nudge’ approaches in terms of yielding incremental shifts, but often have high transaction costs. Agri-environmental schemes have become normalised within farmer decision-making (i.e. they are accepted and included in farm business planning). These continue to be useful levers.
- Incremental shifts can lead to more major changes; recent research has suggested that engagement in agri-environmental schemes can be a stepping stone towards more substantial changes (e.g. investment in renewable energy production and afforestation).
- About 70% of Scotland’s land is eligible for subsidies; only about 5% of potential recipients do not take these up. Although some of the remaining land comprises urban developments, water resources, mountains etc, there is still a substantial amount of land (e.g. horticulture, recreational properties, private sporting estates) which has not traditionally been eligible for subsidies. These land managers are unlikely to be familiar with established subsidy mechanisms and other policy levers, and will therefore require targeted intervention for incentivising management changes.
- Framing of messages about subsidies and schemes influences up-take. For example, the Land Management Contracts introduced with the Single Farm Payment were approached by farmers as an opportunity to ‘take back’ a share of their overall payment entitlement through targeted environmental actions, a different dynamic to competitive agri-environmental schemes.
- ‘Payments by results’ enable land managers to produce specific outcomes, but present higher degrees of risk (e.g. that results will not be achieved). They are also more expensive to monitor than traditional schemes. They may have the benefit of enabling land managers to learn how to produce specific environmental goods and services.
- ‘Payments for ecosystem services’ offer opportunities to enrol private funding in the provision of public goods. Although there has been little investigation of how land managers view these approaches, is it reasonable to expect that issues would be similar to other forms of funding (e.g. establishment of trust between parties, transaction and opportunity costs, social norms, behavioural factors, associated risks, potential rewards). As these approaches are new, it will take time to develop their trust and credibility with land managers.

## Specific topics: Woodlands, Peatlands and Biofuel production

Several subtopics were identified for targeted analysis in this review:

- Scottish woodlands have a diverse range of owners. Both public and private large-scale foresters tend to emphasise commercial timber provision, whereas NGOs focus on biodiversity value and small-scale amenity owners may not actively manage their forests at all. There is general support for native species, but considerable conflict around the best species and location for new woodland development.
- Farmers are largely reluctant to afforest, as this conflicts with their identity as farmers. However, there is some support for agroforestry, particularly amongst organic and dairy farming organisations. Land managers in marginal areas, and who already have woodlands, are most likely to afforest, although these may not be the most suitable locations to address climate objectives.
- Peatland restoration and new woodlands tend to aggregate in particular locales irrespective of land capability, suggesting socially supported path dependence.
- Peatland restoration attitudes have primarily been explored with the general public rather than land managers specifically. Public attitudes vary but there appears to be a large degree of ambivalence towards the benefits of peatland restoration. This reflects personal experiences and trade-offs between different functions, rather than lack of knowledge.
- Biofuel production has had limited attitudinal research, but the research which exists suggests that up-taking farmers were largely motivated by profitability and ease of production. Some farmers oppose biomass production for fuel, as it conflicts with their identity as food producers and perception of food security needs. In terms of wood for fuel species, short duration crops tend to be more palatable as the decision to produce can quickly be reversed.
- Although there is some suggestion that biofuel production would be more acceptable on marginal agricultural land, the [Climate Action Upland, Hill and Farming Group](#) report was strongly opposed to use of agricultural subsidies to support afforestation or biofuel production.

## Policy Recommendations

There are a number of ‘trigger event’ opportunities in the near future where efforts to facilitate major transitions in land management in Scotland could be quite successful. However, this depends on the nature of the supports, and other influences on path dependencies.

Trigger major transitions through:

- Investment in Green Recovery: Many land-based businesses will be seeking to increase their resilience and are likely to be actively considering new options. Digital skills and new ways of working learned during the pandemic may be a particular opportunity upon which to capitalise.
- Subsidy reform following EU exit: Land based businesses are highly vulnerable to EU exit transitions (e.g. changes to trade opportunities, subsidies and regulations). Changes to subsidy structures offer important levers. There is some evidence of business transitions, but most have been immobilised by uncertainties. To promote transformation, major changes need to be accompanied by supports for evaluating and implementing new opportunities. Land managers will need to be confident about future subsidies, agri-environmental measures etc before they reorient their businesses. How to incentivise and communicate with land managers who have not traditionally received subsidies may require specific consideration.
- Facilitating succession: There will a substantial cohort of land-based businesses undergoing succession processes within the next decade. This is typically a time of investment; supporting succession through advice and joint ventures through investment loans could facilitate trajectory change. Assistance with retirement could speed generational turnover. Legal and tax advice around succession planning and joint ventures would be particularly beneficial.
- Orienting recovery supports for unexpected triggers, such as major weather events or disease outbreaks towards Green Recovery. Recovery supports should consider how transformative changes can be incentivised (rather than a return to the status quo).
- Facilitating legitimacy in the Regional Land Use Partnership pilots: These groups may find it challenging to influence change on privately owned land. They may benefit from coaching to establish their legitimacy and good working relationships with the array of stakeholders with whom they engage. They may have the most impact working with land-based businesses which are experiencing triggers (particularly succession/retirement).

- Working with the supply chains: Policy levers should not be solely aimed at land managers. Supply and value chain actors (e.g. processors, supermarkets) are increasingly important influencers on land management choices (e.g. particularly through procurement standards).

Incentivise incremental transitions by making desired changes EAST (easy, attractive, social, timely) by:

- Developing ‘nudge approaches’, which make it easy and attractive (low risk, high reward) to take up agri-environmental schemes and renewable energy production. Make environmental actions a default option for subsidy recipients. Less traditional nudges (e.g. lotteries, peer-based social media campaigns) require development and testing.
- Emphasise locales which are already pursuing desired actions (e.g. woodland expansion, renewable energy production). Land managers in these areas are most likely to expand their actions.
- Identify straightforward but effective climate actions. Climate change action often focusses on longer term planning that will resonate with some land-based choices (forestry, built infrastructure) more so than with businesses focussed on annual or short-term business plans.
- Integrating policies across sectors. Climate action will be influenced by a range of policies, not only agricultural and forestry policies. These other policies include regional spatial strategies, protected area designations, energy, tourism/recreation and food policies, which need to be consistent with each other to achieve effective outcomes.
- Increase peatland awareness: The limited evidence on peatland attitudes suggests that the public – and potentially land managers – are highly ambivalent to peatland restoration. Efforts need to be made to increase public and land manager consciousness of the benefits of peatland restoration.
- Develop payment by results approaches which enable land managers to recognise the environmental benefits they are producing. This will gradually lead to a new understanding of the value of ‘untidy’ green spaces within their holdings.
- Developing private finance options. These are most likely to be successful in achieving incremental shifts, as they are new mechanisms (i.e. unfamiliar to land managers, requiring time to establish credibility and trust).

### Long term options:

Land managers will also respond to broader societal shifts (e.g. changing diets and consumption patterns, expectations around land access and provision of public goods etc). These can be shaped by government messaging around land use and where long-term investments are made

The Learning for Sustainability Agenda appears to be a positive step. Embedding environmental science and practices within educational curricula is an important stepping-stone for cultural transitions to land management in Scotland. However, connections to behaviour change are not direct and require further study. Reconsideration of how land-based businesses are included within secondary curricula may warrant consideration, as there are stigmas that deter the best students from pursuing agricultural education.

## **Research Gaps**

Research is needed to design flexible interventions which can be mobilised to offer supports at critical trigger points, particularly triggers which are not industry wide (e.g. succession) or predictable (e.g. disease outbreaks, commodity price slumps). This should include:

- identification and testing of specific mechanisms and incentives, particularly quantification of how land managers will respond to specific interventions (e.g. experimental economics).
- novel approaches to 'hard to reach' land managers (e.g. land managers who have never planted to trees and/or engaged in agri-environmental measures)
- reaching land managers who are not accustomed to subsidy supports and/or are not financially motivated (e.g. non-commercial farmers, amenity foresters)
- assessing how 'good farmer' identity can be mobilised to enable a cultural shift towards climate action (e.g. peer to peer learning approaches)
- how to more actively enrol supply chain actors in environmental actions through procurement and marketing practices
- application of nudge thinking approaches within the land sector

More interdisciplinary research is needed which directly connects changes in land manager practices to environmental outcomes. This is important for underpinning 'payments by results' approaches, and return on investment for 'payment for ecosystem services' investors

Action research is needed to enrol land managers in experiential learning about and understanding the environmental impacts of their actions, and the options for biodiversity production and environmental protection. Research has shown that land managers are more likely to engage in environmental activities if they have seen the environmental benefits of past efforts.

The Farmer Intentions Surveys run by the James Hutton Institute and Scotland's Rural College addresses farmers' attitudes towards and plans to make specific changes to their management practices. Continuing these surveys into 2023 and 2028, and specifically investigating desired behaviours (e.g. biofuel production, woodland expansion) will identify areas where intervention is particularly needed or most likely to have impact.

There is very little knowledge of behavioural drivers of peatland restoration. Research focuses on cost benefit analysis, the potential role of private finance and attitudes of the general public and industry stakeholders. Targeted research into land manager attitudes and behaviours is required to identify potential levers.

Understanding of the attitudes and drivers of decision-making on less traditional holdings (e.g. contract farming, large business management, community land management) requires new research. Little is known about how decisions are made on these holdings, and therefore what drives their behaviours.

Current research methods emphasise one decision-maker per holding; this approach marginalises the voices of women and young people in research processes, reifying inequalities within the land management sector. New methods need to be developed to include multiple decision-makers on the same holding in the research process.

## **Limitations**

This review has not addressed the literature on attitudes towards soil or water management or the substantial farm diversification literature. Diversification may prove to be a useful example of major transition, and/or include a shift towards environmental actions like renewable energy production. Many farmers are diversifying into non-food based businesses and the implications of these choices for climate change targets also need to be considered.

The review process has been expert driven and undertaken within the confines of a ten day work schedule. It should therefore be considered indicative, rather than comprehensive of the UK literature on land manager attitudes and drivers of behaviours. Particular emphasis has been placed on

research conducted by scientists at Scottish Government's Major Research Providers (the James Hutton Institute and Scotland's Rural College).

## 2. Introduction

In seeking to tackle the Global Climate Emergency, the Scottish Government has committed to restoring 250,000 hectares of peatland in Scotland by 2030 and increasing Scotland's woodland cover from 18% to 21% of the Scottish land area by 2032. There is also an intention to increase production of bio-energy feedstock, which will require land. Achieving these commitments will require wide-scale land use change in Scotland. This was recognised in the [Scottish Government's Climate Change Plan Update Report](#) (December 2020), the [Implementation Plan for the Scottish Forestry Strategy](#) (February 2019) and [Scotland's Third Land Use Strategy](#) (March 2021). The land use sector is similarly recognising the importance of these objectives, through initiatives like [Farming for a Better Climate](#), and the [Farming for 1.5°C Independent Inquiry](#) on farming and climate change in Scotland. The 3rd Land Use Strategy identifies the unprecedented urgency and scale of change needed from the land use sector to meet Scotland's climate change targets.

The purpose of this review is to provide an initial evidence base and identify associated gaps for designing effective policies which have implications for land use change. The primary evidence for the report is a review of existing academic and grey literature on the attitudes and drivers of behaviour for landowners/managers towards land use and land use change in Scotland. The review aims to cover Scottish and UK literature, with selective inclusion of relevant wider English language sources. In particular, the report addresses:

- Land manager attitudes towards climate change and environmental actions
- Evidence for how major transformations in landholding trajectory occur
- Approaches to influencing land use change
- Specific research into how changes in management of woodland, peatland and bioenergy feedstock

The report concludes with recommendations for policy makers seeking to deliver land use change to achieve the targets in [the Climate Change Plan Update](#). Study findings are highly relevant to current policy initiatives. These include the implementation of [Regional Land Use Partnerships](#), Scotland's [Land Use Strategy](#), [The Agri-Environment Climate Scheme](#), [Scottish Biodiversity Strategy](#) and broader activities associated with [Scotland's Green Recovery](#) from the COVID-19 crisis. In the UK more broadly, findings are relevant to Defra's [25 year Plan to Improve the Environment](#), including a new [Network for Trees on Land](#) and [Sustainable Farming Initiative](#); [Environment Bill 2020](#), [Green Finance Strategy](#) and the [UK's NetZero targets](#). The United Nations Conference of the Parties [Climate Change Summit](#) will be held in Glasgow in 2021. The [United Nations Biodiversity Conference](#) will be held in China in 2021.



### 3. Methods

This report is based on a 'Rapid Evidence Assessment' process, which integrated expert knowledge of the authors of this report with empirical research from the RESAS Strategic Research Programme, academic literature review and analysis of grey literature.

Scottish Government has been – and continues to be – one of the largest funders of research into land manager decision-making in the United Kingdom, through its RESAS Strategic Research Programmes and associated Centres of Expertise. The authors of this report have over 30 years' combined expertise as social scientists or economists who specialise in investigating the attitudes and decision-making processes of a range of land managers in the UK, particularly in relation to the agri-environment. This expertise has been gained within the RESAS strategic programme, supplemented by research projects (including the European Commission FP7 and Horizon 2020 projects, Defra, UK research councils and stakeholder organisation projects). The review is therefore intentionally selective to build on the most policy relevant material and is not a complete census of all available literature.

The authors have applied their expert knowledge to a review of the academic literature utilising Scopus. Scopus is the most comprehensive search engine for academic publications. Searches were conducted systematically utilising key words (see Appendix A). The authors also directly searched over 25 UK stakeholder web-sites for grey literature reports. Initial analysis was conducted by analysing the titles and abstracts of papers and reports for consistency with the search parameters (i.e. social research, conducted in the UK and published within the past 10 years). This was followed by selective review of key papers.

This review process identified a number of recent review papers and reports which are of particular relevance to the purposes of the study:

- Ambrose-Oji, B., Robinson, J., O'Brien, L., 2018. Influencing behaviour for resilient treescapes: Rapid Evidence Assessment. Forest Research, Farnham, p. 43.
- Dessart, F., Barreiro-Hurlé, J, van Bavel, R., 2019. Behavioural factors affecting the adoption of sustainable farming practices: a policy-oriented review. *European Review of Agricultural Economics* 46, 417-471.
- Herzon, I., Birge, T., Allen, B., Povellato, A., Vanni, F., Hart, K., Radley, G., Tucker, G., Keenleyside, C., Oppermann, R., Underwood, E., Poux, X., Beaufoy, G., Pražan, J., 2018. Time to look for evidence: Results-based approach to biodiversity conservation on farmland in Europe. *Land Use Policy* 71, 347-354.

- Lawrence, A., Dandy, N., 2014. Private landowners' approaches to planting and managing forests in the UK: What's the evidence? *Land Use Policy* 36, 351-360.
- Rose, D.C., Keating, C., Morris, C., 2018. Understand how to influence farmers' decision-making behaviour. A social science literature review. AHDB.

Several reviews were also identified from earlier in the 2010s. Scottish Government researchers previously undertook a review of land manager attitudes to climate change in 2012. Forest Research commissioned several reviews of behaviour and behavioural change approaches from 2010 – 2012<sup>1</sup>. These reviews are somewhat different in scope to the remit of this present study, but represent important sources of further information. It should also be noted that most academic journal articles begin with a review of the recent literature and associated gaps. Recent literature has also been identified through these introductory reviews.

Overall, there is substantially more UK literature on attitudes and drivers of behaviours of land managers who are focused on agricultural commodity production (i.e. 'farmers'). Within this literature, policy interest in responses to agri-environmental measures has led to a research emphasis on the land managers who had access to these subsidies. Much less is known about the attitudes of other agricultural land managers (e.g. sporting estates, non-commercial farmers, which together comprise over 20% of the land base in Scotland). There is a much smaller body of UK literature on forester attitudes; much of the literature is from the USA and Scandinavia (Lawrence and Dandy 2014) and is therefore not included in this review.

### **A note on terms:**

The majority of the academic literature on land manager attitudes and drivers of behaviours relating to the environment and climate change addresses 'farmers'. This term refers to any manager of agricultural land (i.e. including croft, estates etc). As managers of the vast majority of Scotland's land, 'farmers' will inevitably need to increase forestry on their holdings in order to achieve Scotland's climate targets. There is thus substantial overlap between 'farmers', 'foresters' and other land managers.

---

<sup>1</sup> <https://www.forestresearch.gov.uk/research/literature-review-behaviour-and-behavioural-change/>  
<https://www.forestresearch.gov.uk/research/landowners-attitudes-to-woodland-creation-and-management-in-the-uk-a-review-of-evidence-in-the-uk/2010-report>

## Who makes decisions about land management in Scotland?

Scotland's land use sector is diverse. Decisions are made by a wide array of actors, both individually and in collaboration. These actors include landowners, professional managers, boards, owner-operators, NGOs, local authorities, community groups, and tenants. Within households (e.g. particularly 'family farms') a range of family members including spouses and adult children may be involved in decision-making. Although it is possible for all of the decisions on a land holding to be made by a single individual (farm are increasingly 'one man bands'), it's not uncommon for the oldest family member to 'hold the chequebook' and lead on major strategic decision-making. The day-to-day management decisions on the farm are often taken by younger household members who are working on the farm. Many estates, private forest owners and increasingly large-scale farmers hire professional managers or contractors, who take responsibility for many or all of the day-to-day management decisions. Strategic decision-making may be undertaken by owners, hired managers, or by boards of directors. Tenants and employees work within the parameters set by their landowners, and are obligated to discuss many major decisions with them (particularly afforestation). Land use decision-making by community groups is a new area of activity and research.

