epa Research

Evidence Synthesis Report 12

Impediments to Agricultural Land Use Change and Interventions for Multifunctional Land Use Outcomes

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Rialtas na hÉireann
Government of Ireland

Environmental Protection Agency

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The work of the EPA can be divided into three main areas:

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2. Office of Environmental Enforcement
3. Office of Evidence and Assessment
4. Office of Radiation Protection and Environmental Monitoring
5. Office of Communications and Corporate Services

The EPA is assisted by advisory committees who meet regularly to discuss issues of concern and provide advice to the Board.

EPA RESEARCH PROGRAMME 2021–2030

Impediments to Agricultural Land Use Change and Interventions for Multifunctional Land Use Outcomes

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EPA Research Evidence Synthesis Report

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by

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This report is one of a number of evidence synthesis reports funded by the EPA that are intended to support and inform the National Land Use Review. The second phase of the Land Use Review commenced in October 2023 and is being co-led by the Department of Climate, Energy and the Environment, the Department of Agriculture, Food and the Marine and the Department of Housing, Local Government and Heritage. It will seek to identify the key demands on land (both public and private) to inform policies for land use across key government objectives, improving socioeconomic, climate, biodiversity, water and air quality outcomes.

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DISCLAIMER

This report is based on research carried out/data from May to September 2024. More recent data may have become available since the research was completed.

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

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Executive Summary

The agriculture and agri-food sectors are among Ireland's most important indigenous manufacturing sectors, accounting for employment of around 173,000 people across 135,000 farms and roughly 2000 food production and beverage enterprises. The sectors use 4.5 million hectares of agricultural land and 808,848 hectares of forestry. Importantly, economic activity in the agriculture and agri-food sectors produces a far bigger return than equivalent activity in other traded sectors of the economy.[1]

Agriculture, accounting for Ireland's predominant land use, contributes to and shares responsibility for 37.8% of Ireland's greenhouse gas emissions,[2] declines in air and water quality, and biodiversity loss. To address these negative impacts, sustainable land use practices need to be enhanced to provide environmental benefits, while also offering opportunities for farm diversification.

This research focuses on identifying social, behavioural and knowledge-related factors that impede farmers from implementing land use changes that are aligned with the government objective of improving socioeconomic, climate, biodiversity, and water and air quality outcomes. In addition, it explores methods to promote land use changes that are conducive to economic, social and environmental goals. This report presents findings from a systematic evidence review of academic journals, government reports and publications from both Irish and international sources.

Impediments were identified across various forms of land use change, including afforestation and agroforestry; the restoration and rewetting of peatlands; regenerative, agroecological and organic agriculture; water quality management practices; and renewable energy generation. Some of the recurring impediments identified are outlined below.

Socioeconomic impediments:

- **Financial and economic pressures:** high upfront costs including implementation and labour expenses; insufficient financial incentives to offset costs of transitioning; high opportunity costs for switching from traditional practices to more sustainable alternatives; perceived low profitability of sustainable alternatives; payment delays, particularly in agri-environmental schemes (AESs); perceived lack of financial benefits from adopting interventions; and concerns over long-term productivity of land after transitioning.
- **Demographic and farm characteristics:** age affecting land use change; larger and more profitable farms often being less likely to adopt new practices; smaller farms facing financial constraints and perceiving low productivity and low profitability from adopting alternative land uses; and productive, profitable and full-time farms being hesitant to shift towards new practices, especially when good agricultural land is involved.
- **Administrative complexity, bureaucracy and inflexibility:** high levels of administrative bureaucracy and complex regulations when applying for policy support and funding, and rigid contract terms limiting land use flexibility, especially for long-term commitments.
- **Institutional and structural limitations:** insufficient enabling policies, legislation and regulatory support (including support for cross-farm co-operation and professional co-operatives).
- **Market and infrastructure limitations:** lack of market access, market uncertainty and limited availability of equipment and skills (particularly for landscape-scale projects); high labour and infrastructure requirements; and incompatibility of land use changes with existing farm practices.

1 DAFM, 2024. *Fact Sheet on Irish Agriculture – April 2024*. Department of Agriculture, Food and the Marine. Available online: https://assets.gov.ie/289345/d3a618b0-a3fa-4be8-8824-1d4eb70cf120.pdf (accessed 6 January 2025).

2 EPA, 2024. Latest emissions data. Environmental Protection Agency. Available online: https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/#:~:text=In%202023%2C%20the%20energy%20industries,overall%20emissions%2C%20at%2037.8%25 (accessed 9 December 2024).

- **Insecure land tenure and succession:** insecure land tenure limiting long-term land use changes or investments.

Behavioural impediments:

- **Personal and cultural attitudes and beliefs:** some farmers' attitudes being driven by profit and psychological factors such as subjective norms within farming communities.
- **Control concerns and autonomy:** fear of losing decision-making power; concerns over the irreversibility of decisions; and hesitation around dependence on co-operation with others.
- **Risk aversion and resistance to change:** reluctance to alter established practices due to strong ties to traditions and landscapes passed down through generations; fear of change; high risk aversion; and concerns about external factors.
- **Social identity and cultural values:** strong cultural ties, peer pressure and anticipated loss of the "good farmer identity" influencing farmers' reluctance to adopt new land use practices; cultural values outweighing financial incentives, especially for older, more conservative farmers; attachment to traditional practices; and cultural legacies.
- **Trust and perception of benefits:** scepticism and a lack of trust in programmes, government regulations or the perceived benefits of adopting new land use practices; uncertainties about the added value of the practices; concerns over opportunity costs; and lack of confidence in accessing resources or making investment decisions.

Knowledge-related impediments:

- **Lack of knowledge, awareness and understanding:** limited awareness about the need for and benefits of new practices; uncertainty about ongoing costs, scheme conditions and potential impacts (e.g. losing eligibility for basic payments); doubts about feasibility, flexibility and overall financial viability of the new practices; insufficient access to good-quality information; and unfamiliarity with key initiatives like AESs.
- **Limited support networks and access to advisory services:** lack of contact with tailored agricultural extension services and the cognitive burden of managing bureaucratic tasks.
- **Peer and information source influence:** farmers' reliance on media, press and advisory services to adopt the practice; strong influence of peers and community, particularly among dairy and drystock farmers; and dependence on others for practice implementation.
- **Education and training issues:** lack of skills, experience and formal agricultural education; and low education levels among farmers contributing to difficulties in overcoming planning and implementation challenges.