Although the academic literature recognises the collaborative processes of decision making by many land managers, empirical research has tended to focus on one decision-maker per holding. Amongst other considerations, it is more straightforward and less expensive to collect and analyse empirical datasets conducted with a single representative per holding. There are two major problems with this approach:

- Management structures of land-based businesses are increasingly complex, with different roles played by owners, managers, and other employees. The attitudes and behaviours of one of these individuals may not accurately reflect the major influences on land use change processes.
- Focusing on a single decision-maker per holding risks reinforcing inclusivity issues within the land use sector, particularly in relation to gender and age (i.e. overemphasising attitudes expressed by older, male decision-makers).

Research gaps: There is absence of data on the scope and implications of contract farming, very large-scale farming and community land ownership, as well as attitudes and drivers of behaviours within these approaches.

Policy issue: Orienting programming and communications towards the 'primary decision-maker' implicitly reinforces inclusivity barriers.

## 4. Land Manager Perspectives on Future Land Use

Until about 2010, studies of farmer attitudes and behaviour tended to emphasise orientations towards production and labour allocation, with more recent work emphasising environmental orientations. Research into environmental orientations tended to emphasise biodiversity and engagement in agri-environmental schemes, reflecting policy interest and funding.

Land manager attitudes towards climate change has had less exploration, primarily within the past decade. However, early evidence in the 2010s found that UK farmers (Barnes and Toma 2012, Burbi et al. 2016, Glenk et al. 2014) and private foresters (Lawrence and Marzano 2014) were unconvinced of the need to actively respond to climate change. This stems in part from lack of confidence in climate change predictions and more immediate concerns about the management of their holdings. A recent study by the University of Exeter<sup>2</sup> has found that although farmers are aware of climate change and have experienced it directly through extreme events, few have made changes to their practices. A number of farmers saw future weather and climate changes as too uncertain and long-term to justify investing significant time or money in making changes, particularly within a challenging economic environment. When steps were taken, these were primarily towards improving their business resilience and vulnerability to extreme weather, rather than climate action per se.

In this section, recent UK studies which largely describe relationships between attitudes and behaviours are presented. These studies consistently demonstrate that economic rationales feature in land management decision-making to various degrees, but that there are a range of other objectives and culturally embedded preferences and norms which also impact on land management decision-making. The studies also demonstrate that the connection between attitudes and behaviours is often tenuous for a variety of reasons (i.e. attitudinal change does not necessarily lead to behaviour change).

### 4.1 Demographic Trends

The demographics of land managers are usually included amongst broader lists of characteristics which co-relate to different land management attitudes and behaviours. A number of quantitative and qualitative studies in the UK have demonstrated that land managers who are younger and better educated tend to express stronger environmental values and/or environmental behaviours (Sutherland et al. 2016). This is particularly evident in

---

<sup>2</sup> [https://www.exeter.ac.uk/news/research/title\\_857812\\_en.html](https://www.exeter.ac.uk/news/research/title_857812_en.html)

establishment or conversion to organic farming (Lobley et al. 2009; Läpple and van Rensburg 2011). People with less experience (i.e. *ex novo* new entrants) are more likely to establish organic farms. This reflects ideological reasons for entering the sector and practical realities associated with the cost of initiating a financially viable farm: new entrants need to develop high value products on limited acreages in order to achieve profitability. However, older farmers typically make more extensive use of their holdings, scaling down as a form of semi-retirement, which may also have environmental benefits (Munton 2009).

A review in 2015 found that the largest cohort of Scottish farmers is over 64 years of age<sup>3</sup>. Early retirement schemes are an option for promoting generational renewal, but their success has been debated. European research by Bika (2007) demonstrated that schemes facilitated succession, but that succession may have occurred at the same pace in any case. Research by Ingram and Kirwan (2011) in the UK found that joint ventures (which facilitate retirement through establishing joint businesses with new farmers) were only successful where there was a pre-established relationship. Defra is currently implementing a new early retirement scheme in England<sup>4</sup>.

New entrants to farming have recently emerged as a major topic in European agricultural policy, which a number of studies and activities oriented towards assessing the impact and utility of new entrant supports (including an European Innovation Partnership Expert Focus Group coordinated by Sutherland and a review of new entrant supports for the European Parliament, which Hutton staff co-authored – Zagata et al. 2017). Although it is typically assumed that new entrants will increase the sustainability of agriculture by a number of metrics (i.e. social, economic and environmental) there has been limited research in this area. A report by Hopkins et al. (2020) on new entrants to Scottish agriculture supported this contention. Hopkins et al's analysis of the Farmer Intentions Survey demonstrated also that new entrants (who have not inherited land) are not necessarily young, but are more likely to identify themselves as business people or hobbyists<sup>5</sup> than long-established farmers, suggesting more diverse management practices.

The stronger environmental values apparent in younger farmers may be a reflection of growing up during a period when agri-environmental issues and measures were well publicised and part of public discourse. Older farmers observed first hand the dramatic increases in productivity resulting from intensification and input use in the 1960s and 1970s, with the associated

---

<sup>3</sup> <https://www.fas.scot/faq/age-structure-scottish-farming/>

<sup>4</sup> <https://www.bbc.co.uk/news/science-environment-57149744>

<sup>5</sup> Of the sample population, 39% of new entrants considered themselves to be farmers, and 10% identified themselves as crofters.

agenda of achieving food security; they are often resistant to taking a 'backwards step' away from these approaches (Sutherland, 2011).

There is some suggestion in the literature that female-led farms may be more environmentally oriented, although this may reflect the tendency of these farms to be non-commercial in orientation. A comparison of male and female led farms conducted in Scotland demonstrated that intention to increase environmental activity was not statistically different between male and female farmers (Hopkins et al. 2021).

### **A note on up-take of innovations**

It is well established in the literature that some farmers are more innovative than others. Rogers' (2010) seminal 'diffusion of innovations approach', initially published in the 1960s, distinguishes five cohorts along a bell curve of adoption: pioneers (innovators), early adopters, early majority, late majority and laggards. Innovators take the greatest risks, but often fail – it is the early adopters who are seen as leaders by their peers and are often influential on them. Rogers' approach has a number of problems (for example, not all innovations are necessarily beneficial or adopted at the same rate, it doesn't take into account a holding's resources or co-innovation processes, land managers may fall into different categories at different points in the lifecycle and for different types of innovation) but is useful for recognising how innovations can be approached differently by different people. In particular, early adopters are important opinion leaders, heavily influencing and often acting as formal or informal advisors to later adopters. However, targeting potential opinion leaders for support can be seen as discriminatory against land managers who need the most assistance to innovate. Roger's distinction of innovators, and early versus late adopters is still commonly referenced in relation to contemporary innovation processes.

## **4.2 Behavioural and Psychological Factors**

Dessart et al. (2019) conducted a European review of behavioural factors in farmers' decisions to voluntarily adopt environmentally sustainable practices (e.g. conservation tillage, crop rotation, reduction of input use, organic farming, growing cover crops). They use the term 'behavioural' synonymously with 'psychological', identifying dispositional (e.g. personality factors such as extroversion, resistance to change and risk tolerance); social factors (particularly social norms); and cognitive factors (including knowledge, self-efficacy, and costs and benefits). They noted statistical differences between all three types of factors and up-take of environmental measures. However, these dispositional characteristics in particular are difficult to change.

Environmental concern is more malleable, reflecting emotional connection to nature and the avoidance of guilt associated with environmental action. Dessart et al. (2019) demonstrate that the literature on farmers' behaviour consistently shows that adopting sustainable practices is negatively correlated with economic objectives, and positively correlated with lifestyle and conservation objectives, although they also cite Australian literature which found that most farmers embrace both conservation and economic objectives to varying degrees (Gosling and Williams 2010). Dessart et al. also identified a number of potential policy options for addressing behavioural issues.

### **4.3 The Role of Education**

Scotland's Curriculum for Excellence Scotland's is world-leading in integrating sustainable development, global citizenship and outdoor learning, through its cross-curricular Learning For Sustainability approach. A recent review for Scottish Government demonstrated that there is considerable evidence that education on sustainable development leads to pro-environmental attitudinal shifts, although this was not a primary focus of the study (Christie and Higgins 2020). This connection between education and attitudes is also the principle underpinning UNESCO's Education for Sustainable Development and Global Citizenship initiative. However, the relationship between education and behaviour change is more complex. There are a variety of constraints and influences on behaviour beyond education, which are explored in this present review.

In addition, the extent to which land management issues feature in the Scottish curricula is an issue warranting further exploration. This topic was not explicitly explored in this review, but a review conducted in the H2020 NEWBIE project (by the authors of this review) suggests that topical focus on agriculture is limited. That is, there may be an opportunity to increase the content relating to land management within the Learning for Sustainability approach, which can influence attitudinal shifts. There is often a stigma associated with agricultural education at secondary school level, based in part on an impression of farming by educators as a manual-labour based profession. Young people who are not farming backgrounds are therefore largely disconnected from contemporary land management practices, and those who have high academic potential are actively or passively discouraged from pursuing agriculture-related professions by the educational system. These young people are an important resource for the future of the land use sector. Broader education on agricultural practices as they relate to the environment and climate change are important for influencing public opinions, which will also inform future land management practices.

There are also a substantial array of ongoing professional development for land managers (e.g. monitor farm programmes, courses offered by LANTRA, NGOs, charities, farming and crofting groups). Environmental sustainability actions are being addressed in a recent monitor farm in the Lothians<sup>6</sup>.

#### **4.4 Cultural Approaches: Identity as a ‘good farmer’**

Land managers almost ubiquitously identify themselves as environmental stewards. This is particularly true for farmers (Wheeler et al. 2018). This positioning is a part of a broader culturally embedded rhetoric where farmers in particular see themselves as stewards of their land: working on and taking care of their holdings is part of what it is to identify and be recognised as a ‘good farmer’. Land-based businesses in general tend to be multi-generational, and oriented towards protecting their resources for future generations.

The academic conceptualisation of ‘good farming’ is grounded in empirical research in the UK, first published by Rob Burton (then of the Macaulay Institute) in 2004. He argued that the cultural norm of being a ‘good farmer’ was socially reproduced in farming households and communities across generations, resulting in a cultural impetus to produce symbols of good farming. These symbols demonstrated skilled role performance (e.g. regular crop height and density, high yields, and the tidiness of the farm). In his 2004 paper he demonstrated that farmers were therefore resistant to afforestation (i.e. his respondents expressed a mantra that ‘farmers are not foresters’). In later work (Burton et al. 2008, 2011) demonstrated that farmers are similarly resistant to agri-environmental scheme participation, because of the cultural cost associated with producing (what look to farmers to be) ‘fields full of weeds’.

Burton’s research has been highly cited and led to a body of research into the development and contemporary evolution of what it means to be a good farmer in a range of contexts, particularly the UK (Burton et al. 2021). A number of papers have demonstrated that although farming culture is durable, depressed commodity prices and opportunities associated with more environmental practices (including conversion to organic farming – Sutherland 2013, and participation in Environmental Stewardship Schemes, Cusworth 2020) have led to changes in the social standards farmers have for each other. Widespread participation in agri-environmental schemes has led to their normalisation within farming contexts; farmers come to see agri-environmental engagement as a viable land use, and include it in their business planning (Sutherland 2010). However, Thomas et al. (2019) found that in the case of

---

<sup>6</sup> <https://www.qmscotland.co.uk/news/environmental-sustainability-highlighted-new-lothians-monitor-farm-video>



riparian zones in particular, farmers continue to restrict environmental actions to a designated section of the farm – rivers in particular lead to ‘untidy farming’ which remains unappealing. Changes to marginal areas of the farm do not constitute whole farm transition.

The good farming literature as a whole demonstrates the role of production of visible changes to the farming environment to shifting farming norms. Farmers who have perceived the environmental benefits of agri-environmental measures are more likely to plan to engage in them in future (Sutherland et al. 2017). Payments by results approaches discussed in Section 6.2 thus offer the opportunity for farmers to learn to produce and value environmental goods.

Research into ‘good farming’ has been applied across a range of commodity types, demonstrating that there are similarities across contexts in preferred farming symbols (e.g. healthy animals, tidy holdings, straight tram-lines), but differ in relation the specific commodities being produced. Research in Scotland has been applied primarily within the beef and sheep sectors (Burton 2004; Burton et al 2008), but also to crofting on the west coast (Sutherland and Calo 2020). Sutherland’s (2013) work on ‘good farming’ was conducted in England with organic dairy and mixed holdings; Riley’s (2016) work was undertaken in the Peak District. The good farmer concept has been applied outside of agriculture (e.g. to fishing, Gustavsson et al. 2017), but has not had a similar application within forestry or other land use sectors. Although the ‘good farmer’ has been well explored in relation to environmental action and behaviour, specific applications to climate change have not yet been developed.

#### **4.5 From Multifunctional Transitions to Ecosystem Services**

Research on land management decision-making in the 1990s and into the present century employed terms like ‘post-productivism’ and ‘multifunctionality’ to express the shift from understanding of rural land primarily as a productive resource (largely for food production), to recognising the multiple (sometimes competing) functions of land, particularly environmental protection and public amenity. European policy discourses particularly emphasised the need for transformation in the understanding of farming as production-oriented, towards a wider range of outputs. However, there was considerable academic literature questioning whether this policy transition led to changes in farming practice (Marsden and Sonnino 2008).

In the early 2010s, the term ecosystem services became more prominent in these discourses. Ecosystem service thinking increased focus on encouraging farmers to view nature as one of their assets to manage for resilient businesses. It requires farmers to consider their holdings in the round,

moving away from traditional single-focus environmental conservation. However, as most farmers view themselves as stewards of the environment already, it is difficult to have traction with this concept – it tends to be more appealing to the non-farming actors in the system (e.g. investors, regulators, nature conservation NGOs) (see Blackstock et al. 2020). Martin-Ortega and Waylen (2018) found that within the UK, there was confusion about what payments for ecosystem services actually meant, and to what extent it involved leveraging private investment, or simply using rural development (CAP pillar 2) funding in different ways. Ecosystem service approaches position climate change actions as financial opportunities (e.g. through carbon markets or reducing risk in supply chains) but have had limited development within the UK to date. The potential of ‘payments for ecosystem services’ are further discussed in Section 6.3.

#### **4.6 Types of Land Manager**

Typology development is a popular segmentation tool, intended to enable design of interventions and policies which are tailored to the identified subpopulations. Land manager perspectives on the environment and climate change are well recognised as diverse (i.e. comprising a range of attitudes and behaviours). This diversity is often presented in the form of typologies of land manager types, in order to identify cohorts with similar attitudes and behaviours. These studies typically utilise quantitative or mixed methods approaches which facilitate the statistical identification of clusters. These typologies tend to be sector specific (e.g. typologies of farmers, or of foresters), and to focus on commercial businesses. Sutherland et al.’s (2011) typology of land managers in Scotland aimed to cross this spectrum, identifying: ecological land stewards, economic land stewards, multi-functionalists, community stewards and ‘other’. The article was based on the Scottish Government’s Rural Land Use Study, commissioned in 2009. As could be expected given the types described, participants identified a range of economic, ecological and social objectives for the land use decision-making. The study was also unusual in including public, private and charitable land managers.

Sutherland et al.’s (2011) typology was consistent with sector specific typologies in identifying types primarily characterised by economic, environmental and social attitudes and approaches. The strong emphasis on ‘community stewardship’ may reflect the service that land managers believe they are providing the public by operating land-based businesses. This framing is the typical justification for agricultural subsidies, and strongly promoted by subsidy recipients. The study demonstrated that economics are important to decision-making but that there are multiple drivers. The high percentage of ‘other’ land management approaches amongst horticulturalists and hobby farmers reflects how distinctive these types are from the more

commonly studied farmers and foresters, in terms of their land management decision-making.

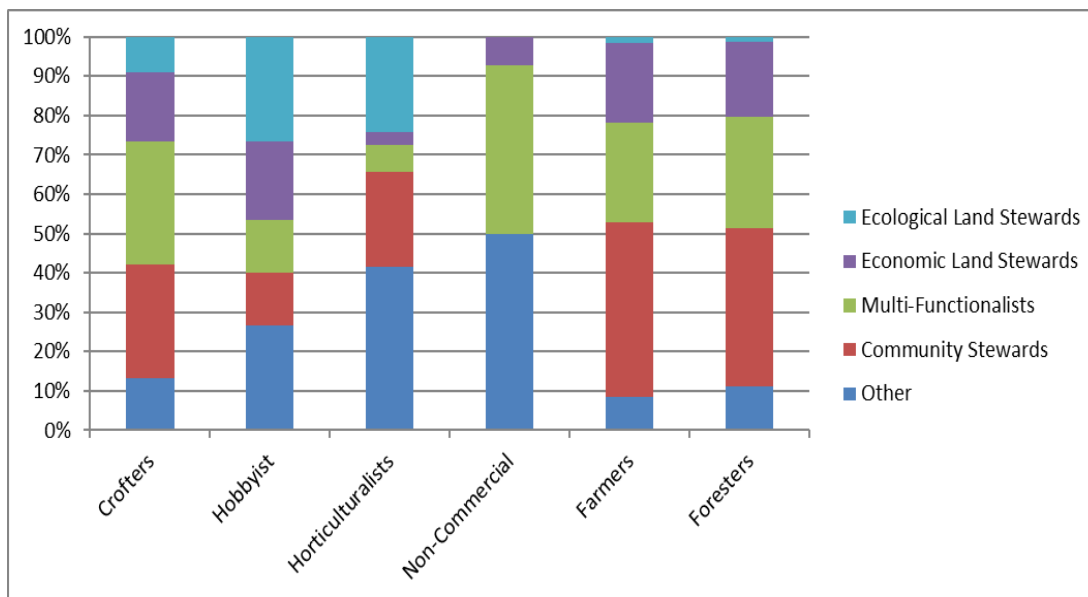


Figure 1: Example of distribution of types across land use actors. Source: Sutherland et al. 2011.