Interventions to overcome these impediments include those that:

- improve financial support and incentives;
- simplify administrative procedures;
- enhance market access and infrastructure;
- improve land tenure security;
- address risk aversion and resistance to change;
- foster farmers' autonomy and participation in AESs;
- leverage social identity and cultural values;
- build trust and confidence in schemes including place-based approaches;
- increase knowledge and awareness;
- expand tailored advisory services and support networks;
- enhance education and training.

These interventions are discussed in the context of specific forms of land use change throughout the report.

1 Introduction

1.1 Scope and Overview of the Report

In Ireland, 78% of land is privately owned, with agriculture being the primary land use class, covering 67% of the country's land and dominated by grassland (59%) for ruminant livestock production (EPA, 2023). Intensive agricultural land use has had implications for the environment, contributing to greenhouse gas emissions, water quality deterioration and loss of biodiversity (EPA, 2023). This has resulted in increased interest in sustainable land use to provide environmental benefits, while also offering opportunities for farm diversification. However, there are impediments to land use change, ranging from social norms to knowledge gaps. Moreover, farmers' decisions are shaped by diverse behavioural, motivational and cognitive factors, which exhibit significant geographical, farm-specific and individual characteristics. This complex interplay of forces highlights the challenges involved in encouraging land use change towards more sustainable practices among farmers.

Recognising the urgent need for change in Ireland's land use, in its Programme for Government, the Irish Government has committed to a comprehensive land use review, aiming to ensure that optimal land use options inform all relevant government decisions (Government of Ireland, 2021). Phase 2 of this review is being led by the Department of the Environment, Climate and Communications (DECC), the Department of Agriculture, Food and the Marine (DAFM) and the Department of Housing, Local Government and Heritage with support from other stakeholders, such as the Environmental Protection Agency (EPA). It includes an evidential review of appropriate polices, measures and actions that promote sustainable land use change within the broader context of the government's economic, social and climate objectives (Government of Ireland, 2021). As part of this initiative, the EPA proposed this project for "Fast-Track to Policy" funding. This research identifies the impediments to land use change in Ireland and provides crucial insights for policy formulation, ultimately supporting widespread land use changes that deliver broader socioeconomic and environmental benefits in line with government objectives. To support these goals, this evidence synthesis report presents key findings, conclusions and policy recommendations.

1.1.1 Objectives

There are several socioeconomic, behavioural and knowledge-related impediments facing landowners in relation to land use change, which must be understood and overcome. The objectives of this research are to answer two core questions:

1. With a focus on landowners and farmers, what are the social, behaviour and knowledge-related impediments to land use changes that meet the government's objective of improving socioeconomic, climate, biodiversity, and water and air quality outcomes?
2. What methods can be deployed to enhance land use change to meet economic, social and environmental goals and to foster engagement and "ownership" of measures among landowners and farmers?

1.2 Report Structure

The review of literature on land use change has been organised into five main forms of land use. These are (1) forestry, (2) peatlands, (3) renewable energy generation, (4) organic and regenerative farming, and (5) practices that improve water quality. These categories were chosen to align with the government objectives of improving socioeconomic, climate, biodiversity, and water and air quality outcomes. The discussion is structured around specific forms of land use change, to provide a more nuanced and targeted analysis of the social, behavioural and knowledge-related impediments associated with each. This allows for actionable and tailored policy recommendations, which are presented in the following chapters.

We review the impediments to and interventions for promoting land use change for each type of land use in turn, and then we provide an overview of agri-environmental schemes (AESs) and how they can support land use change. This is followed by a final chapter that outlines the research conclusions.

2 Overview of the Research

This research employed a systematic review of academic journals, government reports and publications, including international and Irish sources, to identify social, behavioural and knowledge-related impediments hindering farmers' adoption of sustainable land use practices. The research also accounted for variations in farm-specific characteristics, sectoral characteristics and socio-demographic variables, which are intrinsically linked to impediments to adoption. Based on the impediments identified and a synthesis of existing insights, this research provides policy recommendations to support the adoption of sustainable land use interventions.

The four systematic steps followed are outlined below:

1. Data collection:
   (a) **Literature review:** we reviewed relevant literature and reports on sustainable land use interventions, focusing on impediments identified for each intervention.
   (b) **Categorisation of impediments:** we extracted and categorised impediments into three main types: socioeconomic, behavioural and knowledge-related impediments.
2. **Data organisation:** we organised the impediments extracted into a **tabular format**, listing the impediments under each category (form of land use) for different interventions. This helped to systematically compare the impediments.
3. **Identifying common themes:** we conducted a **thematic analysis** to identify recurring themes within each category of impediments. This involved:
   (a) **Coding:** we assigned codes to specific impediments based on their nature (e.g. financial constraints, cultural resistance, risk aversion, insufficient knowledge and limited support networks);
   (b) **Grouping codes:** we grouped similar codes into broader themes to identify patterns and recurring issues across land use interventions.
4. **Developing policy recommendations:** building on the thematic analysis of impediments, we undertook a synthesis of potential policy interventions. This involved aligning impediments with policy interventions that have been successful in similar contexts or proposing innovative solutions tailored to the specific needs of the Irish land use landscape.

Figure 2.1 provides a graphical representation of the methodology followed in this study.