#### 4.6a Farmer typologies

Farmer typologies in the 1990s tended to emphasise differences in labour allocations (e.g. part-time farming and farm diversification). In this century, typologies reflect academic and policy interest in environmental behaviour. Andrew Barnes of Scotland's Rural College has led a number of analyses utilising typology development, particularly in relation to environmental practices and climate change. Barnes et al. (2011) identified a typology of farmer responses to nitrate vulnerable zones, identifying Resistors, Apathists and Multifunctionalists. In a study of Scottish dairy farmers, Barnes and Toma (2012) identified six distinct outlooks about the impact of climate change in the future: Relational Skeptics (12%), Commercial Ecologists (15%), Innovators (16%), Disengaged (23%), Negativist (22%), and Positivist (12%) (Figure 2 below).

Of these types, half believed that climate change would negatively impact on them in the future, but only one – the innovators – saw climate change requiring a change to their management planning. Barnes and Toma speculated that climate change may be too large an issue for an individual farmer to address. They made a critical distinction between impacts at farm level – which farmers would be motivated to address – and farmers' perceived role in mitigating climate change more broadly through changes to practice.

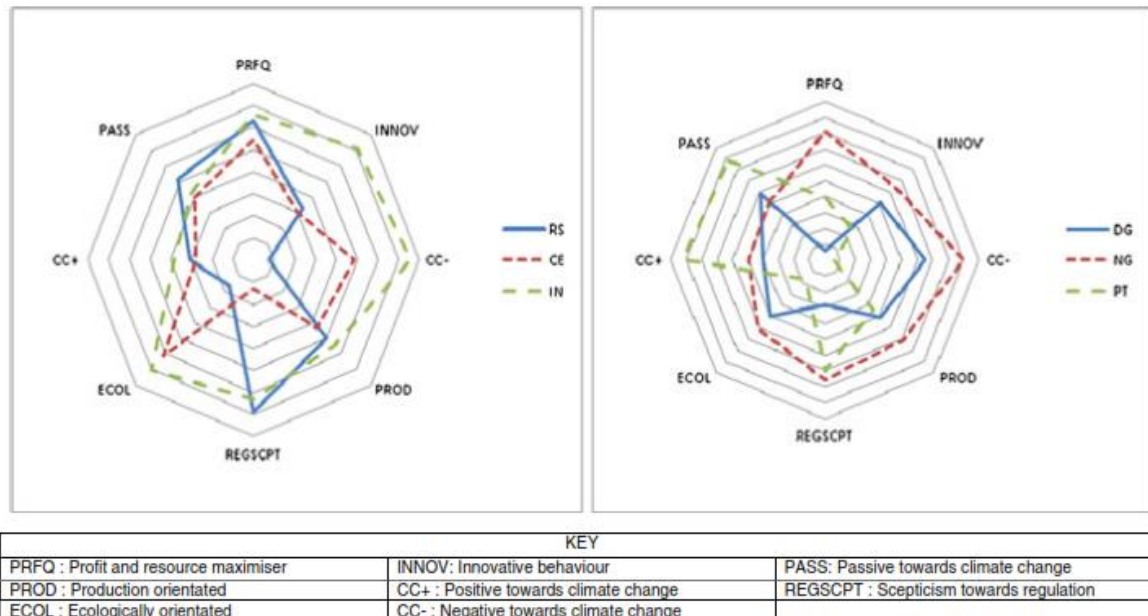


Figure 2: Example of mean factor loading and cohort differences between the six types (three on each radial graph) Source: Barnes and Toma 2012

Raymond et al. (2016) developed a farmer typology in England, specifically addressing how farmers engage in environmental actions. They identified four approaches: emphasis on wildlife protection and restoration; emphasis on primary production assets (e.g. soils), the farmer as conservationist and an instrumentalist frame focused on the financial benefits of agri-environmental scheme participation. Their typology identified the multiple motivations farmers have for engaging in agri-environmental schemes. They also demonstrate that many farmers enjoy seeing biodiversity on their holdings.

Most farmer typologies are dependent on reported behaviour. Guillem, Barnes et al. (2011) took the unusual step of matching survey respondents to census findings, in order to connect how farmers perceive their environment to actual behaviours. Based on a survey of 46 farmers, they distinguished profit-oriented, multifunctionalist, traditionalist and hobby farmers. Despite these distinctions, they found that attitudes were inconsistent with actual behaviour. Although farmers may express environmental ideals, external factors such as subsidy levels and commodity prices were found to have stronger influence on their strategies. This is consistent with literature from outside of the UK suggesting that farmer identities are multiple and layered (Farmer Bowers and Lane 2009): farmers may identify themselves as environmental stewards, but the economic requirements of maintaining a commercially viable farm or meeting household needs may outweigh these concerns in practice.

Within agricultural typologies, a category of 'hobby' farmer is often identified. Hobby farmers are often seen as environmental stewards because they do not need to achieve a profit from their land holding (e.g. Guillem, Barnes et al.

2012). Sutherland et al. (2019) identified a typology of non-commercial farmers in Scotland, distinguishing types largely on the basis of holding size and diversification activities. The relevance to climate change is that these non-commercial farmers were estimated to occupy 13% of Scotland's agricultural land. Sutherland's further qualitative research (2019) has demonstrated that non-commercial farmers are frequently disconnected from agricultural advisory services, and do not tend to engage in agri-environmental schemes or receive subsidies. She also found cases of *de facto* land abandonment. A European study has demonstrated that low farm stability and viability, as well as regional context can also drive land abandonment (Terres et al. 2015).

#### **4.6b Forester typologies**

In Scotland, some 38.4% of woodland area is public forest estate, with slightly more (39.8%) classified as 'private personal', and 10.7% operated by private businesses (companies, partnerships and syndicates)<sup>7</sup>. The remainder is owned by private forestry or timber businesses, charities and other public groups (each with less than 5%). A UK typology by Raum (2018), identified distinctions in orientation based on tenure type: she found that private estates tend to emphasise new income streams, whereas the forest industry emphasises softwood timber production, and conservation NGOs seek to improve biodiversity. Brown (2020) pointed out that these widely differing objectives leads to considerable conflict within the forestry sector. Most studies focus on private owners (Ambrose-Oji et al. 2018).

Ambrose-Oji et al. (2018)'s review demonstrated that there has been an emphasis within the forestry literature on differentiating types of land manager. Like the farming typologies, this work is grounded in the assumption that effective development of policy tools and communication strategies should target particular cohorts. Ambrose-Oji et al. identified a remarkable degree of similarity in the types identified, situating these on a spectrum from productivist/revenue oriented, conservation and ecological orientation, to multifunctional or amenity focused. Ficto et al. (2017) specifically conducted a review of European private forest owner typologies, identifying 66 typologies across 28 countries. They identified the most frequently recognised types as: multi-objective owners, recreationists, investors, farmers, indifferent owners, conservationists, multifunctional owners and self-employed owners.

Of the European typologies identified by Ambrose-Oji et al., only one was based in the UK – Urquhart and Courtney 2011. Julie Urquhart, Paul Courtney and Bill Slee (2010, 2012) published a series of papers in the early 2010s about the attitudes and behaviours of small-scale private woodland

---

<sup>7</sup> <https://www.gov.scot/publications/woodland-ownership-key-data/>

owners in England. They argued that there was an increasingly diverse cohort of non-financially oriented owners in England, many of whom had limited experience of forest management. Their typology included: the Individualist, the Multifunctional Owner, the Private Consumer, the Conservationist, the Investor and the Amenity Owner.

As a set, private forest managers tend to be more passive than agricultural land managers in how they manage their forests. Small-scale woodland owners in particular do not tend to be motivated by economic benefits, and are therefore less amenable to management grants. Many woodland managers believe that non-intervention is the best form of management (Lawrence and Dandy 2014), although Glynn et al. 2012 noted that 94% of England's woodland owners reported undertaking management in some form. The lack of a register of private forest owners in the UK has constrained studies of motivation and behaviour (Lawrence and Dandy 2014).

#### **4.7 Future Intentions and Land Use Scenarios**

The characterisation of land managers described throughout Section 4 is largely undertaken in an effort to explain past actions, with a view to predicting or influencing future behaviours. Longitudinal research is unusual in this subject area. In the 2010s, two successive large-scale surveys of agricultural land managers in Scotland were undertaken through the RESAS Strategic Research Programmes, enabling comparisons to be made of anticipated and actual future behaviour. Recent analysis of the two surveys has demonstrated that farmers are fairly accurate in predicting their future actions (Hopkins et al. 2021), although the majority predicted limited changes. The Farmer Intentions surveys of 2013 and 2018 addressed a range of land management decisions and farming pathways. Of particular relevance to this review:

- Both surveys demonstrated the broad intention of farmers to increase their agri-environmental actions in future.
- Analysis of the 2013 survey, undertaken by Sutherland et al. (2017), demonstrated a link between agri-environmental scheme engagement, afforestation and diversification into renewable energy production. They argued that agri-environmental scheme engagement was an important stepping stone towards further environmental activity on-farm.
- Analysis of farm forestry in the 2013 study by Hopkins et al. (2017) demonstrated the path dependency of forest expansion: they found that farmers with forests were by far the most likely to plan to expand their forestry. This suggests that easiest gains for afforestation are on holdings with forests, but that establishment of forests on holdings where there have never been forests is a critical stepping stone to broader afforestation.

- Analysis of the 2018 survey (Barnes et al. under review), similarly found that intentions to increase agro-forestry and on-farm renewable energy generation were most common amongst farmers who were already engaged in those activities. They also found that succession planning, the level of agricultural diversification and risk seeking perceptions had significant influence on planned forestry and renewable energy expansion.
- Analysis of the 2018 survey also demonstrated the value of new entrants to the industry; in particular, that they are typically more innovative and globally engaged than existing farmers and their successors (Hopkins et al. 2020).
- Analysis of the 2018 survey demonstrated that farmers were finding it difficult to plan for changes associated with Brexit, owing to the associated uncertainties in markets, subsidies and regulations (see Appendix B).

The Farmer Intentions survey contains core questions, and subsets of questions on specific topics which are integrated depending on policy demand. The 2013 survey emphasised farm diversification and agri-environmental engagement, whereas the 2018 survey emphasised new entrants to farming and global engagement. Core questions include a list of land uses which farmers plan to increase or decrease in the next five years, including agri-environmental scheme engagement, forestry, and renewable energy production. Optional questions are negotiated directly with policy officers at RESAS; biofuel production and peatland restoration could be added to this list in 2023.

Visioning processes are also employed to identify transition pathways towards a sustainable future. Valluri-Nitsch et al. (2019) interviewed 20 Scottish land use sector stakeholders, finding that there was general agreement on the importance of the environment; desire for society to be more engaged and aware about land use; for more partnerships, dialogue and collaboration; and to meet climate change targets. The most notable differences were in land ownership and governance, with very diverse perspectives on whether there should be any change to land ownership structures or involvement of the public in land use decision-making.

## 5. Approaches to Influencing Land Use Change

### 5.1 Path Dependency and Room for Manoeuvre

It is well established within the academic literature that land-based businesses tend to follow a steady trajectory, that is, to be 'path dependent'. This reflects the characteristics of land-based production. Most of the commodities produced on land take months or years to reach the market, during which time market trends can shift. In addition, contemporary commercial farms typically involve considerable investment in land, infrastructure and equipment to support the production of specific commodities (i.e. 'sunk costs') which can be lost in the transition to new commodity production. Agricultural commodity markets are recognised as fluctuating over time, typically rebounding at some point. Farmers have learned that it is more pragmatic to stay the course than to risk 'chopping and changing' (Sutherland et al. 2012b). Agricultural commodity production is also embedded in the skills and knowledge associated with production, and the identity of farmers (e.g. as skilled producers of particular commodities), similarly yielding inertia to the sector. Lock-in can also be institutional and political (e.g. agricultural subsidies and regulatory frameworks can encourage or discourage particular directions of travel) (Waylen et al. 2015).

Private forestry is similarly path dependent, in large part because of the length of time it takes for newly planted trees to reach maturity. In addition, non-management of forests is often seen to be the best course of action by private woodland owners (Lawrence and Dandy 2014). Private forest owners in the UK are frequently non-commercial in their orientation, acquiring forests for amenity and other reasons, and are therefore unlikely to be impacted upon by changing timber and forest product markets, and may be oblivious to government incentive programmes.

Path dependency thus reflects the 'room for manoeuvre' of their holding. Larger holdings are typically recognised as having a greater range of opportunities open to them, in part because of the assets they have available to them (Wilson 2008). Larger farmers are more likely to be able to afford in diversification activities, for example, whereas smaller-scale farms are more likely to invest labour off-farm to address financial issues. Major transitions are restricted by land managers' 'room for manoeuvre': for example, land capability, potential markets, and the financial and other resources available to the land manager. Supply chain actors, such as supermarkets and suppliers can strongly incentivise or restrict transition processes through their procurement standards and processes.

Legal and policy conditions also influence path dependencies. For example, agricultural land is subject to reduced business tax rates, and inheritance tax concessions. Farmers will therefore be hesitant to undertake activities which



jeopardise these favourable tax conditions. This is a particular issue for enabling new entrants to join the agricultural sector: farmers are reluctant to tenant their land for fear of losing access to agricultural subsidies. Research within the Women in Agriculture Task force found that knowledge of tax laws was variable amongst farmers and often erroneous (e.g. the belief that there were tax benefits if the senior farmer to retain ownership until his or her death). This approach can delay investment in holding development and the pursuit of innovative actions for decades prior to this event.

In this section, we review literature which addresses how this path dependency can be worked with or overcome.

## 5.2 Triggering Change in Decision-Making

Sutherland et al. (2012a) developed a conceptualisation of ‘triggering change’ in farmer decision-making, based on a series of UK research studies on agri-environmental behaviour, which demonstrated the change in farming trajectories resulting from major events. These events ranged from disease outbreaks to farm successors joining the business to successive years of unprofitable farming. The model is currently being further developed through the H2020 [AgriLink project](#), which is assessing the role of agricultural advice in on-farm innovation processes across Europe.

The Triggering Change Model featured as a primary approach in the AHDB review of Farmer’s Decision-making behaviour (Rose et al. 2018). The Triggering Change Model is based on social psychology theory, particularly Petty and Cacioppo’s Elaboration Likelihood Model (ELM). The ELM posits that most decisions are made automatically, with very little active reflection. These decisions tend to lead to minor shifts in behaviour, which are informed by peer groups and the actions or advice of respected others. Major changes to behaviour occur more rarely but are accompanied by active processing of alternatives – individuals actively weigh up their options and seek new knowledge to address particular problems, needs or opportunities. If an identified behavioural shift appears to have potential, the decision-maker begins the process of testing and implementing the new opportunity. Businesses are particularly vulnerable during this time, as new investments in infrastructure and knowledge are being made. If the alteration is successful, the new behaviour becomes path dependent, that is, part of standard practice. If it is unsuccessful in some respect, then it is modified or other options evaluated. Recent research by Sutherland (under review) suggests that for innovations which are rapidly changing (particularly digital innovations), farmers may engage in co-construction of innovations during this implementation stage.

## Up-dated Triggering Change Model

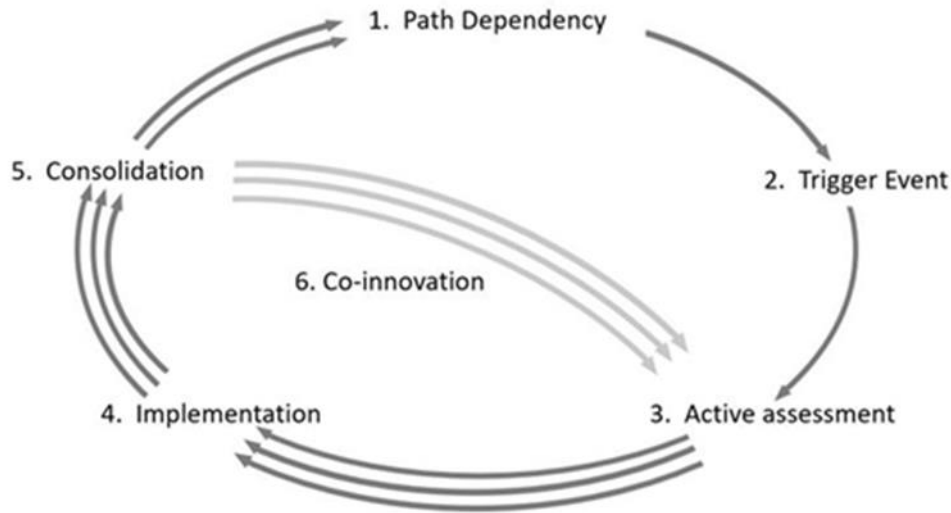


Figure 3: Up-dated Triggering Change Model Source: Sutherland (author)

The implications of the Triggering Change model are that there are specific windows of opportunity for influencing behaviour. For example, some of the respondents in the Triggering Change paper converted to organic farming following the BSE outbreak in the UK: the incident made them question how they were feeding and treating their livestock. Others had experienced low milk prices for a period of time and sought a premium price for their product. Unfortunately, this coincided with the introduction of organic conversion subsidies in England, which subsequently depressed organic milk prices. In relation to environment and climate actions, land managers who are seeking to enrol a successor can be expected to actively consider options to expand the business. Renewable energy production in particular can be undertaken as a means of 'future proofing the farm', to increase farm income to support an additional household (Sutherland and Holstead 2014). Policy initiatives could usefully increase incentives during periods of widespread unrest in the agricultural sector (e.g. when major changes to agricultural subsidy structures are being introduced) or in the wake of low commodity prices or disease outbreaks.