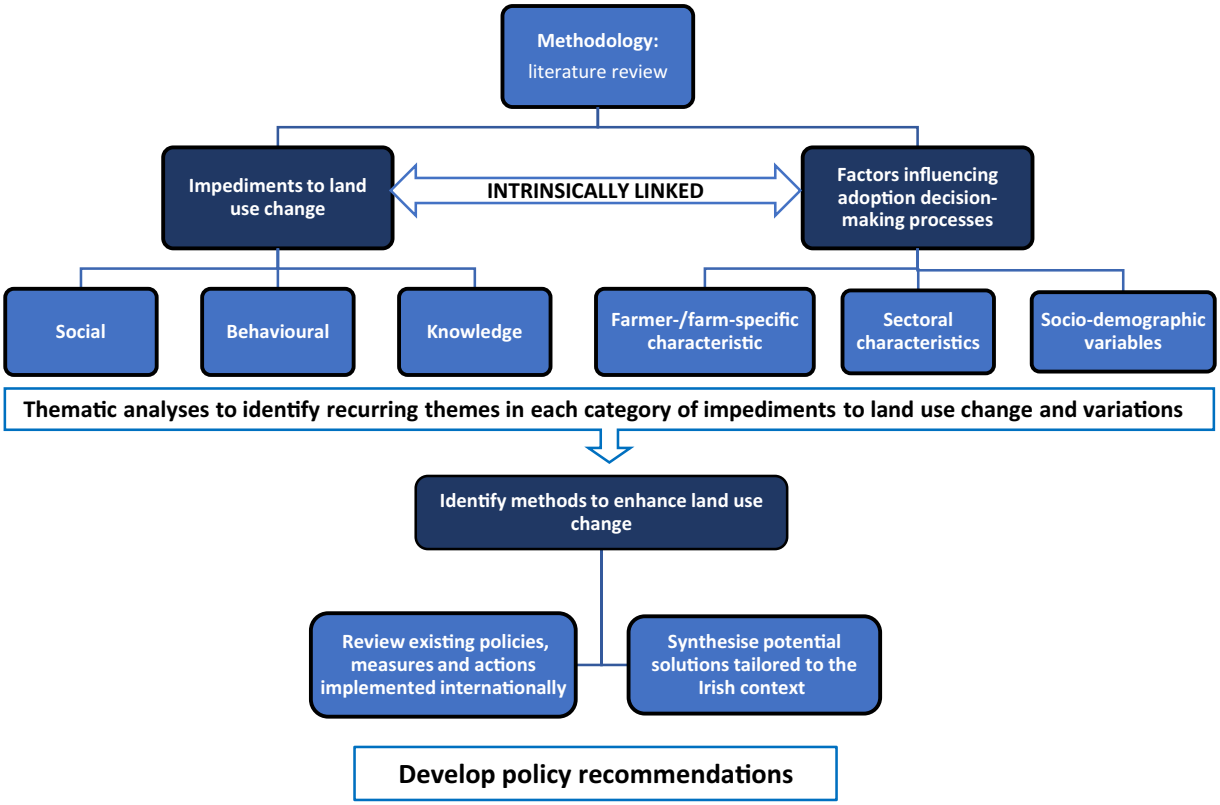

Figure 2.1. An outline of the methodology used for the research.

3 Examination of the Findings: Impediments to and Interventions for Land Use Change

The findings presented in this chapter outline different types of land use change, across variations of farms, farmers and sectoral characteristics, that aim to improve climate, biodiversity, and water and air quality outcomes.

3.1 Afforestation

3.1.1 Impediments to afforestation

Increasing Ireland's forest cover can help counteract climate change, as trees absorb greenhouse gases. However, various impediments hinder farmers' and landowners' willingness to afforest their land.

Socioeconomic impediments

In Ireland, one of the most significant impediments to afforestation efforts is rooted in social norms and values surrounding land use, including attachment to traditional farming lifestyles and business directions (Ryan and O'Donoghue, 2016), farming values that prioritise food production, land use flexibility, family traditions and attachment to an enjoyable type of work and lifestyle (Duesberg *et al*., 2014; Ryan and O'Donoghue, 2016). These cultural attitudes are reinforced by the limited financial attractiveness of afforestation for full-time farmers (Irwin *et al*., 2023), concerns over high opportunity costs and the long period required for economic returns from forestry (Schirmer and Bull, 2014; Ryan and O'Donoghue, 2016).

Ryan *et al*. (2022) calculated that, while farmers in Ireland prefer higher incomes, they derive three times more utility from agricultural income than from forestry income. Utility also declines if forestry devalues land, and Ryan and O'Donoghue (2016) noted that farms with forests reduce self-reported land values after planting. The long-term commitment required by afforestation schemes often leads to concerns about the loss of land management flexibility, as farmers feel constrained by the inability to switch back to agricultural use once the land has been afforested (Duesberg *et al*., 2014; Ryan and O'Donoghue, 2016). In addition, making the decision to plant forests is perceived as effectively making a decision for future generations in terms of what type of farming they can conduct (Duesberg *et al*., 2014; Vidyaratne *et al*., 2020).

Vidyarante *et al*. (2020) found, also from a study conducted in Ireland, that farmers of smaller farms are less likely to afforest their land than those of large farms, and that the extent of forested land is likely to be smaller. These findings are similar to those of Duesberg *et al*. (2014) and Frawley and Leavy (2001), with the latter noting that farmers in Ireland with small land holdings are reluctant to afforest because they feel that they need all their land for farming. In contrast, farmers with large land holdings are more willing to afforest, and their behaviour can be explained as a form of asset diversification and risk minimisation (Peter, 1995; Vidyaratne *et al*., 2020). Magner (2024) noted in the *Irish Farmers Journal* that foresters, sawmillers and farmers broadly agree that a minimum area of 10 hectares of commercial trees is required to generate a profit. Given that only 65% of forested land can be used for commercial purposes, this means that a minimum of approximately 15 hectares would have to be under forestry to generate a profit. Therefore, farm size is likely to remain a barrier (Magner, 2024).

Vidyaratne *et al*. (2020) noted that, while farmers have a notional view of the intergenerational nature of farming, the long time frames involved in forestry may go beyond the planning horizon of many. As a result, farmers may apply different discount rates to expected income streams from forestry than those applied to income streams from agriculture. This makes planning for the future difficult. Vidyaratne *et al*. (2020) also found that households with low off-farm incomes are dependent on farming as their primary source of income and are less likely to convert part of their farmland to forestry. They found that with increasing age, farmers are both more likely to engage in afforestation and more likely to afforest a greater proportion of their farmland. Several factors may be

important. First, forests require significantly less labour to maintain than farmland, which may be attractive for older farmers. Second, older farmers are likely to have older children and potentially care more about passing property on to their descendants than younger farmers.[3] Vidyaratne *et al*. (2020) noted that older farmers may recognise the future value that forestry could have for their descendants, which may increase their willingness to afforest. However, the role of age is inconclusive, as Ryan *et al*. (2022) found that farmers who plant forests are on average slightly younger than those who do not plant. However, the time taken to realise harvesting gains is likely to explain why younger farmers would be more likely to afforest land than older farmers, who constitute the majority of farmers in Ireland, rather than there being a strong life cycle effect (Läpple *et al*., 2015; Ryan *et al*., 2022). In addition, Ryan and O'Donoghue (2016) found that negative perceptions of forestry are more likely to be held by older farmers.

Behavioural impediments

Behavioural impediments to afforestation include concerns over the irreversibility of the decision to convert farmland to forestry, as many farmers want to pass agricultural land and enterprises on to the next generation, which discourages afforestation (Vidyaratne *et al*., 2020). Farmers' strong attachment to productivist values and traditional agricultural practices often leads to agricultural production being prioritised over afforestation, contributing to risk aversion due to uncertainties associated with tree growth and the potential for project failure (Schirmer and Bull, 2014). In addition, farmers fear losing their identity and the social or cultural rewards associated with being seen as a "good farmer" within their community (Burton, 2004), which involves adhering to the social norms and values that shape the belief that good agricultural land should not be used to grow trees (Schirmer and Bull, 2014; Irwin *et al*., 2023). Vidyaratne *et al*. (2020) found that farmers who were satisfied with the current level of premium were more likely to plant trees, although this did not lead to an increase in the area of land planted. The reasoning is that many forest owners afforested to increase income from poor farmland. Thus, farmers may feel that the current level of premium is good income from poor farmland, but not all land.

Knowledge-related impediments

Vidyaratne *et al*. (2020) found that farmers with high levels of education, albeit not forestry-specific education, were more likely to afforest land. Irwin *et al*. (2023) studied agroforestry on dairy and drystock farms in Ireland and found that these farmers are mainly driven by their attitudes and moral norms, which are in turn shaped by the views of influential people such as advisors and local farmers. Forestry companies, social media, newspaper articles and policymakers have little influence compared with the significant impact of the community and peers on dairy and drystock farmers (Irwin *et al*., 2023). A lack of necessary skills, knowledge and experience relevant to afforestation and a lack of information on benefits associated with afforestation schemes, such as shelter, are impediments to adoption (Duesberg *et al*., 2014; Irwin *et al*., 2023). In addition, a lack of awareness of the economic benefits of some practices, such as thinning, further hinder adoption (Vidyaratne *et al*., 2020).

3.1.2 Interventions for increased afforestation

Reduce replanting obligations

Although the Afforestation Scheme 2023–2027 is relatively new, the Climate Change Advisory Council noted that farmers and landowners have not engaged with the scheme to the extent required to achieve the target level of afforestation of 8000 hectares per year, as specified in the Climate Action Plan (CCAC, 2024). The Afforestation Scheme 2023–2027 is likely to reduce some of the economic impediments by providing greater financial incentives. However, a potential impediment remains in that farmers may feel that forestry does not provide them with land management flexibility. For example, land that is classified as forest, as defined in the Forestry Act 2014, is subject to felling licence requirements and a replanting obligation post felling (DAFM, 2024a). These requirements include trees that have been planted as part of the Agri-Climate Rural Environment Scheme (ACRES) (DAFM, 2024a). This creates a

3 The presence of a child or successor was not identified within this research.

sense of permanency over the decision to plant trees. A time lapse on post-felling obligations may incentivise farmers to convert land to forestry.

Encourage complementary practices

The Native Tree Area Scheme, which was launched in late 2023, allows farmers to plant up to a hectare of native woodland without the need for a licence, or up to two hectares if they have a suitable watercourse along which to plant a riparian small-scale native woodland (Teagasc, 2024). This may incentivise small-scale tree planting and encourage the planting of marginalised land, which is often preferred by land managers (Duesberg *et al*., 2014). An additional benefit of the Native Tree Area Scheme is that it will help to build confidence among farmers in the benefits of forestry as a viable option to complement their existing farm enterprises. Such initiatives may help reduce concerns about the flexibility of converting land to forestry.

Agroforestry may be more attractive to some landowners than large-scale afforestation. A continued policy focus on complementary practices may help to remove impediments including succession planning (Vidyaratne *et al*., 2020) and the desire to continue farming "good land" (Irwin *et al*., 2023). A potential amendment to the Afforestation Scheme 2023–2027 that could be considered would be to not classify areas under agroforestry as forestry, meaning, therefore, that agroforestry areas would not be subject to replanting requirements. This change would help to reduce concerns regarding the irreversibility of converting land to forestry.

Offer carbon management incentives

Ryan and O'Donoghue (2016) discussed incentives for encouraging afforestation via carbon-neutral actions. For example, livestock farmers could be granted stock relief if they plant a certain number of trees. This is a valid suggestion that could be explored further and potentially implemented with a carbon-negative obligation.

Encourage peer learning

Family members, agricultural advisors and people within the local community were found by Irwin *et al*. (2023) to be the most influential sources of knowledge regarding afforestation. Suggestions for improving this form of knowledge sharing include promoting the establishment of knowledge transfer groups, comprising people from the local community who have influence on farming practices, and supporting local farm demonstrations (Irwin *et al*., 2023). These approaches may be particularly important for addressing socio-cultural habits and negative cultural attitudes, which were identified as impediments by Ryan and O'Donoghue (2016). As attachment to family tradition is also an impediment (Duesberg *et al*., 2014), peer learning may aid understanding and open discussions among family members. However, these processes are likely to be slow, and positive perceptions regarding forestry may also need to be created within the schooling system, as is done in Finland, where approximately 75% of land is under forestry (Heino and Karvonen, 2003).

Allow free access to private forestry

In Finland, a high degree of societal importance and value is placed on forestry. This is because it has been a key contributor to the national economy and is a source of recreation for both rural and urban dwellers. An important factor influencing the public perception of forests is that visitors are allowed to walk, ski or cycle on other people's land if landowners and land are not disturbed or damaged (Heino and Karvonen, 2003). A similar agreement could be adopted in Ireland, and greater income-generating support for tourism, such as business planning advice and grants for touristic activities, may help to generate acceptance from forestry owners. An example of a popular forestry tourism initiative in Ireland is the Beyond the Trees[4] centre, which is state run.

3.2 Peatland Restoration

3.2.1 Impediments to peatland restoration

Peatland restoration offers significant environmental benefits, including mitigating climate change,

4 https://www.beyondthetreesavondale.com/ (accessed 6 January 2025).

enhancing biodiversity and improving water quality. However, several impediments hinder the adoption of peatland restoration practices.