### **How does new knowledge influence land manager behaviour?**

The Triggering Change Model was developed in part to address 'information deficit' assumptions about influencing land manager behaviour. It is often assumed that land managers make poor or undesirable decisions because of lack of information. While lack of information about alternatives can contribute to lock-in, research has consistently demonstrated that this is seldom the dominant cause. Most land managers have numerous opportunities to gain new knowledge on a range of topics through agricultural shows and events, newspapers, social media, the internet and organisations (e.g. Scottish Land & Estates, the National Farmers Union of Scotland, Tenant Farmers' Forum, Scottish Crofting Federation). Social psychology has demonstrated that most information received is not actively processed, and therefore seldom leads to a major change in behaviour. The decision-maker needs to be motivated to actively consider and act on the information available. Ensuring that land managers have good information on which to plan is important, but new information is likely to have much greater impact after a trigger event has occurred. Land managers also need to be able to act on that information, that is, to have the resources (e.g. funding, labour, skills and peer support) to integrate that new knowledge into their business plans.

### **5.3 Planning to Make Changes**

Rose et al.'s 2018 review of farmer decision-making identified the Theory of Planned Behaviour as one of the most popular conceptual approaches for understanding change processes within the agricultural sector. Within Scotland, it has been applied to up-take of agri-environmental measures (Sutherland 2010) and on-farm renewable energy production (Sutherland and Holstead 2014). The Theory of Planned Behaviour is underpinned by similar academic concepts as the Triggering Change Model. Both approaches emphasise that major changes are planned and made consciously, that is, they involve active consideration and evaluation of options by the decision-maker(s).

The Theory of Planned Behaviour identifies three primary sets of factors which condition the intention to make a change: attitudes towards a behaviour, perceived social norms and perceived behavioural control. Attitudes reflect what a decision-maker hopes could be achieved (or not) through the new behaviour. Social norms comprise what the decision-maker believes that other people will think of the behaviour. Perceived behavioural control is the decision-maker's perception of their own ability to implement the behaviour and achieve the desired effect. In Sutherland and Holstead (2014)'s

Aberdeenshire study, for example, farmers were generally positive towards renewable energy production, but the potential negative responses of neighbours (i.e. social norms) and the difficulties and costs associated with gaining planning permission and access to the grid made many of them unwilling to pursue wind energy installations. Only medium to large-scale farms had the resources to risk direct investment in a wind turbine. To successfully encourage up-take, all three of these factors must be addressed.

## 5.4 The Role of Advice

Land managers have access to a wide range of sources of information and advice on decision-making. This includes advisory services, farming organisations, NGOs, industry professionals (e.g. veterinarians), financial services, regulators and researchers, which often collaborate to encourage innovation (e.g. Scotland's monitor farms programmes). Recent digital transformations (particularly social media and the internet) have enabled land managers to access a wide range of knowledge across geographical boundaries.

Research sponsored by Forest Research found that lack of information and advice is a major barrier to decision-making for private foresters<sup>8</sup>. Trusted and influential sources of advice include: other woodland owners, forestry agents and consultants, organisations such as Royal Forestry Society, the Forestry Commission and Forest Research. Advice and information on dealing with climate change is difficult to access and apply – the report finds that owners and managers find advice confusing or inappropriate for small-scale holdings.

The James Hutton Institute has led and contributed case studies to a number of European funded projects on advice and farmer learning (FP7 PRO AKIS, H2020 PLAID, H2020 NEFERTITI, H2020 AgriLink). Recent research in the H2020 PROAKIS project demonstrated that farmers draw on different sources of information for different topics (Sutherland et al. 2017). Provision of advice on how to access government subsidies, particularly agri-environmental funding, is a primary activity of agricultural advisory services across the UK. However, there are also a range of other advisors associated with conservancy trusts, charities and national park authorities. Information on production and new technologies tends to be led by the producers of associated technologies, as these companies are typically the experts in their innovation's use and implementation. Sutherland et al.'s (2017) study of the knowledge networks of newcomers to crofting demonstrated that they tend to rely on farming neighbours and peers for production advice, and Highlands and Islands enterprise for diversification advice, approaching agricultural

---

<sup>8</sup> <https://www.forestresearch.gov.uk/documents/7124/FCRN036.pdf>

advisory organisations primarily to facilitate access to subsidy funding (including agri-environmental scheme applications).

Research by Prager et al. (2016) in PROAKIS demonstrated that the privatisation of agricultural advice in the UK and throughout Europe has privileged affluent clients (i.e. larger or more intensive farms). Key informants in the linked Sutherland et al. (2017) study estimated that less than half of crofters access agricultural advice. There is evidence from across Europe that small-scale farmers have been disadvantaged by the privatisation of advisory services, because larger farms are more lucrative customers for private service provision (Labarthe and Laurent 2012).

Privatisation of advice in Europe has raised questions about the trust of farmers in different sources. Research by Sutherland et al (2013b) found that advisors build up trust with farmers over time; although input suppliers may be reliant on customer sales, many inputs are purchased on an annual basis, giving an impetus for suppliers to offer sound advice and associated service. Farmers may be less likely to trust advisors from environmental NGOs, which may be perceived as privileging environmental agendas over the needs of the farm.

Research from the AgriLink project also demonstrated that sources of information also differ in relation to when the innovation is taken up. Pioneers tend to have few sources of knowledge, and draw on sources which may be geographically distant. Local agricultural advisory services rarely have access to this type of information, but are more important for later adopters, once the information is more commonplace and adopters are seeking independent sources of local advice.

The H2020 PLAID project focused on peer-to-peer learning processes, particularly through on-farm demonstration. The project developed the first good practice guidelines for on-farm demonstration, but demonstrated that on-farm demonstrations primarily tend to be attended by men (Sutherland et al. 2020). The PLAID project developed a novel 'virtual demonstration' approach, which has been further developed during the covid-19 pandemic. On-line approaches enable more egalitarian participation in demonstration and training events (for land managers with good internet access), removing barriers caused by geographical distance and the time required to travel.

The PLAID project identified the important role of agricultural advisors in bringing together diverse actors within the land management sector to exchange information (e.g. through monitor farm programming). The project also demonstrated the importance of agricultural education for producing a culture of 'lifelong learning' in the agricultural sector.

Major changes to land management in Scotland will involve a cultural shift. An important entry point is the educational system. Review of educational curricula in the H2020 NEWBIE project suggested that training in agri-environmental management remains minimal at secondary and post-secondary levels. Many farmers undertake agricultural education; educational achievement in general is correlated with positive environmental attitudes. A review of educational curricula (at secondary and post-secondary levels) is beyond the scope of this review, but embedding scientific and practical knowledge around responses to the biodiversity crisis and climate emergency will be critical to addressing these topics.

## 5.5 The Role of Private Sector Actors

Some of the strongest influences on land manager behavioural are industry actors, who have a direct influence on the financial options open to land-based businesses. Supply chain actors, particularly supermarkets and processors, can have an enormous impact on practices at holding level through their procurement practices. For example, work by Barlagne (2019) on the Scottish potato sector demonstrated that supermarkets and processors strongly restrict the new variety of potatoes which can be produced. Processors and supermarkets set the acceptable sizes, appearance and volume of produce, which farmers must then achieve. Their marketing strategies influence consumer demands. The need to conform to these standards inevitably influences how the associated land is managed. To date, there has been limited investigation of the role of these supply chain actors in relation to these types of actions.

## 5.6 Nudges: Incentivising Incremental Shifts

The UK Government's Nudge Unit was established in 2010 to apply behavioural science to public policy. Nudge-based approaches seek to influence the architecture of choices – to make desirable choices easy, attractive, social and timely ([‘EAST’](#) - Service et al, undated). To date, the Nudge Unit has addressed environmental behaviours broadly (e.g. reducing food waste by removing trays from cafeterias so that customers limit purchases; increasing recycling by introducing large numbers of colourful containers which are easy to locate and use). In this section we describe the basic EAST nudge principles with examples of how these could be applied in the land use sector.

EAST in application to land management change.

- Making a behaviour easy involves make it the default action, reducing the hassle factor and simplifying messages. Automatic enrolment in agri-environmental measures, reducing the transaction costs of

participation and simplifying the terms and conditions would fit this criterion.

- Making behavioural changes attractive draws attention to them. Signposting successful agri-environmental activities can draw community attention to these actions. Current financial rewards of agri-environmental action tend to be calculated to offset the costs of participation; different reward structures could be successful but less expensive (e.g. lotteries). Sutherland et al. (2016) found that seeing the positive environmental impacts of agri-environmental scheme engagement was more strongly co-related to planned agri-environmental action than positive environmental attitudes, suggesting that making these outcomes more visible or understandable to farmers could be influential.
- Making new behaviours social includes showing that most people perform the desired behaviour, fostering network development to facilitate collective action and encouraging people to make a commitment to others. Scotland is already working with peer-to-peer learning through the monitor farm programme. England has introduced collaborative agri-environmental measures, which have the double benefit of encouraging collective action and the environmental gains of activities undertaken across multiple holdings.
- Making new behaviour timely means prompting people when they are likely to be most receptive, considering the immediate costs and benefits and helping people to plan their responses to events. The Triggering Change Model demonstrates the time periods during which land managers are more likely to make major changes<sup>9</sup>. Offering additional assistance with the immediate costs of change and help with planning at this time is likely to be particularly effective.

Reports from the Nudge Unit demonstrate that nudge approaches can be highly successful for enabling incremental shifts (e.g. increases in desired behaviours of 5 to 10%).

Barnes et al. (2013) utilised a form of nudge thinking to distinguish between 'nudges' and 'budes' for management of water quality. They defined nudges as non-regulatory and non-fiscal interventions, whereas budes were regulatory restrictions on actions (specifically Nitrate Vulnerable Zones). They found that farmers much preferred nudge approaches, but recognised that these voluntary changes engender some limitations, particularly if farmers do not see their actions on farm as influencing pollution levels. They argue for a

---

<sup>9</sup> Trigger events vary in frequency. Succession typically happens once with a generation. Extreme weather events similarly used to be rare but are increasing in frequency. Exit from the EU is likely to be a major trigger, influencing markets and subsidy structures.

mix of nudge and budge-based approaches. Both yielded incremental outcomes.

European research has been developing on ‘nudging’ farmers. Kuhfuss et al. (2016), in French research, found that ‘nudging’ farmers by conveying information on other farmers’ environmental practices appeared successful as a means of maintaining long-term benefits of agri-environmental schemes. Chabé-Ferret et al. (2019) similarly found that providing farmers with weekly information on water consumption was effective at reducing the water consumption of farmers who irrigate the most, but appeared to have increased consumption for farmers who had not consumed water at all. Nudges – like all incentives – may not have the desired effect.

## 5.7 Climate Smart Agriculture Initiatives

The concept of ‘climate smart agriculture’ has gained considerable traction in recent years, as an approach to meeting both food security objectives under climate change. Recent reviews of this approach (Chandra et al. 2018; Totin et al. 2018) demonstrated that public investment has focused on knowledge infrastructure, market structures and technological developments. Very little attempt has been made to understand the drivers of up-take of these technologies and land management approaches. A European study by Long et al. (2016) considered the barriers to diffusion, which included low awareness of initiatives, high costs of technology and low return on investment, lack of verified impact and disconnection between research and practical application.

### **A note on post-pandemic Green Recovery**

Land managers, like many others in Scotland, have learned new skills during the movement restrictions associated with the Covid-19 pandemic. Land managers will have increased competencies in the use of digital platforms, social media and on-line meeting interfaces. A report conducted by McKee et al. (2021) found that these new on-line ways of working had been taken up rapidly within the agricultural sector, and had been particularly beneficial to women, who were more able to take up training events and participate in agricultural organisation meetings, because these were assessable from their homes. At the same time, movement restrictions impacted particularly severely on some forms of business diversification (particularly tourism). The combination of green recovery and new digital skills of rural land managers could be an important opportunity to mobilise environmental and climate change adaptation.

For more detail on covid-recovery as a trigger for change, see Appendix B.



## 6. Business Models

Governments frequently incentivise land managers to adopt sustainable practices. In the UK, these measures are typically financial and voluntary, and until recently administered in line with EU Rural Development Programming. The development of the UK's own measures post Brexit are an important opportunity to employ novel approaches. Recent UK research has demonstrated that participation in agri-environmental measures is now normalised as a standard part of UK farm business decision-making (Sutherland, 2010; Riley 2016; Wheeler 2018; Cusworth 2020), that is, it has become part of farmers' business models. Agri-environmental scheme engagement has both economic and environmental drivers, providing an additional source of income to farms. Organic farming in particular is often considered a form of farm diversification (Maye et al. 2009). There is an extensive literature on attitudes and behavioural drivers towards farm diversification which is not addressed in this review.

It is important to note that there are a number of issues important in the design of any agri-environmental intervention, which go beyond attitudes and drivers of behaviour (e.g. administrative structures, clarity of guidelines and objectives etc). In this section we summarise recent literature on relatively novel forms of compensation to land managers for their actions.

### 6.1 Farmer-led Climate Change Groups

[Farmer Led Groups](#) have been recently been established to develop advice and proposals to the Scottish Government on how to cut emissions and tackle climate change. Groups have been established to focus on the arable, dairy and high nature value (upland farming/crofting) sectors, with additional reports provided by the Scottish Pig Industry Leadership Group and the Suckler Beef Climate Programme Board. The reports of these groups reveal the attitudes of farmers implicitly, through recommendations for policy reform.

As a set, the reports advocate for addressing climate change objectives by increasing production efficiencies. Where subsidies are addressed, the reports strongly prefer that agricultural subsidies should be oriented towards agricultural activity. The [Dairy Report](#) demonstrated some support for agroforestry, whereas the [Hill, Upland and Crofting Group](#) in particular were strongly opposed to any form of subsidy for afforestation, or production of crops for biofuel or other non-food products. Renewable energy was also a particular topic of the [Pig Industry Report](#), which emphasised opportunities for turning waste into a resource. The reports reflect culturally embedded orientation of most farmers towards producing agricultural commodities.

## 6.2 Payments by Results

Agri-environmental actions have traditionally been compensated largely through financial rewards for actions taken (e.g. for installing hedgerows, field margins, flower meadows, etc). Recently some academics have argued for 'payment by results', which makes payments conditional on the delivery of outcomes. Research has clearly demonstrated that farmers often fail to see the value in the actions required by agri-environmental measures, and are therefore less likely to participate (Sutherland et al. 2016). A major criticism of traditional schemes has been that farmers are primarily motivated by the associated financial incentives; resultant environmental behaviour is thus temporary (Mills et al. 2017; Wheeler et al. 2018).

The case for results-based payments follows a logic that farmers in particular are motivated to produce: payment by results would incentivise them to adopt the right conditions for producing desired outcomes (Burton et al. 2008). 'Payment by results' offers higher flexibility for farmers, utilises their specialist knowledge of their farms, and actively engages them with the objective of the measures. The direct link to the desired result can also be easily communicated to the public (Burton and Schwarz 2013), and is expected to link to farmer learning: farmer learn how to intentionally produce desired outcomes, leading the durable behaviour change. However, these models are higher risk to farmers (e.g. of failure to produce the desired results, Sutherland and Darnhofer 2012) and are expensive to adequately monitor.

Herzon et al. (2018) in their European review of results-based approaches argued that these are most likely to be successful in maintaining existing habitats (i.e. because farmers already have management experience) rather than re-creating new habitats. This reliance on farmer expertise to produce biodiversity similarly means that associated indicators should be perceived as measurable and achievable. Challenges include high transaction costs, but Herzon et al. also cited European research which has utilised alternative mechanisms such as competitive bidding for production of outcomes, as an alternative to traditional approaches.

## 6.3 Payments for Ecosystem Services (PES) and Natural Capital Accounting

Payments for Ecosystem Services encompass a wide range of approaches which broadly seek to utilise a range of funding sources to incentivise provision of public goods. These approaches are oriented towards bridging the gap between public funding and the funds needed to address contemporary environmental challenges. A [paper under review](#) by Reed et al. compares private ecosystem markets at national and subnational scales in the UK, Germany, Switzerland and the Netherlands. UK markets reviewed included: the Woodland Carbon Code (WCC), Landscape Enterprise

Networks (LENs), Habitat Banking (HB), the proposed Natural Infrastructure Scheme (NIS), Nature-Climate Bond (NCB), Natural Capital Pioneer Fund (NCPF), Habitat Banking (HB) and the Blue Impact Fund (BIF). These schemes were entirely voluntary. Reed et al. classified the approaches in to three general categories:

- national carbon markets which sell climate change benefits or offsets
- regional ecosystem markets, which enable buyers to manage environmental risks (e.g. water quality, biodiversity)
- green finance – which enable investors to invest in ecosystem outcomes, typically with rates of return which are lower than for conventional investments

Payments for ecosystem services thus provide alternative payment schemes to land managers. A study of by Schroeder et al. (2013) in England found that the majority of farmers were positive about these schemes (which had not yet been introduced). Limitations included the complexities of negotiating and maintaining the agreements, and of defining and ensuring outcomes. Brokers and intermediaries are highly important for facilitating these approaches. Valluri-Nitsch et al. (2019) found that payments for ecosystem services were popular with private and public sector study participants, but NGO sector representatives emphasised that sound environmental management should not require additional rewards.

Coyne et al. (2021) analysed the responses of farmers who had engaged in a privately funded agri-environmental scheme. Milk producers in northern England were required to engage in specific environmental activities in order to gain an enhanced milk price. Study participants were generally positive about the scheme because of its simplicity (lack of bureaucracy) and compatibility with farming activities, values and norms. However, Coyne et al. questioned the extent to which the limited changes to farmer behaviour achieved through the scheme led to environmental benefits.

Recent discourse has included a shift towards Natural Capital Accounting approaches. These approaches encourage farmers to view nature as one of their assets to manage for resilient businesses. It requires farmers to consider their holdings in the round, moving away from traditional single-focus environmental conservation. However, as most farmers already view themselves as stewards of the environment, it is difficult to have traction with this concept. The concept tends to be more appealing to the non-farming actors in the system (e.g. investors, regulators, nature conservation NGOs) (see Blackstock et al. 2020).

## 6.4 Partnership Working

Numerous ecological studies have demonstrated that agri-environmental measures are more likely to be effective at landscape scale, that is, beyond the scale of individual land holdings, to match the spatial scale of priority habitats, water systems and landscape features (Westerink et al. 2017; Prager et al. 2012). These actions require an additional level of coordination and trust between farmers. An article by Westerink et al. (2017) included a Scottish case study which demonstrated that external facilitators are typically involved, in order to mobilise and coordinate farmer collaboration. The paper as a whole demonstrated the opportunities and challenges of this broader level coordination. A particular issue is that land holders may not want to collaborate with their immediate neighbours for a variety of reasons, including lack of trust. Sutherland and Burton (2011) found that farmers were more likely to collaborate with neighbours they saw as 'good farmers', but that not all neighbours fit this category. Sutherland et al. (2012b) similarly identified the perceived trustworthiness of neighbours as a limiting factor to agri-environmental collaboration.

Research on partnership working from 2003 onwards in Scotland (Marshall et al. 2010; Waylen et al. 2020) suggests that voluntary partnerships tend to exist where collaboration is expected to achieve improved outcomes. However, there is limited evidence on whether partnerships actually improve outcomes, partly due to a lack of metrics to enable such an evaluation. There is a substantial body of literature into land manager collaboration more broadly, which demonstrates that as farms and associated infrastructure have become more capital intensive, many traditionally informal labour exchange collaborations have been formalised (e.g. through machinery rings, Flanagan et al. 2016). The formal mediation offered through machinery rings both enabled wider collaboration, and to protect the remaining informal relationships (e.g. emergency assistance).

Collaborative action at community level is often understood as 'social innovation' – new social practices – which can advance sustainable development. These approaches can be particularly effective in marginalised rural areas and disadvantaged communities, which often struggle with biophysical limits, market imperfections and shortages of public funding (Nijnik et al. 2019). For example, there is a community ownership-based management of local woodlands in Lochcarron, Scotland, which responds to social needs by creating opportunities for local employment, housing, skills enhancement, and cultural heritage (Barlagne et al. 2019; Nijnik et al. 2019). Community land ownership could similarly be considered a social innovation. Social innovations can introduce (temporary or long-term) changes affecting communities and the territory where they are initiated (and can have spill-out effects) (Kluvankova et al. 2021).

Studies of upland and catchment collaboration (MacLeod et al., 2020) also highlight the need to understand social relationships and the importance of having an explicit coordinating organisation or individual to manage and sustain collaboration.

## **6.5 Considerations for Regional Land Use Partnership Pilots**

The Scottish Government has recently introduced five new Regional Land Use Partnership pilots. Regional Land Use Partnership pilots have been established in order to enable regional and local engagement in land use decision-making and action, integrate the planning of the delivery of multiple objectives, ultimately achieving greater transparency, accountability, efficiency and impact (Scottish Land Commission 2020). The recommendations made to ministers about implementing these partnerships stressed the importance of these groups having roles in making decisions on priorities and resourcing, connecting directly to levers of funding and finance.

There is an inherent tension between the objectives and perceived autonomy of landowners and the inclusion of other actors in decision-making processes around land use. Landowners in particular are very keen to retain ownership of their land, and have concerns about sharing authority over decision-making with other actors. For example, recent reductions to tenancy availability in Scotland are directly attributable to landowner fear of future tenant 'right to buy'. Many large-scale landowners are seeking to secure their ownership rights by replacing tenancies with contract farming, an unintended response to Scottish Government's Land Reform Agenda. Research by Blackstock et al. (2017) on the Cairngorm National Park Plan found that it took considerable time to establish the legitimacy and authority of non-land owning actors in decision-making processes. Blackstock et al.'s work distinguished between 'rational-legal', 'charismatic' and 'ideological' authority (various forms of power and ability to persuade land manager to make particular decisions), noting the challenges of aiming to influence through ideology while simultaneously wielding legal authority. Owing to lock-in of land uses described earlier, it may take considerable time for rural land managers to understand and support these new partnership approaches.

## **6.6 Quantifying the Design of Contracts**

Research in experimental economics seeks to quantify the relationships between interventions and outcomes. Specific 'treatments' are designed to test how participants would respond to particular subsidies or regulations. Experimental approaches are widely used in developing countries, but seldom in Europe and rarely in the United Kingdom. The James Hutton Institute has recently invested in an experimental research methods lab which will enable economists to undertake these experiments.

This type of experimental research is very important for ensuring the design of effective policy instruments. At present, many of these studies are conducted in laboratories with students. A large research gap is to be able to use these approaches with farmers themselves to be able to (i) measure farmers' "behavioural" characteristics for a better understanding of their decision-making process when it comes to the adoption of pro-environmental practices and (ii) test ex ante alternative policy designs. Experiments could be either seen as a "screening" stage ahead of pilots (e.g. lab in the field) and/or embedded in pilots for future policies (e.g. including randomized control trials in the pilot stage). These experiments are particularly important for supporting new actions with which land managers do not have experience (e.g. peatland restoration programs).

Experimental economics research from Europe demonstrates that the framing of interventions is important to up-take, for example, whether farmers perceive themselves as part of the problem or solution, the voluntary or regulatory nature of the action, and the extent to which incentives are perceived as gaining or averting losses. For example, the Sutherland (2010) found that farmers in her Scottish study pursued Land Management Contracts through a sense of entitlement; these had been introduced with the Single Farm Payment and framed as a means of averting subsidy losses. Through Land Management Contracts involving targeted environmental actions, farmers could 'take back' subsidies which they would otherwise lose, a very different dynamic to competitive agri-environmental schemes. Thomas et al. (2019) tested different framings of agri-environmental policies with a sample of farmers in Germany. They found that simple compensation of costs made farmers indifferent to adopting a sustainable practice; other factors then influenced farmer choices. Interestingly, they found that negative framing (i.e. farmer behaviour as a problem than needed correction) increased responsiveness, although farmers who experienced a 'warm glow' from pro-environmental behaviour responded better to a positive framing. In all cases, the intervention was more effective than no intervention at all.

## **6.7 Quantifying the Outcome of Interventions**

To date, most measures of the success of agri-environmental schemes and approaches have emphasised the up-take of those measures and their successful administration. Very little research has quantified the outcomes of these approaches in terms of environmental gains. This is an important research gap.

Reed et al. (2014) argued for the importance of going beyond scheme participation to include changes in practices. They particularly identified the Welsh Government's Glastir programme. The current Welsh Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP) collects data

across the Welsh landscape and links any changes to their impacts on a wide range of benefits including their economic consequences. For example, the final 2017 GMEP report included results from a structured survey of 600 farms which indicated that farms participating in Glastir reported a net 9% reduction in manufactured nitrogen and phosphate fertiliser use on grassland fields on scheme entry. Other indicators related to actions taken (e.g. fencing off streams, establishing buffer strips or expanding woodlands). The scheme involves provision of both information and financial support.

Both ERAMMP and GMEP have been delivered through a diverse partnership of research organisations (e.g. UK Centre for Ecology & Hydrology (UKCEH), National Parks, Welsh Government departments e.g. Public Health Wales, and private consultancies e.g. Ricardo. This is seen as quite positive for enabling establishment of viable targets and achieving collective action. Enabling land managers to observe the impacts of their actions on the environment is also important for motivating long-term behaviours (as discussed in Section 6.2

## 7. Issues for Specific Land Uses

Three specific topics were identified for targeted exploration in this evidence review: peatland restoration, woodland expansion and biofuel production.

### 7.1 Peatland Restoration

SNH (2015 in Brown 2020) estimated that 80% of Scottish peatland is degraded. Although the literature search identified 187 articles and reports addressing peatland restoration and conservation, only six addressed attitudes and drivers of behaviour, and these were primarily in relation to the general public. In addition, attitudes towards peatland restoration were not the primary topic. Iain Brown's (2020) journal article addressed peatland restoration within the context of afforestation, focusing on differential up-take. Consistent with the broader literature on path dependency in the land management sector, he demonstrated that both peatland restoration and new woodlands tend to aggregate in particular locales, regardless of the biophysical properties of those areas. Particularly notable was the lack of peatland restoration sites in the Western Isles despite extensive peatland degradation. Peatland restoration in general is more likely at lower elevations in comparison to peatland distribution, which suggests that accessibility and costs of restoration are playing a role in restoration processes. He advocated for a spatially targeted approach.

Peatland restoration ranked fifth (of 27) of preferred climate change mitigation practices by stakeholders at workshops in North East Scotland (Feliciano et al. 2014). Key barriers to climate action more broadly included transaction costs, financial and physical constraints (e.g. farmer age and holding size), lack of information and interference with other regulations.

Glenk and Martin-Ortega (2018) noted that peatland restoration represents a financial cost to private land managers. They tested the willingness to pay for peatland restoration by almost 600 UK study respondents, estimating the social (non-market) benefits of peatland restoration utilising a choice experiment (i.e. not land managers *per se*). They found that preferences for peatland restoration were highly spatial, with stronger preferences for restoring the 'heart' (central) areas of peatland, and peatland which like to subsequently remain undisturbed. However, they also observed considerable heterogeneity in public perceptions. Recent work by Byg et al. (2017) demonstrated the ambivalence of many members of the public to peatland restoration. This reflected intersecting and sometimes competing understandings of peatland biophysical characteristics, history, trade-offs between different uses and their own personal experiences, rather than lack of knowledge.



## 7.2 Woodland Expansion

It is only since the 1990s that public objectives for forestry in Scotland have shifted from predominantly production-oriented towards more multi-functional uses which include biodiversity conservation and public recreation (Nijnik and Mather 2008). Rates of afforestation are higher in Scotland than elsewhere in the UK, but rates have slowed in recent years. Slee et al. (2014) identified the challenges of the 'squeezed middle' – the intermediate zone between prime agricultural land and uncultivated uplands. This is land for which there are multiple (often competing) policy objectives. The resultant path of least resistance is for afforestation to occur on marginal land (Brown 2020), which may have limited carbon sequestration benefits (Matthews et al. 2020).

As described in Section 4.6b, the ownership of UK forests is highly diverse, including the Forestry Commission, commercial foresters, environmental organisations, and amenity owners. There is similarly a wide range of drivers. Nijnik et al. (2016) identified and explained this diversity, showing that despite the attitudinal heterogeneity, all of the stakeholder groups had a strong preference for native woodland regeneration and improvement of aesthetic values of woodlands, but differed concerning afforestation. For example, the 'productivist' orientation supported expansion of plantation forestry, both as a commercial provider of timber and as a source of employment in rural areas. In contrast, recreationists emphasise the aesthetic values of landscapes and how these can be accessed. Conservationists intrinsically value nature, preferring native woodland regeneration. These distinctions also relate to land holding types, with private estates emphasising income streams, the forest industry emphasising softwood timber production, and conservation NGOs focusing on biodiversity value (Raum 2018). As could be expected, individuals working within the forestry sector or identified as forest stakeholders were largely in favour of woodland expansion.

Attitudinal distinctions also relate to land holding types, with private estates emphasising income streams, the forest industry emphasising softwood timber production, and conservation NGOs focusing on biodiversity value (Raum 2018). The species mix of the associated forests is thus diverse and contested, and can have unanticipated implications for carbon sequestration (Matthews et al. 2020). Collaborative studies at the James Hutton Institute and Forest Research have demonstrated that choosing appropriate tree species and locations are important considerations for tree planting (e.g. afforestation with relatively fast-growing tree species like Sitka spruce on low grade agricultural land may be cost effective and societally acceptable options of land use change, Nijnik et al. 2008; Moseley et al. 2014). Therefore, a particular challenge for afforestation is placing 'the right tree in the right place' (Munoz-Rojas et al. 2015).

Bowditch et al. (2018) engaged with estate owners in the highlands and islands of Scotland to assess approaches to resilience, which included options for woodland expansion. They found that although woodlands were common on these estates, less than 10% of land was perceived as being open to change. Estate land managers in the study pointed to the lack of knowledge about forestry on their estates and low levels of collaboration between estates, which limited opportunities for afforestation and the development of forestry-based diversification activities.

The studies carried out at the James Hutton Institute have shown public support for woodland expansion but poor uptake of afforestation by landowners (Nijnik et al. 2010). Afforestation changes land use long term; research by Wynne-Jones et al. (2013) in Wales demonstrated that both farmers and their successors need to be convinced of the business case. Research into woodland expansion has demonstrated that tree planting is most likely to occur on holdings where there are already trees present; landholders who have afforested in past are similarly more likely to afforest in future (Hopkins et al. 2017). Brown (2020) demonstrated that afforestation tends to occur in clusters, regardless of the biophysical characteristics of the area. Land tenure has historically been a barrier to afforestation (tenants unable to afforest without landowner permission), along with economics, management, and administration of land conversion (Towers et al. 2006). Scottish farmers often have moral belief that agricultural land should be utilised to produce food (Feliciano et al. 2014). Thus, social, and psychological factors are a cause of farmers' reluctance to plant trees.

A recent UK study has found that familiarity with agroforestry has increased substantially in the past 10 years. A study by the Organic Research Association found that whereas few farmers had heard of agroforestry a decade ago, most are now familiar with the term. They identified the top 10 factors influencing UK farmers in adopting agroforestry:

- Lack of conceptual understanding and knowledge of agroforestry (top factor)
- Grants, subsidy, funding opportunities for agroforestry or lack thereof (tied second)
- Lack of practical understanding and knowledge of agroforestry (tied second)
- Establishments costs (tied third)
- Capital investment requirements (tied third)
- Management and maintenance costs (tied third)
- Reduced profitability and loss of yield (tied third)
- Lack of economic understanding of agroforestry (tied third)
- Access to case studies and demo farms (tied third)

- Clashes with existing agricultural processes and activities (tied third)

Source: <https://www.gov.scot/publications/woodland-ownership-key-data/>

Most of these factors are either financial/economic or knowledge-based: farmers are concerned about the long terms costs of agroforestry and the availability of subsidies and they do not feel they know enough about agroforestry to implement an agroforestry system.

Some scholars argue that Scotland has a weakly developed forest culture (Mather et al. 2006) and that it is likely that “hobby” farmers and those not using land for their primary source of livelihood may exhibit a greater propensity to plant trees (Nijnik et al. 2010). However, amenity foresters – that is, most of the small-scale private forest owners in the UK – are not very responsive to economic incentives to alter the management of their forests, often believing that non-management is the best option. This is grounded in a belief that forests are inherently ‘natural’ and therefore do not require managing; active management of forests can provide a wide range of benefits, such as timber production, protection of biodiversity, and reduction of fire risk. Feliciano et al. (2014) found that lack of incentives is not the primary barrier to climate change actions in private forestry. Sutherland and Huttunan (2018) found that farmers would willingly plant small pieces of forest in order to provide drainage or shelter for livestock. This may be a pathway to encourage farmers who have never planted trees to do so for the first time, breaking their path dependency.

### **7.3 Biofuels**

Specific issues surrounding attitudes and drivers of behaviour in relation to biofuel production have had limited specific exploration in the academic and grey literatures. The Scopus search identified two papers by Glithero et al. in 2012/ 2013, which addressed barriers and incentives for bioethanol and miscanthus production. They found that farmers were largely motivated by profitability and ease of production, but were concerned by issues surrounding the morality of utilising agricultural land to produce energy crops, and limits to knowledge of the new commodities. A more recent study by Townsend et al. (2018) on straw use, found that some survey respondents were strongly opposed to the use of wheat straw for bioenergy for ethical reasons.