Socioeconomic impediments

In Ireland, cultural legacies and long-standing practices such as peat cutting have made it challenging to shift behaviours and attitudes towards peatland restoration (Wilson and Wilson, 2017; Farrell *et al*., 2024). The financial incentives for convincing farmers to rewet agricultural peatlands are also considered inadequate (Wilson and Wilson, 2017; Reed *et al*., 2020) and the impact on profits of adopting peatland restoration practices in Ireland is perceived to be negative, compounding the challenge (Murray, 2023).

While impediments to the restoration and rewetting of peatlands in Ireland have been relatively under-researched to date, insights can be drawn from international literature. Across Europe, high upfront capital costs pose an impediment to restoration efforts (Andersen *et al*., 2016; Murray, 2023) and the loss of outputs such as timber, fuel or food production further disincentivises farmers (Andersen *et al*., 2016; Murray, 2023).

In Switzerland, cultural and social backgrounds correspond to a strong regional identity and pride in historical peatland management practices, creating resistance to adopting new methods that deviate from traditional practices (Ferré *et al*., 2019). This resistance is reinforced by the economic working environment for the production of vegetables from organic soils. For example, pressure from retailers, time constraints and the necessary investments at both collective and individual levels limit farmers' ability to reconsider their practices, explore potential adaptations and engage in long-term planning (Ferré *et al*., 2019).

In Switzerland and the Netherlands, high opportunity costs are associated with switching to sustainable practices. In Switzerland, the profitability of current land use, such as vegetable farming, creates substantial opportunity costs for farmers considering transitioning to sustainable management practices such as rewetting (Ferré *et al*., 2019).

In the Netherlands, farmers whose businesses are heavily dependent on peatlands face higher opportunity costs not only in terms of profitability but also in terms of social and cultural capital. These farmers may feel increased social pressure and expect to exert more effort when changing their practices, which can discourage their adoption of co-operative peatland management measures (Norris *et al*., 2021). In addition, limited cross-farm co-operation further hinders the implementation of landscape-scale peatland restoration efforts in the Netherlands (Norris *et al*., 2021).

In the UK, impediments include the limited availability of the equipment and skills necessary for peatland restoration at the local level, administrative bureaucracy and inflexibility in applying for funding (Moxey *et al*., 2021). In England specifically, place attachment and strong cultural ties to traditional practices and common land management, as well as challenges in splitting payments between different rights owners and adjudicating decision-making processes within groups of commoners' rights holders, complicate landscape-scale peatland restoration (Reed *et al*., 2020). While many of these impediments have not been explicitly identified in Ireland, it is likely that similar issues regarding cultural legacies and attachment, economic pressures and administrative complexities are relevant, and they should be considered when developing restoration strategies.

Behavioural impediments

Behaviour-related impediments to peatland restoration include differing perceptions, particularly among professional full-time farmers with formal agricultural training and access to professional advice. These farmers often reject support for co-operation, as they do not see the benefits of additional institutions facilitating that co-operation, such as in the case of landscape-scale peatland restoration in northern Germany (Häfner and Piorr, 2021). In the UK, there is resistance to land use change, as peatland restoration is often perceived to compromise agricultural production, with this resistance further reinforced by cultural ties, peer pressure and the desire to honour practices inherited from previous generations (Moxey *et al*., 2021). In addition, past negative experiences with AESs have fostered scepticism and a lack of trust in the effectiveness or benefits of new restoration programmes (Moxey *et al*., 2021). There are also control concerns, where land managers value their

autonomy and fear that government-prescribed peatland restoration strategies could limit their management options and freedom of action, which are integral to their identities as independent decision-makers (Reed *et al*., 2020).

Knowledge-related impediments

Knowledge-related impediments include a general lack of awareness about the need for and benefits of peatland restoration, as well as uncertainty over the ongoing costs and support for restoration efforts (Moxey *et al*., 2021). There are also concerns about new scheme options, particularly around payment levels, including the potential loss of eligibility for Basic Payment Scheme payments, and doubts about the feasibility and flexibility of some restoration activities (Reed *et al*., 2020).

3.2.2 Interventions for peatland restoration

Provide long-term economic support

As noted by Murray (2023) in relation to peatland restoration in Ireland, ensuring sufficient and long-term funding commitments is crucial for the voluntary participation of farmers in restoration efforts. Reed *et al*. (2020) stressed that payments should cover at least the full economic cost of implementing and maintaining changes, including capital costs, income foregone, ongoing maintenance (of restoration, and considering temporal variation), opportunity costs and time/labour costs, and provide long-term financial stability (Reed *et al*., 2020). Moreover, to make these incentives attractive, economic returns from entering a restoration scheme must compare favourably with existing land use and management practices (Reed *et al*., 2020). ACRES supports peatland restoration through results-based payments. This gives land managers incentives to maximise their ecological contribution for financial return. This scheme also supports landowners in utilising their experiential and local knowledge, which Farrell *et al*. (2024) have identified as important to peatland restoration.

Enable market development

Developing market-based incentives, such as carbon credit systems and other payments for ecosystem services from peatlands, can further support farmers and landowners in transitioning to sustainable practices (Sechi *et al*., 2021; Farrell *et al*., 2024). Belarus has developed a scheme for selling carbon credits to support peatland rewetting and biodiversity protection, while also providing financial support for landowners (Wilson and Wilson, 2017). A similar model is currently being trialled in Donegal.[5] Such initiatives are supported by accreditation bodies, such as MoorFutures in Germany and the Peatland Code in the UK (Sechi *et al*., 2021; Farrell *et al*., 2024), which assure voluntary carbon market buyers that the climate benefits being sold are quantifiable, additional and permanent (IUCN, 2024). Peatland Finance Ireland (2024) was established in 2022 with the aim of developing national- and catchment-scale financing systems for peatland restoration in Ireland. The current phase involves establishing the national-scale financing system. In summary, such market offerings can help address farmers' concerns about the economic viability of restoration efforts and support wider adoption of sustainable practices.

Promote community engagement, awareness and cultural change

Overcoming cultural and social resistance to peatland restoration is crucial for the successful implementation of restoration projects. Improving communication about the environmental imperatives of peatland restoration, for example in relation to water storage and quality, carbon storage and biodiversity, can engage rural communities and encourage their participation (Wilson and Wilson, 2017).