### **7.4 Regional Differences**

The literature review found no systematic academic assessments of regional differences relating to attitudes and behavioural drivers of climate change action within Scotland. However, differences in natural constraint, patterns of land tenure and cultural affiliations with particular practices can be expected to impact on land use transitions, as described in previous sections. It is well

recognised that there are 'less favoured areas' in Scotland, which have been designated in part to facilitate the provision of targeted supports to enable provision of public goods. These areas tend to be located in remote regions (e.g. the highlands and islands). Land-based businesses in these regions, tend to be less financially viable, but these vulnerabilities can be overcome by clear succession planning and tenancy arrangements (Barnes et al. 2020)

## 7.5 Commodity Production Differences

In general, the literature on attitudes and drivers of behaviours in relation to climate change does not tend to differentiate by commodity produced, beyond distinctions between agriculture and forestry. Although there are occasional papers focusing on producers of particular commodities within sectors (e.g. dairy farmers, crop farmers) none of the papers reviewed identified differential responses on this basis. However, Scottish Government's Farmer-led Climate Change Groups demonstrate some sectoral distinctions in desirable interventions. For example, the Dairy Sector group saw potential for agroforestry, whereas the Hill, Upland and Crofting Group opposed any non-agricultural application of subsidy funds. These reports did not specifically address attitudes or drivers of behaviour, so have not been reviewed in depth for this report.

There are also a number of studies which have been conducted on specific interventions which are suited to particular commodity producers (e.g. shifting from traditional to minimum or no till options in the arable sector). A study by Alskaf et al. (2020) in England, found that tillage became less common with increasing farm size. They argued for better information supports, both about low tillage practice and potential pesticide use, particularly for smaller scale farmers. Opportunities to control soil erosion and reducing energy expenditures were found to be important drivers in a European study ([ORC Bulletin, 2014](#)). Findings imply that climate actions taken are more likely to be driven by financial benefits and environmental protection, than attitudes towards climate change *per se*.

## 8. Policy Recommendations and Research Gaps

### 8.1 Policy Recommendations

Policy priorities are presented in the Executive Summary. This section offers a fuller, unprioritized list of potential policy actions.

- Policies and approaches should aim at ‘trigger points’ (e.g. farm succession, major subsidy changes, post-Covid Green Recovery) to facilitate major transitions and durable changes to land use.
- Subsidy levers are well accepted approaches, but not all sectors in Scotland’s land use sector have traditionally received subsidies. Sectors which have relied heavily on subsidies in the past will respond differently than sectors which are new to subsidies.
- Younger land managers tend to be more environmentally oriented; farms with successors are more likely to invest in renewable energy production. Policies and approaches which facilitate generational renewal (e.g. new entrant supports) and succession planning are therefore likely to have positive environmental benefits. A report on option for increasing land access to new entrants – a major barrier – was produced by McKee et al. (2018).
- ‘Nudge approaches’ make it easy and attractive (low risk, high reward) to take up agri-environmental schemes and renewable energy production. Making environmental actions a default option for subsidy recipients is an option. Less traditional nudges (e.g. lotteries, peer-based social media campaigns) may also be effective. Nudge approaches have not been specifically developed in relation to land management changes, so require elaboration and testing.
- The role of advisors and peer-based knowledge networks will be essential to the transmission of knowledge and opportunities within and between land manager networks. The establishment of trust and legitimacy with individual organisations over time has greater impact on the influence of those organisations, than the type of organisation (e.g. planning authority, advisory service, NGO).
- Locales which are already pursuing desired actions (e.g. woodland expansion, renewable energy production) are the ‘easy wins’ for ongoing increases. Land managers in these areas are most likely to expand their actions.
- Policy levers should not be solely aimed at land managers. Supply and value chain actors (e.g. processors, supermarkets) are increasingly

important influencers on land management choices (e.g. through procurement standards).

- Embedding environmental science and practices within educational curricula is an important stepping-stone for cultural transitions to land management in Scotland. This includes secondary and post-secondary levels agricultural and environmental education.
- Approaches are needed to make climate change action meaningful short term. Climate change action often focusses on longer term planning that will resonate with some land-based choices (forestry, built infrastructure) more than businesses focussed on annual or short-term business plans.
- Climate action will be influenced by a range of policies, not only agricultural and forestry policies. These other policies include regional spatial strategies, protected area designations, energy, tourism/recreation and food policies, which need to be consistent with each other to achieve effective outcomes.
- The limited evidence on peatland attitudes suggests that the public – and potentially land managers – are highly ambivalent to peatland restoration. Efforts need to be made to increase public and land manager consciousness of the benefits of peatland restoration.
- The Learning for Sustainability Agenda appears to be a positive step. Embedding environmental science and practices within educational curricula is an important stepping-stone for cultural transitions to land management in Scotland. However, connections to behaviour change are not direct and require further study. Reconsideration of how land-based businesses are included within secondary curricula may warrant consideration.
- The new Regional Land Use Partnership pilots may find it challenging to influence change on privately owned land. They may benefit from coaching to establish their legitimacy and good working relationships with the array of stakeholders with whom they engage. They may have the most impact working with land-based businesses which are experiencing triggers (particularly succession/retirement).
- Payment by results approaches can enable farmers to recognise the environmental benefits they are producing, thus gradually teaching them the value of ‘untidy’ spaces within their holdings.
- Private finance options are most likely to be successful in achieving incremental shifts, as they are new mechanisms (i.e. unfamiliar to land managers, requiring time to establish credibility and trust). Once well established, they may be able to support more radical transitions.

- Land managers will also respond to broader societal shifts (e.g. changing diets and consumption patterns, expectations around land access and provision of public goods etc). These can be shaped by government messaging around land use and where long-term investments are made

## 8.2 Research Gaps

This review has identified a number of topic areas for further research. Priorities are presented in the Executive Summary. This section offers a fuller description, organised by general subject area.

### Underpinning knowledge of the land management sector

- identification and assessment of the scope of non-traditional land management arrangements (e.g. 'contract farming', large business management, community land management) is required to more accurately identify who is making decisions about land management, and therefore what drives their behaviours
- finalisation of the Land Registry of Scotland would assist researchers in sampling land managers and gaining a wider perspective. At present, registries (e.g. the agricultural census) include only agricultural land holders.

### Understanding attitudes and behavioural drivers

- There is very little knowledge of behavioural drivers of peatland restoration. Research focuses on cost benefit analysis and attitudes of the general public and industry stakeholders. Targeted research into land manager attitudes and behaviours is required to identify potential levers.
- The Farmer Intentions Surveys run by the James Hutton Institute and Scotland's Rural College address farmers' attitudes towards and plans to make specific changes to their management practices. Continuing these surveys into 2023 and 2028, and specifically investigating desired behaviours (e.g. peatland restoration, biofuel production, woodland expansion) will identify areas where intervention is particularly needed or most likely to have impact.
- Current methods emphasise one decision-maker per holding; this approach marginalises the voices of women and young people in research processes, reifying inequalities within the land management sector. New methods need to be developed to include multiple decision-makers on the same holding in the research process.

## Influencing Behaviour

- Trigger events lead to major changes in land use trajectory. Some are industry wide but hard to predict (e.g. disease outbreaks, commodity price slumps); others are more predictable (e.g. retirement, succession) but specific to individual households. Research is needed to design flexible interventions which can be mobilised to offer supports at these critical trigger points.
- Identification and testing of specific mechanisms and incentives for major transition in land holding trajectory (e.g. payments by results) is needed. This should include quantification of how land managers will respond to specific interventions (e.g. experimental economics). Non-subsidy incentives should also be developed.
- Targeted research to develop novel approaches to ‘hard to reach’ land managers
  - land managers who have never planted to trees and/or engaged in agri-environmental measures
  - land managers who are not accustomed to subsidy supports and/or are not financially motivated (e.g. non-commercial farmers, amenity foresters), who manage up to 20% of Scotland’s land
- Much of the social research seeks to explain (rather than enable change in) land manager behaviour, for example identifying underlying personal, cultural or social dispositions and understandings which temper rational economic responses. Farmers often see themselves as ‘environmental stewards’ but resist many environmental actions – how can ‘good farmer’ identity be mobilised to enable a cultural shift towards climate action?
- Nudge thinking is an approach which makes it easier or the default action to take environmental action. Research is needed to develop specific applications for the land use sector.
- Further research is needed into private finance mechanisms to support land management transitions (e.g. payment for ecosystem services). There is some evidence of an appetite for these types of arrangements, but little research on their effective functioning or wider influence on land manager attitudes.
- Research has shown that land managers are more likely to engage in environmental activities if they have seen the environmental benefits of past efforts. Action research is needed to enrol land managers in experiential learning about and understanding the environmental impacts of their actions, and the options for biodiversity production.



This research would inform design of approaches to better engage and enrol land managers in long-term behaviour change.

### Measuring outcomes

- It is still very difficult to connect changes in land manager practices to environmental outcomes – most environmental monitoring focusses on changes in environmental state, whereas most agri-environmental monitoring focusses on practices, using different resolutions, time series and monitoring criteria. The move towards payment by results and [pilots](#) by Scottish Government are seeking to reduce this mismatch. More interdisciplinary research is needed which directly connects changes in land manager practices to environmental outcomes. This is important for underpinning ‘payments by results’ approaches, and return on investment for ‘payment for ecosystem services’ investors.

## References

- Alskaf, K., Sparkes, D.L., Mooney, S.J., Sjögersten, S., Wilson, P., 2020. The uptake of different tillage practices in England. *Soil Use and Management* 36, 27-44.
- Ambrose-Oji, B., Robinson, J., O'Brien, L., 2018. Influencing behaviour for resilient treescapes: Rapid Evidence Assessment. *Forest Research*, Farnham, p. 43.
- Barlagne, C. 2019. Challenges and opportunities brought about by genetic diversity in the Scottish Potato Sector. Report for RESAS WP2.3.2 Protecting Genetic Diversity.  
[https://www.hutton.ac.uk/sites/default/files/files/research/srp2016-21/rd232outputs/WP232\\_DO3\\_3-2019-Challenges-and-opportunities-of-genetic-agrodiversity-in-the-potato-%20sector-Scotland-Final.pdf](https://www.hutton.ac.uk/sites/default/files/files/research/srp2016-21/rd232outputs/WP232_DO3_3-2019-Challenges-and-opportunities-of-genetic-agrodiversity-in-the-potato-%20sector-Scotland-Final.pdf)
- Barnes, A., McMillan, J., Sutherland, L.A., Hopkins, J., Thomson, S., under review. Farmer pathways for net zero carbon: exploring the lock-in effects of agro-forestry and renewables. *Land Use Policy*.
- Barnes, A., Sutherland, L.A., Toma, L., Matthews, K., Thomson, S., 2016. The effect of the Common Agricultural Policy reforms on intentionstowards food production: Evidence from livestock farmers. *Land Use Policy* 50, 548-558.
- Barnes, A.P., Thomson, S.G., Ferreira, J., 2020. Disadvantage and economic viability: characterising vulnerabilities and resilience in upland farming systems. *Land Use Policy* 96, 104698.
- Barnes, A.P., Toma, L., 2012. A typology of dairy farmer perceptions towards climate change. *Climatic Change* 112, 507-522.
- Barnes, A.P., Toma, L., Willock, J., Hall, C., 2013. Comparing a 'budge' to a 'nudge': Farmer responses to voluntary and compulsory compliance in a water quality management regime. *Journal of Rural Studies* 32, 448-459.
- Barnes, A.P., Willock, J., Hall, C., Toma, L., 2009. Farmer perspectives and practices regarding water pollution control programmes in Scotland. *Agricultural Water Management* 96, 1715-1722.
- Bika, Z., 2007. The territorial impact of the farmers' early retirement scheme. *Sociologia Ruralis* 47, 246-272.
- Blackstock, K., Calo, A., Currie, M., Dinnie, L., Eastwood, A., MacLeod, K., Matthews, K., McKee, A., Miller, D., Nijnik, M., Sutherland, L-An., Waylen, K. 2020. Issues arising from SLC's Interim Report on Regional Land Use Partnerships – Evidence from the Scottish Government Strategic Research Programme 2016-2021.

[https://www.landcommission.gov.scot/downloads/5fa124a24a0a1\\_Appendix%203.%20Research%20Review.%20James%20Hutton%20Institute.pdf](https://www.landcommission.gov.scot/downloads/5fa124a24a0a1_Appendix%203.%20Research%20Review.%20James%20Hutton%20Institute.pdf)

Blackstock, K.L., Dinnie, E., Dilley, R., 2017. Governing the Cairngorms National Park – Revisiting the neglected concept of authority. *Journal of Rural Studies* 52, 12-20.

Bowditch, E.A.D., McMorran, R., Bryce, R., Smith, M., 2019. Perception and partnership: Developing forest resilience on private estates. *Forest Policy and Economics* 99, 110-122.

Brown, I., 2020. Challenges in delivering climate change policy through land use targets for afforestation and peatland restoration. *Environmental Science & Policy* 107, 36-45.

Burbi, S., Baines, R.N., Conway, J.S., 2016. Achieving successful farmer engagement on greenhouse gas emission mitigation. *International Journal of Agricultural Sustainability* 14, 466-483.

Burton, R.J.F., 2004. Seeing through the 'good farmer's' eyes: Towards developing an understanding of the social symbolic value of 'productivist' behaviour. *Sociologia Ruralis* 44, 195-215.

Burton, R.J.F., Forney, J., Stock, P.V., Sutherland, L.-A., 2021. *The Good Farmer. Culture and identity in food and agriculture*. Routledge, London.

Burton, R.J.F., Kuczera, C., Schwarz, G., 2008. Exploring farmers' cultural resistance to voluntary agri-environmental schemes. *Sociologia Ruralis* 48, 16-37.

Burton, R.J.F., Paragahawewa, U.H., 2011. Creating culturally sustainable agri-environmental schemes. *Journal of Rural Studies* 27, 95-104.

Byg, A., Martin-Ortega, J., Glenk, K., Novo, P., 2017. Conservation in the face of ambivalent public perceptions – The case of peatlands as 'the good, the bad and the ugly'. *Biological Conservation* 206, 181-189.

Chabé-Ferret, S., Le Coent, P., Reynaud, A., Subervie, J., Lepercq, D., 2019. Can we nudge farmers into saving water? Evidence from a randomised experiment. *European Review of Agricultural Economics* 46, 393-416.

Chandra, A., McNamara, K.E., Dargusch, P., 2018. Climate-smart agriculture: perspectives and framings. *Climate Policy* 18, 526-541.

Christie, B., Higgins, P., 2020. *The Educational Outcomes of Learning for Sustainability: A Brief Review of Literature*. A report for the Scottish Government Learning Directorate, Scottish Government, p. 103.

- Coyne, L., Kendall, H., Hansda, R., Reed, M.S., Williams, D.J.L., 2021. Identifying economic and societal drivers of engagement in agri-environmental schemes for English dairy producers. *Land Use Policy* 101, 105174.
- Cusworth, G., 2020. Falling short of being the 'good farmer': Losses of social and cultural capital incurred through environmental mismanagement, and the long-term impacts agri-environment scheme participation. *Journal of Rural Studies* 75, 164-173.
- Dessart, F., Barreiro-Hurlé, J., van Bavel, R., 2019. Behavioural factors affecting the adoption of sustainable farming practices: a policy-oriented review. *European Review of Agricultural Economics* 46, 417-471.
- EIP Agri, 2016. EIP-Agri Focus Group: New Entrants into farming: Lessons to foster innovation and entrepreneurship. Final Report. European Commission, p. 40.
- Farmar-Bowers, Q., Lane, R., 2009. Understanding farmers' strategic decision-making processes and the implications for biodiversity conservation policy. *Journal of Environmental Management* 90, 1135-1144.
- Feliciano, D., Hunter, C., Slee, B., Smith, P., 2014. Climate change mitigation options in the rural land use sector: Stakeholders' perspectives on barriers, enablers and the role of policy in North East Scotland. *Environmental Science & Policy* 44, 26-38.
- Ficko, A., Lidestav, G., Ní Dhubháin, Á., Karppinen, H., Zivojinovic, I., Westin, K., 2019. European private forest owner typologies: A review of methods and use. *Forest Policy and Economics* 99, 21-31.
- Flanigan, S., Sutherland, L.-A., 2016. Buying Access to Social Capital? From Collaboration to Service Provision in an Agricultural Co-operative. *Sociologia Ruralis* 56, 471-490.
- Glenk, K., Eory, V., Colombo, S., Barnes, A., 2014. Adoption of greenhouse gas mitigation in agriculture: An analysis of dairy farmers' perceptions and adoption behaviour. *Ecological Economics* 108, 49-58.
- Glenk, K., Martin-Ortega, J., 2018. The economics of peatland restoration. *Journal of Environmental Economics and Policy* 7, 345-362.
- Glithero, N.J., Ramsden, S.J., Wilson, P., 2013. Barriers and incentives to the production of bioethanol from cereal straw: A farm business perspective. *Energy Policy* 59, 161-171.
- Glynn, M., Richardson, W., Anable, J., Quick, T., Rowcroft, P., Smith, S., 2012. Independent Panel on Forestry Woodland Owner Survey. Final Report to the Independent Panel on Forestry. URS, London.

- Gosling, E., Williams, K.J.H., 2010. Connectedness to nature, place attachment and conservation behaviour: Testing connectedness theory among farmers. *Journal of Environmental Psychology* 30, 298-304.
- Guillem, E.E., Barnes, A.P., Rounsevell, M.D.A., Renwick, A., 2012. Refining perception-based farmer typologies with the analysis of past census data. *Journal of Environmental Management* 110, 226-235.
- Gustavsson, M., Riley, M., Morrissey, K., Plater, A.J., 2017. Exploring the socio-cultural contexts of fishers and fishing: Developing the concept of the 'good fisher'. *Journal of Rural Studies* 50, 104-116.
- Herzon, I., Birge, T., Allen, B., Povellato, A., Vanni, F., Hart, K., Radley, G., Tucker, G., Keenleyside, C., Oppermann, R., Underwood, E., Poux, X., Beaufoy, G., Pražan, J., 2018. Time to look for evidence: Results-based approach to biodiversity conservation on farmland in Europe. *Land Use Policy* 71, 347-354.
- Hopkins, J., Sutherland, L.-A., Ehlers, M.-H., Matthews, K., Barnes, A., Toma, L., 2017. Scottish farmers' intentions to afforest land in the context of farm diversification. *Forest Policy and Economics* 78, 122-132.
- Hopkins, J.; Sutherland, L-A.; Calo, A.; Barlagne, C.; Wardell-Johnson, D.; Barnes, A.; Thomson, S.; McMillan, J.; Spencer, M. 2020. [New entrants: their potential contribution to farming in Scotland by 2023.](#), Farmer Intentions Survey Briefing Note, March 2020, 8pp.
- Hopkins, J.; Thomson, S.; Miller, D.G.; Sutherland, L-A.; Barlagne, C.; Wardell-Johnson, D.; Barnes, A.; McMillan, J. 2021. How often does intended farm management behaviour match 'actual' behaviour? Insights for thirteen farm activities (2013-18)., Farmer Intentions Survey Briefing Note, March 2021, 8pp.
- Ingram, J., Kirwan, J., 2011. Matching new entrants and retiring farmers through farm joint ventures: Insights from the fresh start initiative in Cornwall, UK. *Land Use Policy* 28, 917-927.
- Kluvankova, T., Nijnik, M., Spacek, M., Sarkki, S., Perlik, M., Lukesch, R., Melnykovich, M., Valero, D., Brnkalakova, S., 2021. Social Innovation for Sustainability Transformation and its Diverging Development Paths in Marginalised Rural Areas. *Sociologia Ruralis* n/a.
- Kuhfuss, L., Preget, R.I., Thoyer, S., Hanley, N., Coent, P.L., De'sole', a.M., 2016. Nudges, Social Norms, and Permanence in Agri-environmental Schemes. *Land Economics* 92, 641-655.

Labarthe, P., Laurent, C., 2013. Privatization of agricultural extension services in the EU: Towards a lack of adequate knowledge for small-scale farms? *Food Policy* 38, 240-252.

Läpple, D., Rensburg, T.V., 2011. Adoption of organic farming: Are there differences between early and late adoption? *Ecological Economics* 70, 1406-1414.

Lawrence, A., Dandy, N., 2014. Private landowners' approaches to planting and managing forests in the UK: What's the evidence? *Land Use Policy* 36, 351-360.

Lawrence, A., Marzano, M., 2014. Is the private forest sector adapting to climate change? A study of forest managers in north Wales. *Annals of Forest Science* 71, 291-300.

Lobley, M., Butler, A., Reed, M., 2009. The contribution of organic farming to rural development: An exploration of the socio-economic linkages of organic and non-organic farms in England. *Land Use Policy* 26, 723-735.

Long, T.B., Blok, V., Coninx, I., 2016. Barriers to the adoption and diffusion of technological innovations for climate-smart agriculture in Europe: evidence from the Netherlands, France, Switzerland and Italy. *Journal of Cleaner Production* 112, 9-21.

Macleod et al. 2020. Recommendations for landscape-level adaptive management for ecological, economic, and social outcomes: findings from five case studies. The James Hutton Institute. Report, 20 pages.

Marsden, T., Sonnino, R., 2008. Rural development and the regional state: Denying multifunctional agriculture in the UK. *Journal of Rural Studies* 24, 422-431.

Marshall, K., Blackstock, K.L., Dunglinson, J., 2010. A contextual framework for understanding good practice in integrated catchment management. *Journal of Environmental Planning and Management* 53, 63-89.

Martin-Ortega, J., Waylen, K.A., 2018. PES What a Mess? An Analysis of the Position of Environmental Professionals in the Conceptual Debate on Payments for Ecosystem Services. *Ecological Economics* 154, 218-237.

Matthews, K.B., Wardell-Johnson, D., Miller, D., Fitton, N., Jones, E., Bathgate, S., Randle, T., Matthews, R., Smith, P., Perks, M., 2020. Not seeing the carbon for the trees? Why area-based targets for establishing new woodlands can limit or underplay their climate change mitigation benefits. *Land Use Policy* 97, 104690.

Maye, D., Ilbery, B., Watts, D., 2009. Farm diversification, tenancy and CAP reform: Results from a survey of tenant farmers in England. *Journal of Rural Studies* 25, 333-342.

McKee, A.M., Sutherland, L-A., Hopkins, J, Flanigan, S., Rickett, A. 2018. Increasing the availability of Farmland for New Entrants to Agriculture in Scotland. Final report to the Scottish Land Commission.  
[https://www.landcommission.gov.scot/downloads/5dd6a2d2ac866\\_McKee-et-al.-Final-report-to-SLC-Increasing-land-availability-for-new-entrants-2.5.2018.pdf](https://www.landcommission.gov.scot/downloads/5dd6a2d2ac866_McKee-et-al.-Final-report-to-SLC-Increasing-land-availability-for-new-entrants-2.5.2018.pdf)

McMillan, J., Barnes, A., Thomson, S., Spencer, S., Hopkins, J., Sutherland L-A., Wardell-Johnson, D. (2019) Farmer Responses to Brexit: Intentions to deliver more “public goods for public money”. 2018 Farmers’ Intention Survey: Briefing Note 2: October 2019. 7pp. [https://www.ruralbrexit.scot/wp-content/uploads/2020/01/Public-Good-Briefing\\_Final\\_For\\_Distribution\\_2.pdf](https://www.ruralbrexit.scot/wp-content/uploads/2020/01/Public-Good-Briefing_Final_For_Distribution_2.pdf)

Mills, J., Gaskell, P., Ingram, J., Dwyer, J., Reed, M., Short, C., 2017. Engaging farmers in environmental management through a better understanding of behaviour. *Agriculture and Human Values* 34, 283-299.

Moseley, D., Nijnik, M., Miller, D., Valatin, G., Edwards, D., Nijnik, A. 2014. How people make decisions and value ecosystem services: tools to develop and direct policy for woodland expansion. Discussion Paper. ESCOM Scotland Conference, 1st May, Edinburgh.

Muñoz-Rojas, J., Nijnik, M., González-Puente, M., Cortines-García, F., 2015. Synergies and conflicts in the use of policy and planning instruments for implementing forest and woodland corridors and networks; a case study in NE Scotland. *Forest Policy and Economics* 57, 47-64.

Munton, R., 2009. Rural land ownership in the United Kingdom: Changing patterns and future possibilities for land use. *Land Use Policy* 26, S54-S61.

Nijnik, M., Mather, A., 2008. Analyzing public preferences concerning woodland development in rural landscapes in Scotland. *Landscape and Urban Planning* 86, 267-275.

Nijnik, M., Nijnik, A., Brown, I., 2016. Exploring the linkages between multifunctional forestry goals and the legacy of spruce plantations in Scotland. *Canadian Journal of Forest Research* 46, 1247–1254.

Nijnik, M., Secco, L., Miller, D., Melnykovich, M., 2019. Can social innovation make a difference to forest-dependent communities? *Forest Policy and Economics* 100, 207-213.

Nijnik, M., Slee, B., Pajot, G., Xu, Y., Miller, D., Bebbington, J., 2010. Forestry and Climate Change: A socio-economic perspective. Report to the Forestry

Commission, p.

[https://www.researchgate.net/publication/316342436\\_Forestry\\_and\\_climate\\_change\\_Report\\_to\\_UK\\_Forestry\\_Commission\\_draft](https://www.researchgate.net/publication/316342436_Forestry_and_climate_change_Report_to_UK_Forestry_Commission_draft).

Prager, K., Reed, M., Scott, A., 2012. Encouraging collaboration for the provision of ecosystem services at a landscape scale. Rethinking agri-environmental payments. *Land Use Policy* 29, 244–249.

Petty, R.E., Cacioppo, J.T., 1986. *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. Springer-Verlag, New York.

Raum, S., 2018. A framework for integrating systematic stakeholder analysis in ecosystem services research: Stakeholder mapping for forest ecosystem services in the UK. *Ecosystem Services* 29, 170-184.

Raymond, C.M., Bieling, C., Fagerholm, N., Martin-Lopez, B., Plieninger, T., 2016. The farmer as a landscape steward: Comparing local understandings of landscape stewardship, landscape values, and land management actions. *Ambio* 45, 173-184.

Reed, M.S., Moxey, A., Prager, K., Hanley, N., Skates, J., Bonn, A., Evans, C.D., Glenk, K., Thomson, K., 2014. Improving the link between payments and the provision of ecosystem services in agri-environment schemes. *Ecosystem Services* 9, 44-53.

Riley, M., 2016. How does longer term participation in agri-environment schemes [re]shape farmers' environmental dispositions and identities? *Land Use Policy* 52, 62-75.

Rogers, E. M., 2010. *Diffusion of Innovations*: Free press.

Rose, D.C., Keating, C., Morris, C., 2018. Understand how to influence farmers' decision-making behaviour a social science literature review. AHDB. <https://ahdb.org.uk/knowledge-library/understand-how-to-influence-farmers-decision-making-behaviour>

Rose, D.C., Sutherland, W.J., Parker, C., Lobley, M., Winter, M., Morris, C., Twining, S., Ffoulkes, C., Amano, T., Dicks, L.V., 2016. Decision support tools for agriculture: Towards effective design and delivery. *Agricultural Systems* 149, 165-174.

Schroeder, L.A., Isselstein, J., Chaplin, S., Peel, S., 2013. Agri-environment schemes: Farmers' acceptance and perception of potential 'Payment by Results' in grassland—A case study in England. *Land Use Policy* 32, 134-144.

Farming for 1.5°C. A transformation pathway. 2020. Nourish Scotland and NFU Scotland.



Scottish Government, 2021. Scotland's Third Land Use Strategy 2021-2026. Getting the best from our land. Scottish Government, Edinburgh.

Shortall, S., Sutherland, L.-A., McKee, A.J., Hopkins, J., 2017. Women in Farming and the Agriculture Sector. Final report for the Environment and Forestry Directorate, Rural and Environmental Science and Analytical Services (RESAS) Division, Scottish Government, Scottish Government Riaghaltas na h-Alba gov.scot Social Research, p. 187.

Slee, B., Brown, I., Donnelly, D., Gordon, I.J., Matthews, K., Towers, W., 2014. The 'squeezed middle': Identifying and addressing conflicting demands on intermediate quality farmland in Scotland. *Land Use Policy* 41, 206-216.

Sutherland, L.-A., 2010. Environmental grants and regulations in strategic farm business decision-making: A case study of attitudinal behaviour in Scotland. *Land Use Policy* 27, 415-423.

Sutherland, L.-A., 2011. "Effectively organic": Environmental gains on conventional farms through the market? *Land Use Policy* 28, 815-824.

Sutherland, L.-A., 2013. Can organic farmers be 'good farmers'? Adding the 'taste of necessity' to the conventionalization debate. *Agriculture and Human Values*, 30:429–441.

Sutherland, L.-A., 2019. Agriculture and inequalities: Gentrification in a Scottish parish. *Journal of Rural Studies* 68, 240-250.

Sutherland, L.-A., Barlagne, C., Barnes, A.P., 2019. Beyond 'Hobby Farming': towards a typology of non-commercial farming. *Agriculture and Human Values* 36, 475-493.

Sutherland, L.-A., Barnes, A., McCrum, G., Blackstock, K., Toma, L., 2011. Towards a cross-sectoral analysis of land use decision-making in Scotland. *Landscape and Urban Planning* 100, 1-10.

Sutherland, L.-A., Burton, R.J.F., 2011. Good Farmers, Good Neighbours? The Role of Cultural Capital in Social Capital Development in a Scottish Farming Community. *Sociologia Ruralis* 51, 238-255.

Sutherland, L.-A., Burton, R.J.F., Ingram, J., Blackstock, K., Slee, B., Gotts, N., 2012. Triggering change: Towards a conceptualisation of major change processes in farm decision-making. *Journal of Environmental Management* 104, 142-151.

Sutherland, L.-A., Darnhofer, I., 2012. Of organic farmers and 'good farmers': Changing habitus in rural England. *Journal of Rural Studies* 28, 232-240.

Sutherland, L.-A., Holstead, K.L., 2014. Future-proofing the farm: On-farm wind turbine development in farm business decision-making. *Land Use Policy* 36, 102-112.

Sutherland, L.-A., Hopkins, J., Toma, L., Barnes, A., Matthews, K., 2017. Adaptation, Resilience and CAP Reform: A Comparison of Crofts and Livestock Farms in Scotland. *Scottish Geographical Journal* 133, 192-213.

Sutherland, L.-A., Gabriel, D., Hathaway-Jenkins, L., Pascual, U., Schmutz, U., Rigby, D., Godwin, R., Sait, S.M., Sakrabani, R., Kunin, W.E., Benton, T.G., Stagl, S., 2012b. The 'Neighbourhood Effect': A multidisciplinary assessment of the case for farmer co-ordination in agri-environmental programmes. *Land Use Policy* 29, 502-512.

Sutherland, L.-A., Huttunen, S., 2018. Linking practices of multifunctional forestry to policy objectives: Case studies in Finland and the UK. *Forest Policy and Economics* 86, 35-44.

Sutherland, L.-A., Mills, J., Ingram, J., Burton, R.J.F., Dwyer, J., Blackstock, K., 2013. Considering the source: Commercialisation and trust in agri-environmental information and advisory services in England. *Journal of Environmental Management* 118, 96-105.

Sutherland, L.-A., Mills, J., Ingram, J., Burton, R.J.F., Dwyer, J., Blackstock, K., 2013. Considering the source: Commercialisation and trust in agri-environmental information and advisory services in England. *Journal of Environmental Management* 118, 96-105.

Sutherland, L.-A., Toma, L., Barnes, A.P., Matthews, K.B., Hopkins, J., 2016. Agri-environmental diversification: Linking environmental, forestry and renewable energy engagement on Scottish farms. *Journal of Rural Studies* 47, Part A, 10-20.

Terres, J.-M., Scacchiafichi, L.N., Wania, A., Ambar, M., Anguiano, E., Buckwell, A., Coppola, A., Gocht, A., Källström, H.N., Pointereau, P., Strijker, D., Visek, L., Vranken, L., Zobena, A., 2015. Farmland abandonment in Europe: Identification of drivers and indicators, and development of a composite indicator of risk. *Land Use Policy* 49, 20-34.

Thomas, E., Riley, M., Spees, J., 2019. Good farming beyond farmland – Riparian environments and the concept of the 'good farmer'. *Journal of Rural Studies* 67, 111-119.

Toma, L., Barnes, A.P., Sutherland, L.-A., Thomson, S., Burnett, F., Mathews, K., 2016. Impact of information transfer on farmers' uptake of innovative crop technologies: a structural equation model applied to survey data. *The Journal of Technology Transfer*, 1-18.

- Totin, E., Segnon, A.C., Schut, M., Affognon, H., Zougmoré, R.B., Rosenstock, T., Thornton, P.K., 2018. Institutional Perspectives of Climate-Smart Agriculture: A Systematic Literature Review. *Sustainability* 10, 1990.
- Townsend, T.J., Sparkes, D.L., Ramsden, S.J., Glithero, N.J., Wilson, P., 2018. Wheat straw availability for bioenergy in England. *Energy Policy* 122, 349-357.
- Urquhart, J., Courtney, P., Slee, B., 2010. Private ownership and public goods provision in English woodlands. *Small Scale Forestry* 9, 1–20.
- Urquhart, J., Courtney, P., 2011. Seeing the owner behind the trees: A typology of small-scale private woodland owners in England. *Forest Policy and Economics* 13, 535-544.
- Urquhart, J., Courtney, P., Slee, B., 2012. Private woodland owners' perspectives on multifunctionality in English woodlands. *Journal of Rural Studies* 28, 95-106.
- Valluri-Nitsch, C., Metzger, M.J., McMorran, R., Price, M.F., 2018. My land? Your land? Scotland?—understanding sectoral similarities and differences in Scottish land use visions. *Regional Environmental Change* 18, 803-816.
- Vinten, A., Kuhfuss, L., Shortall, O., Stockan, J., Ibiyemi, A., Pohle, I., Gabriel, M., Gunn, I., May, L., 2019. Water for all: Towards an integrated approach to wetland conservation and flood risk reduction in a lowland catchment in Scotland. *Journal of Environmental Management* 246, 881-896.
- Waylen, K.A., Blackstock, K.L., Holstead, K.L., 2015. How does legacy create sticking points for environmental management? Insights from challenges to implementation of the ecosystem approach. *Ecology and Society* 20.
- Waylen, K.A., Blackstock, K.L., van Hulst, F.J., Damian, C., Horváth, F., Johnson, R.K., Kanka, R., Külvik, M., Macleod, C.J.A., Meissner, K., Oprina-Pavelescu, M.M., Pino, J., Primmer, E., Rîșnoveanu, G., Šatalová, B., Silander, J., Špulerová, J., Suškevičs, M., Van Uytvanck, J., 2019. Policy-driven monitoring and evaluation: Does it support adaptive management of socio-ecological systems? *Science of The Total Environment* 662, 373-384.
- Waylen, K.A., Marshall, K., Juarez-Bourke, A., Blackstock, K.L. 2020. Exploring the delivery of multiple benefits by catchment partnerships in the UK: Interim results., Report by the James Hutton Institute corresponding to Deliverable 3 within the project formed by Research Deliverable 1.2.4 Objective 1.2 and Deliverable 6 within Research Deliverable 1.4.2bi.
- 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.