Community engagement schemes, such as Ireland's Peatlands and Natura Community Engagement Scheme,[6] play a crucial role in involving local communities in restoration projects. Such involvement fosters a sense of ownership and pride, making restoration efforts more sustainable. Finally, it is important to recognise that there is no "one size fits all" solution. Farmers need tailored information and

5 https://www.europeangreentransition.com/projects/carbon-credit-project-ireland/ (accessed 6 January 2025).

6 https://www.npws.ie/peatlands-and-turf-cutting/peatlands-and-natura-community-engagement-scheme-2024 (accessed 6 January 2025).

support to engage effectively, as well as a choice of approaches tailored to their specific needs and circumstances (Murray, 2023). Establishing more locally led restoration teams may be effective, as these teams provide direct interfaces and learning points, supporting local actions and empowering communities to understand and carry out restoration work themselves (Farrell *et al*., 2024). Learning should centre on the gaps identified in knowledge, which are highlighted by concerns about new scheme options particularly around payment levels, including the potential loss of eligibility for Basic Payment Scheme payments, and doubts about the feasibility and flexibility of some restoration activities (Reed *et al*., 2020). In addition, reinforcing positive perceptions of the "hidden" values of peatlands delivered through restoration can shift cultural attitudes in favour of these projects (Farrell *et al*., 2024).

To ensure equity and a just transition, a "comprehensive and formalised governance approach" is required (NESC, 2023:98). Farrell *et al*. (2024) recommended that an inter-departmental oversight group be created to ensure that each agency is working effectively to support restoration. This is likely to be the approach that will be taken in the formulation of the Nature Restoration Plan in the coming years.

Explore paludiculture opportunities

In the EU's Common Agricultural Policy (CAP), "paludiculture" is defined as the "productive land use of wet and rewetted peatlands that preserves the peat soil and thereby minimises CO_2 emissions and subsidence" (Mulholland *et al*., 2020). Adopting paludiculture may help to remove some impediments to land use change in Ireland by providing new sources of revenue and by ensuring that farmers can maintain their regional identities. There is increasing interest in paludiculture in Europe (now covered by CAP funding) including in the UK (in 2022, the UK Government launched the £5 million Paludiculture Exploration Fund) as a way of restoring peatlands while still farming. O'Neill *et al*. (2022) found that peatlands in County Offaly can support freshwater aquaculture to produce perch and trout and that this aquaculture offers potential for harvesting duckweed. Further research could explore what forms of freshwater aquaculture or crop production are suitable for particular areas and determine if there is a market for these products.

3.3 Renewable Energy Generation

3.3.1 Impediments to renewable energy generation

Promoting renewable energy generation, such as solar energy, wind energy and bioenergy generation, on farms can help to reduce greenhouse gas emissions. However, the widespread adoption of renewable energy technologies by farmers and landowners is hindered by several impediments.

Socioeconomic impediments

Impediments to renewable energy generation in Ireland include inadequate or unknown profit margins in the production of energy crops, driven by the lack of a guaranteed market. This challenge is exacerbated by high upfront investment costs and the need for long-term market guarantees,[7] such as stable and reliable economic returns over time (Augustenborg *et al*., 2012). Similar concerns were found by the National Economic and Social Council (NESC, 2023), which also identified low export tariffs as an impediment. O'Connor *et al*. (2021) studied Irish cattle farmers' attitudes to the installation of on-farm anaerobic digestion systems and found that high start-up costs were a significant obstacle. Furthermore, Augustenborg *et al*. (2012) found that younger farmers and those with lower agricultural education levels were less likely to show interest in adopting bioenergy crops, suggesting that perceptions of risk and long-term profitability might be more influential than technical knowledge itself. They also noted that some survey respondents mentioned the lack of co-operatives as an obstacle to adoption of bioenergy crops. Co-operatives would enable greater trust (Augustenborg *et al*., 2012). Tate *et al*. (2012) noted that famers may find traditional agricultural enterprises more economically viable than energy crops.

7 These long-term guarantees could take the form of long-term contracts, purchase agreements with energy companies, guaranteed subsidies from government programmes or consistent policies.

In the USA, landowners have concerns over long-term land productivity and planning, as farmers worry about how permanent solar photovoltaic structures might affect land viability and quality (Pascaris *et al*., 2020). Additional impediments include market uncertainty and a lack of awareness of benefits, and there is a perceived lack of opportunities for integrating solar photovoltaic renewable energy generation into existing production practices (Pascaris *et al*., 2020). It is likely that these are also impediments in Ireland.

Behavioural impediments

Pascaris *et al*. (2020) found that, in the USA, cultural values and beliefs, such as farmers believing that their land must remain actively agricultural to thrive in their farming communities, hinder the adoption of solar photovoltaic renewable energy generation. They also found that many farmers are hesitant to commit to projects if their access to land is uncertain or if they fear that they will lose access to land before they see a return on their investment in solar energy production (Pascaris *et al*., 2020). This issue is particularly relevant for Ireland's land rental market, which is dominated by conacre agreements (Bradfield *et al*., 2024).

Knowledge-related impediments

A lack of advisory services that provide guidance and information on energy crop production and the renewable energy scheme was identified as an impediment in Ireland (Augustenborg *et al*., 2012). However, this finding dates from 2012, when the renewable energy sector in Ireland would have been in its infancy. A lack of knowledge of technology poses an impediment to the installation of on-farm anaerobic digestion systems among cattle farmers in Ireland (O'Connor *et al*., 2021). A lack of awareness of benefits and a lack of knowledge regarding the operation and business plans of renewable energy have been identified as impediments in the USA (Pascaris *et al*., 2020).

Cumbersome and costly planning processes deter potential investors in renewable energy (Mbzibain *et al*., 2013), while doubts about the short-term financial viability of energy crops, such as uncertainties surrounding production costs, potential yields and market prices, create further challenges in the UK (Adams *et al*., 2011). Robb (2024) found that the design of county development plans prevents the development of wind farms, as do objections from locals who cite noise and ecological and health concerns. While citizen-related impediments to wind energy projects have been well documented, further research is needed to identify the impediments that prevent landowners in Ireland from installing wind turbines on their land.

3.3.2 Interventions for increased renewable energy generation

Increase financial incentives and economic support

Ireland has already taken steps to reduce economic impediments through economic support mechanisms like the Targeted Agricultural Modernisation Schemes, which offer grants for solar photovoltaic technologies (NESC, 2023). Expanding these programmes and introducing more favourable financial aid, such as increasing grants offered by the Solar Capital Investment Scheme, which currently offers a 60% grant rate, would make renewable energy projects more accessible to farmers with limited financial resources (NESC, 2023). Furthermore, the grants and other support provided by the Sustainable Energy Authority of Ireland for renewable energy installations (which are set to last only until 2028) could remain in place for longer (NESC, 2023). This would provide security for farmers looking to adopt renewable energy projects without fear of sudden changes to policy or support mechanisms.

Regarding solar energy, NESC (2023) identified the need for a solar feed-in tariff for surplus electricity to reduce economic impediments to solar energy production in Ireland. Representatives of the Irish Farmers' Association have called for dedicated renewable budgets and further support, such as easy and quick access to the national grid, and an awareness campaign by the government and its agencies to promote the benefits of solar and other renewable technologies (IFA, 2023).

NESC (2014) highlighted the potential of co-operatives to support the generation of wind energy in Ireland, following from the country's strong history of co-operatives. These would connect local communities and farmers and allow them to have a significant, financial stake in wind energy projects (NESC, 2014).

Provide market guarantees

Farmers are unlikely to invest in energy crops or renewable technologies if there is no guaranteed market for their products (Augustenborg *et al*., 2012). The 2007 Bioenergy Scheme, which provided grants to farmers to cultivate energy crops like willow and miscanthus, led to an increase in bioenergy crop cultivation (Clarke *et al*., 2019). However, the scheme ended in 2015 because of a lack of market for feedstocks. This highlights the need for a holistic, value chain-centred approach that considers the full range of market dynamics (Geoghegan and O'Donoghue, 2023).

To address market uncertainty, the government should offer long-term market guarantees for renewable energy products, providing farmers with assurance that they will have a stable, reliable demand for their energy crops. Anaerobic digestors could be supported by the government with a guarantee that they will procure a set percentage of their operation's energy needs from this source. This would boost the industry by guaranteeing demand. In addition, the government could enter contracts of difference, which are used in the electricity market in the UK. This would see the anaerobic digestor operator bid for a strike price[8] and, when the market price is below this, the government would pay the difference (GOV.UK, 2024). Again, this would provide some market certainty for operators.

Mitigate risk

The government could play a more active role in managing risk during the early stages of renewable energy project development. DAFM and DECC (2024) noted that the development of a biomethane industry across Europe has been facilitated by the availability of financial support at the nascent stage of development. Across all forms of renewable energy generation, one approach to mitigate risk aversion could be the introduction of partnership and joint venture models between local communities and private developers. Allowing the community to engage in project development without significant financial exposure could enhance community participation and buy-in, while mitigating concerns about capital investment (Curtin *et al*., 2019). Consideration must also be given to any equity and autonomy concerns arising for farmers, particularly in relation to any bioenergy projects that would require significant external capital (Brosnan, 2024).

Pascaris *et al*. (2020) noted that making the benefits of solar energy technology clear and ensuring that the technology is compatible with existing farm practices will be crucial for driving farmers' adoption of this innovative technology. This diversification also reduces financial risks by providing alternative income and enabling landowners to remain active farmers. This is also applicable to the production of energy crops.

Increase knowledge and enhance confidence

Although anaerobic digestion is a well-known technology in Europe, with over 20,000 plants in operation, it is a relatively new technology in Ireland (DAFM and DECC, 2024). Education and communication strategies need to go beyond providing technical information and should focus on enhancing farmers' confidence in making investment decisions. Educating stakeholder groups on the financial viability of these technologies is crucial for dispelling doubts and encouraging broader participation (DAFM and DECC, 2024). These personal approaches can help build trust, address concerns about profitability and provide the support needed to overcome the hesitancy that many farmers feel towards renewable energy investments.

Augustenborg *et al*. (2012) further highlighted the fact that Irish farmers are motivated to adopt energy crops not only for economic reasons but also because of the environmental benefits. However, more information is needed on sustainable mechanisms that can prevent competition between food and bioenergy production.

Balance biodiversity, climate and equity

Gorman *et al*. (2023) stressed the importance of the "right measure in the right place" in renewable energy development. For solar development, they indicated that technologies should be incorporated into the built environment rather than placed on agricultural or undeveloped land. In terms of bioenergy, they stressed that major land use change should be avoided to minimise soil carbon losses and that the use of waste products should be prioritised for bioenergy. A key

8 This is a fixed price at which the owner of the option can buy, or sell, the underlying security or commodity.

concern of these authors is that the "higher value of grass crops due to waste valorisation may drive further land-use change and intensification". According to Gorman *et al*. (2023), to help mitigate this, bioenergy expansion should incorporate plans on the "protection of important biodiversity landscape features such as hedgerows, ponds and buffer strips". One such measure could possibly be payments for ecosystem services incorporating biodiversity. In addition, there appear to be varying visions of how the bioeconomy should develop, ranging from a planned transition to sustainable capitalism (Hausknost *et al*., 2017). There may also be concerns about farmer input and ownership (Brosnan, 2024). To address these concerns, greater focus could be given to farmer and regional co-operative ownership models (Brosnan, 2023). Vera *et al*. (2022) stressed the importance of considering context-specific conditions for properly analysing synergies and trade-offs prior to any development. As bioenergy planning and discussion are at an early stage in Ireland, there is scope for a broad societal dialogue on what the nature and detail of the vision for the bioeconomy is in Ireland and its implications for biodiversity, climate, farmers and communities.

3.4 Organic and Regenerative Farming

3.4.1 Impediments to organic and regenerative farming

The EU Farm to Fork Strategy (2020) sets out the target that 25% of EU land should be farmed organically by 2030. The target in Ireland is for 10% of agricultural land to be farmed organically by 2030 (DECC, 2024). Organic farming currently accounts for 5% of agricultural land in Ireland (CAP Network Ireland, 2024), rising from 2% in 2021 (Loughran, 2022). Regenerative and agroecological farming are also discussed in this section. These farming practices, while not having formal certification processes, focus on the regeneration of soil and biodiversity and incorporate social and economic dimensions. Adopting organic, agroecological and regenerative agriculture practices can significantly contribute to sustainable land use by enhancing soil health, promoting biodiversity and reducing reliance on chemical inputs. However, the transition to these practices faces a number of impediments.