Wheeler, R., Lobley, M., Winter, M., Morris, C., 2018. "The good guys are doing it anyway": The accommodation of environmental concern among English and Welsh farmers. *Environment and Planning E: Nature and Space* 1, 664-687.

Wilson, G.A., 2008. From 'weak' to 'strong' multifunctionality: Conceptualising farm-level multifunctional transitional pathways. *Journal of Rural Studies* 24, 367-383.

Zagata, L., Hrabak, J., Lostak, M., Ratering, T., Sutherland, L.A., McKee, A.J., 2017. Research for AGRI-Committee - Young farmers - policy implementation after the 2013 CAP reform, Directorate-General for Internal Policies. Policy Department for Structural and Cohesion Policies. Agriculture and Rural Development. <http://www.europarl.europa.eu/committees/en/supporting-analyses-search.html>.

Zagata, L., Sutherland, L.-A., 2015. Deconstructing the 'young farmer problem in Europe': Towards a research agenda. *Journal of Rural Studies* 38, 39-51.

## Appendix A: Keyword Search Terms

- land manager, land owner, tenant, tenure
- land, land use, landscape, climate, peatland, woodland, afforestation, bio-energy feedstock, environment, biodiversity, forestry, sporting, deer management,
- attitude, behaviour, decision-making, drivers, business model, partnership, trust, nudge
- future, planning, support, communications, policy
- Scotland, England, Northern Ireland, Wales, United Kingdom

# Appendix B: Triggering Change – COVID and Brexit Briefing Note

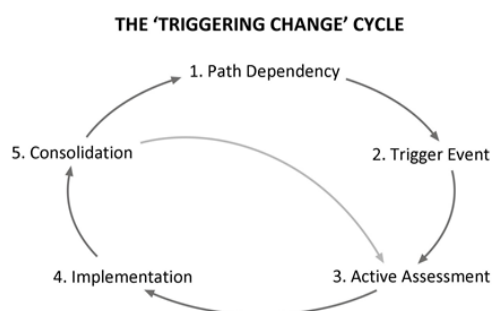
## Triggering Change in Farmer Decision-making

Sutherland, L-A.<sup>1</sup>, Burton, R.J.F.<sup>2</sup>, Ingram, J.<sup>3</sup>, Blackstock, K.<sup>1</sup>, Slee, B.<sup>1</sup>, Gotts, N.<sup>1</sup>

### Summary:

Ongoing research across a number of RESAS and Defra-funded projects has generated a substantial body of research on farmer decision-making processes. This research note summarises the findings of that research, specifically in relation to the 'triggering change' model of farmer decision-making. The principles of the Triggering Change model are:

- Most of the time, farms stay on a stable trajectory, making incremental changes (e.g. new equipment and technologies, more efficient inputs, new marketing strategies etc).
- This path dependency makes good business sense, owing to the high fixed costs of farm businesses.
- Major changes in farming trajectory occur largely in response to trigger event(s) (e.g. crop failures, low commodity prices, succession, retirement).
- In response to these trigger events, farmers more actively seek knowledge, assessing and (sometimes) choosing and implementing a new course of action. To do so, they activate their knowledge networks (e.g. contacting the Farm Advisory Service, input and equipment suppliers, banks, other farmers)
- Farm businesses are more vulnerable during these periods when they are implementing new activities: they are learning new skills, making new financial investments etc.
- If successful, these new activities become part of a new path dependency. If not, farmers return to actively assessing their options or to the status quo, and are particularly susceptible to new triggers.



Brexit and COVID are both times of great uncertainty for farmers. This means that **many farmers are likely to be actively considering their options for increasing the viability of their farming enterprises**. They will be particularly noting their vulnerability and seeking to address related issues (e.g. subsidy dependence, input and commodity market shifts from Brexit, challenges of internet access and remote selling because of the COVID-19 movement restrictions). **Farmers are likely to be particularly receptive to policy levers which enable digitisation, including digital marketing, increased internet access and skill development.**

Some farmers will be very receptive to new information to improve their businesses during these high vulnerability periods; **others may be too busy dealing with the impacts of COVID-19** (e.g. home-schooling children, dealing with family losses, labour shortages) to consider their options. The combination of COVID and Brexit may make some farmers question whether they should continue farming at all. This has implications for policy in terms of supporting positive change; and when policy may not have the desired impacts sought.

<sup>1</sup> Social, Economic and Geographical Sciences Group, James Hutton Institute, Aberdeen, UK

<sup>2</sup> Ruralis. Institute for Rural and Regional Research, Norway

<sup>3</sup> Countryside and Community Research Institute, University of Gloucestershire, UK

## Introduction

The ‘triggering change’ model was developed by Sutherland et al. (2012), using social psychological approaches. The conceptualisation was derived inductively from multiple UK-based empirical studies. The concept of ‘path dependency’ has been developed – and challenged – primarily by economists, but also environmental scientists (e.g. Waylen et al., 2015). Changing farming trajectories have also been developed by Wilson (2007, 2008). The approach thus brings together social psychology and economics, but can also be linked to complexity and resilience theory (e.g. Holling and Gunderson’s, 2002, four-stage ‘adaptive’ cycle of creative destruction).

The triggering change model has wide applicability to UK agriculture. At present, is it being further developed in the Horizon 2020 AgriLink Project<sup>10</sup>, to better understand how it works for different types of farms, and different types of innovation (e.g. up-take of precision-farming and robotic technologies, agri-environmental measures, farmer cooperatives). AgriLink is undertaking 25 case studies across Europe using the Triggering Change model, including 2 cases in the UK. The journal article where the Trigger Change model was first published focused on conversion to organic farming i.e. farmers who were considering conversion identified ‘triggers’ (including BSE, low milk prices and farm succession) which started their processes of actively considering – and changing – their farm trajectories.

## 2.0 The Triggering Change Model

The Triggering Change model draws on social psychology theory to demonstrate that while farmers are locked in path dependency, they engage largely in ‘peripheral route processing’ of new information – giving it superficial attention but storing it for potential later use (Petty and Cacioppo, 1986). Changes are incremental. Following a ‘trigger event’ (which can range from the gradual integration of a successor or recognition of long-term financial losses to more sudden shifts such as loss of staff or the emergence of new market opportunities), farmers more actively seek and assess information using ‘central route processing’, which leads to more active, major changes. New changes are implemented but take time to develop and consolidate, and if unsuccessful, the period of active assessment continues or the farm returns to the status quo. If successful, the changes become the new norm and farmers become path dependent on using the new innovation or approach.

1. **Path Dependency:** All components of the new system are working together and the system has demonstrated its resilience. Investment in skills, knowledge and technology is integrated into farmers’ identities<sup>11</sup>, tying the farm manager(s) to this particular approach and limiting the incentive for major change. Incremental change may occur along the existing trajectory. Farmers access new information but largely through ‘peripheral route processing’, where it is given limited attention and potentially stored for possible, later in-depth consideration. The farm system remains in this state for indefinite periods of time. *Policy levers that reinforce existing farming practices with minimal investment in new techniques, technologies or skills, are therefore most likely to be voluntarily adopted at this stage.*

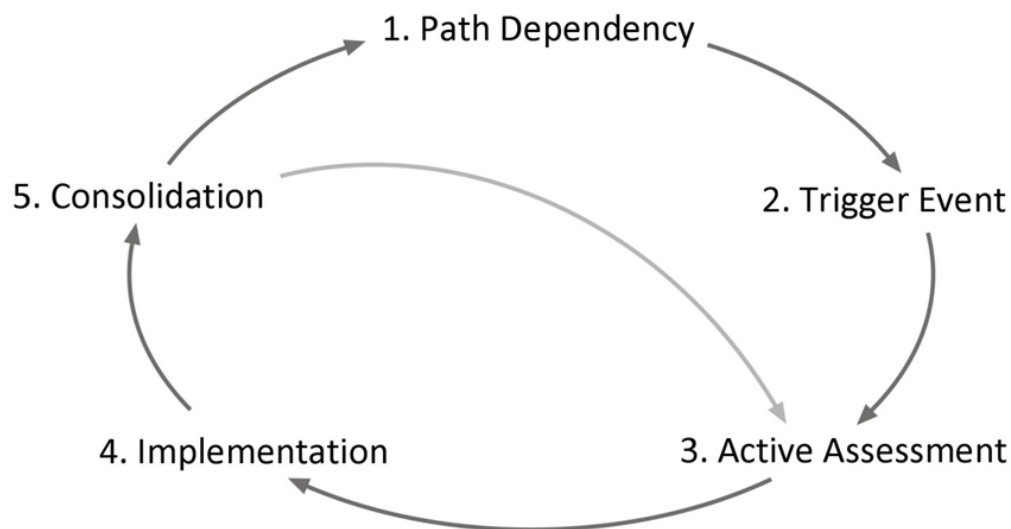
---

<sup>10</sup> For further information on AgriLink, check out the project website: <https://www.agrilink2020.eu/>

<sup>11</sup> E.g. as an intensive crop producer, a pedigree livestock producer, a ‘full-time farmer’ etc.

2. **Trigger Event:** The farm managers of the existing 'path dependent' system encounter or anticipate one or more triggers (e.g. changes in the farm household through succession, injury or death of a farm worker, new market opportunities or failures) leading to a 'trigger event': the realisation that system change is necessary to meet farm management objectives, and/or exploit new opportunities. Not every 'trigger' leads to a 'trigger event': some triggers are insufficient to shake farmers' confidence in the current trajectory; for other triggers, farmers may be too busy dealing with the trigger itself to have the headspace to recognise that a larger change is needed. The trigger event may therefore occur later (i.e. after the immediate crisis has passed, and the farm decision makers have time to reflect).

### THE 'TRIGGERING CHANGE' CYCLE



Source: Sutherland et al. 2012

3. **Active Assessment:** Routine scanning for information intensifies, becoming actively focused on available options ('central route processing'). This is an iterative process, including practical assessment of options and current farm and farm household resources, which may involve testing of options (e.g. experimentation) and networking/talking to other farmers or advisors, banks and accountants, or input and equipment suppliers. The farm managers explore the economic, managerial and social implications of changing the system. After assessing the options, farmers may decide that their current trajectory is still their best choice. This is particularly likely for farms which have few options (e.g. low land capability, distant from markets). *Policy levers that enable access to new information and advice on major changes are most likely to have an impact at this stage, but needs to be suited to different types of farms.*
4. **Implementation:** If the farm managers identify a potentially viable option, a choice is made to pursue it, and implementation of a 'new system' begins. This not only commits the farm managers to financial investments in structural change, but also to developing new skills, knowledge and establishing new social and business networks around the new approach. This is the high-risk stage of the cycle, where the new trajectory is fragile: farmers may have a steep learning curve and may be taking on new financial liabilities. *Policy levers which enable ongoing supports (e.g. advice, flexible financing) are important at this stage for reducing the risks involved in changing business trajectory.*



5. **Consolidation:** New knowledge, skills and networks are developed, and the success of the new system in addressing issues resulting from identified triggers, are evaluated. If the new approach is deemed unsuccessful, the farm manager returns to Stage 3 or Stage 1. However, the investment undertaken during implementation may weaken the ability of the farm manager to implement further new changes. *Policy levers continue to be important at this stage for protecting farms from other triggers and enabling them to respond to new triggers if they occur.*
6. **Path Dependency:** If the new system is deemed successful, the cycle resumes from Stage 1.

It is important to note that the triggering change conceptualisation represents an idealised process. Triggers are often unpredictable, and thus may occur at any stage in the change process or may indeed be removed. This can result in deviations from the process as outlined.

### 3.0 Brexit and COVID-19 Implications

Both the Brexit and COVID-19 situations are potential triggers for farmers, leading to trigger events where farmers shift from path dependency into active assessment. However, Brexit and COVID-19 are likely to have very different impacts.

Although COVID-19 is a new experience, it is likely to be relatively short term and its impacts are clear: reduced mobility (e.g. sourcing inputs, selling produce) and resultant implications for remote working and consumer behaviour, with knock on effects on farm diversification projects (especially tourism and recreation). Availability of seasonal labour is also an issue, which may reduce time available for decision makers to scan for options.

- Farmers are likely to be keenly aware of issues relating to internet access and digitisation, and seek to address them. This may involve contacting agricultural advisors, and seeking more advice on-line or over the phone. Farmers may also engage more with internet service providers, and with local community efforts to increase internet access.
- Those farmers who were already actively using digital tools may be able to access advice and information more easily than others who traditionally relied on face-to-face discussion groups and demonstration events.
- Farmers will therefore experience the loss of access to these face-to-face resources differently; those with weak internet access or skills will be particularly impacted.
- COVID-19 restrictions could lead to permanent changes in the way some farm businesses operate (e.g. pushing farmers into greater use of communications technologies, shortening of value chains, changed stock market and auction practices, reduced reliance on tourism income.)

***Farmers are particularly likely to be open to policy levers which enable them to increase their skills, access to and usage of the internet in their farm businesses.***

COVID-19 will also put some farmers into the position where they are too busy dealing with the consequences to consider their farming trajectories. Increased demands associated with home schooling, family illness and losses, difficulties sourcing labour and inputs etc, will mean that this is a time of great stress. Diversified businesses reliant on visitors coming to the farm will be facing major additional financial strain. COVID-19 may be the 'last straw' for farmers already concerned about Brexit, leading to distress and fears around losing their farm businesses. ***Any effort to enrol farmers in actively considering the future trajectory of their farms must be sensitive to these issues.*** The

'window of opportunity' for influencing farmers may continue for several months after the immediate COVID-19 crisis is over.

Brexit impacts are much more diffuse and the impact is less clear. Farmers are conscious that subsidy changes are likely, and may move to reduce their subsidy dependence. However, uncertainty about the outcomes of Brexit, particularly whether it will be on World Trade Organisation terms or a more benign trade agreement, has made it difficult for them to plan.

- Initial efforts may focus on cost and lending minimisation, to reduce risks within the existing farm trajectory (i.e. maintaining path dependency).
- Farmers may also seek to reduce their dependence on international labour (e.g. through mechanisation or reducing production of crops dependent on substantial human labour).

In terms of policy implications, this means that ***once there is more certainty around the impact of Brexit on different farming systems, Scottish farmers may be in an active assessment mode and could be more responsive to policy levers regarding climate action, environmental protection and animal welfare***, providing these do not worsen any perceptions of farm profitability and productivity. However, ***this window of opportunity may be prematurely closed by the economic and social impacts of COVID-19***, if farmers are too busy coping with immediate crises to partake in active assessment of longer-term options.

Further information on potential Brexit response: The James Hutton Institute and SRUC undertook a spatially representative survey of almost 2500 Scottish farmers in 2018. At that time, it was clear that farmers were already planning to make changes to their farm businesses in response to Brexit. For example, both diversified and non-diversified farms aim to increase their level of diversification in the next 5 years (53% and 28% of the diversified and non-diversified farms respectively). At that time, half of the farmers surveyed believed that Scottish farmers would be worse off after Brexit; a further one third of farmers were uncertain. Since that time, the prospect of reverting to World Trade Organisation trade rules has become more likely, suggesting that farmers may be even more concerned about their future financial prospects.

Further information on potential farmer responses to Brexit can be found in information notes from the Farmer Intentions Survey can be found here:

<https://www.ruralbrexit.scot/farmer-responses-to-brexit-briefing-notes/>

An information note on new entrants to farming, which includes information on Brexit, is available here: [https://www.hutton.ac.uk/sites/default/files/files/research/srp2016-21/rd242outputs/Research\\_Note\\_New\\_Entrants\\_final\\_RD242\\_published.pdf](https://www.hutton.ac.uk/sites/default/files/files/research/srp2016-21/rd242outputs/Research_Note_New_Entrants_final_RD242_published.pdf)

A further information note on farm diversification, which includes responses to Brexit, is currently under review at RESAS. Please contact Richard Haw for further information.

## 4. References

Dwyer, J., Mills, J., Ingram, J., Taylor, J., Burton, R., Blackstock, K.L., Slee, B., Brown, K.M., Schwarz, G., Matthews, K.B., Dilley, R., 2008. Understanding and influencing positive behaviour change in farmers and land managers - a project for Defra., Final report submitted to DEFRA.

Holling, C.S., Gunderson, L.H., 2002. Resilience and adaptive cycles. *Panarchy: Understanding transformations in human and natural systems*, 25-62.

Petty, R. E., Cacioppo, J. T., 1986. *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. New York: Springer-Verlag.

Sutherland, L.-A., Burton, R.J.F., Ingram, J., Blackstock, K., Slee, B., Gotts, N., 2012. Triggering change: Towards a conceptualisation of major change processes in farm decision-making. *Journal of Environmental Management* 104, 142-151.

Waylen, K.A., Blackstock, K.L. and Holstead, K.L. (2015). How does legacy create sticking points for environmental management? Insights from challenges to implementation of the 'Ecosystem Approach'. *Ecology & Society*, 20(2): 21. <http://dx.doi.org/10.5751/ES-07594-200221>.

## Acknowledgements

This work was funded by the Rural & Environment Science & Analytical Services Division of the Scottish Government, as part of the Strategic Research Programme 2016-2021 (RD2.4.2 and RD1.4.2). The interpretations expressed in this report are derived by the authors and do not necessarily reflect those of the Scottish Government or RESAS.

**For further information, please contact:**

**Lee-Ann Sutherland** ([lee-ann.sutherland@hutton.ac.uk](mailto:lee-ann.sutherland@hutton.ac.uk))