Socioeconomic impediments

Social and economic impediments include attachment to traditional agricultural practices and the influence of social norms that discourage the shift towards less conventional farming methods like organic, agroecological and regenerative farming (Hurley *et al*., 2023). In addition, the lack of perceived financial benefits from switching to these practices deters adoption (Hurley *et al*., 2023). This reluctance is further compounded by the upfront costs required to convert existing operations to regenerative practices (Kenny and Castilla-Rho, 2022), including the high upfront costs of converting to organic agriculture, which hinders adoption among small farmers in particular (DAFM, 2022). The lack of supportive polices and legislation also hampers the adoption of agroecological and regenerative farming (Kenny and Castilla-Rho, 2022; Hurley *et al*., 2023). In addition, the lack of generational replacement and farm succession, which is linked to economic impediments like the perceived lack of added value, financial resources for investment and access to land, hinders adoption of agroecological farming (Schwarz *et al*., 2021). Insecure land tenure and succession further exacerbates this issue, as tenant farmers or those without a clear successor are limited in their ability to make long-term system changes (Hurley *et al*., 2023). The labour and infrastructure required for organic, agroecological and regenerative farming also serve as significant impediments to adoption, as these farming systems often require more manual or specialised infrastructure (Schwarz *et al*., 2021; Hurley *et al*., 2023).

The lack of market access for organic and agroecological products is another significant issue, as farmers may be reluctant to transition to these practices without established markets within which they can sell their environmentally friendly products (DAFM, 2022; Brown *et al*., 2023). A survey of organic farmers showed that 72% believe that market access for organic produce is not adequate in Ireland and only 19% indicated that they have never sold their organic produce through conventional market routes thereby leading to market leakage (Brown *et al*., 2023). These farmers may lack the necessary capital to invest in new infrastructure, certification processes and the additional labour often required during the transition to organic farming. Finally, farmer characteristics such as age, gender and household size also influence

the likelihood of adopting organic farming practices, as older farmers, male farm operators and those with a small household size are less likely to adopt organic farming (Serebrennikov *et al*., 2020). This is possibly due to a combination of risk aversion, traditional farming values and limited labour resources (Serebrennikov *et al*., 2020).

Behavioural impediments

Behavioural impediments to the adoption of regenerative, agroecological and organic agricultural practices include personal values regarding the environment (Hurley *et al*., 2023), which influence whether or not farmers prioritise sustainability over conventional methods. Fear of change, particularly regarding transitioning from established practices, is also a key factor (Kenny and Castilla-Rho, 2022), as is risk aversion, where uncertainties about yields or profitability deter adoption (Serebrennikov *et al*., 2020). In addition, environmental attitudes, awareness and economic attitudes, such as profit orientation, negatively affect farmers' willingness to transition to these practices (Serebrennikov *et al*., 2020).

Knowledge-related impediments

In an Irish survey on organic farming, "management" (soil fertility, weed/pest/disease control, labour requirements and seed/feed availability) was highlighted as the most significant challenge for organic farmers (Brown *et al*., 2023). Related to this, limited access to knowledge and support networks was highlighted as a challenge (Brown *et al*., 2023; Hurley *et al*., 2023), with over half of organic farmers indicating that advice on organic farming practices is not adequately available (Schwarz *et al*., 2021; Brown *et al*., 2023). The lack of social capital, including networks for knowledge sharing involving farmers, advisors and researchers, further impedes the adoption of complex agroecological practices (Schwarz *et al*., 2021). A lack of skilled labour to implement these knowledge-intensive practices presents another impediment across Europe (Schwarz *et al*., 2021).

Finally, the sources of information that farmers rely on also influence adoption. Farmers relying on the media or press are less likely to convert to organic farming, and even those relying on advisory services and market communication face challenges in successfully converting to organic practices (Serebrennikov *et al*., 2020).

3.4.2 Interventions for increased organic and regenerative farming

Increase access to the Organic Farming Scheme

Expanding access to financial incentives through AESs such as Ireland's Organic Farming Scheme (OFS) can support farmers financially and reduce the perceived financial risk of converting to organic farming (Schwarz *et al*., 2021). Currently, only farmers with an organic licence can apply for this scheme, which excludes those who have not yet completed a conversion plan but are willing to convert and lack resources (Citizens Information, 2024; Government of Ireland, 2024a). It also excludes those who are experimenting with agroecological or regenerative practices. Providing new and accessible technologies to assist organic farming and agroecological and regenerative practices is also crucial. In Ireland, the Grant Aid for Organic Farm Infrastructure programme plays a significant role in this effort. It offers support for costs associated with farm buildings, as well as specialised equipment and machinery for organic farmers participating in the OFS (IOA, 2024).[9] By making such resources more accessible to farmers in the process of conversion and to those practicing agroecological and regenerative practices, the programme helps farmers transition to and develop more sustainable farming practices.

Provide further education and extension services

In addition to financial support, enhancing farmers' knowledge and skills is vital, as a lack of expertise in implementing regenerative and agroecological practices significantly hinders their adoption (Schwarz *et al*., 2021; Hurley *et al*., 2023). The level of specialist

9 This grant covers a wide range of necessities, including livestock buildings and funding for various types of machinery and equipment, such as mowers, toppers, mulchers, haybobs, straw choppers, dung spreaders, agitators, loaders and discharge dung spreaders, tedders, soil aerators and grass seeding options. For those involved in tillage/horticultural operations, the grant includes funding for a variety of implements and facilities. This includes multiple weeding tools like CombCut, rotary cultivators, brush and flame weeders and inter-row cultivators, as well as produce storage facilities, polytunnels, irrigation systems, insect and bird netting, and two-wheeled tractors (Teagasc, 2023).

organic advisory resources available has increased in Ireland in recent years (Loughran, 2022; Brown *et al*., 2023), with Teagasc increasing their numbers of specialist organic advisors from two to six and the Agricultural Consultants Association also developing their capacity in this regard (Agri Insider, 2024). While this is very welcome, this increase in the level of specialist advisory resources is small when compared with the increasing volume of farmers transitioning to organic farming (with 5000 participants in OFS in 2024) and these services are not designed to offer tailored advice.

The need for more tailored or bespoke advisory services is further reinforced by research from Balaine *et al*. (2022), which reveals that neither private extension services nor mixed public–private arrangements have effectively improved environmental performance on Irish farms and that they are not sufficient for driving the widespread adoption of sustainable farming practices and enhancing environmental outcomes. Engaging in organic, agroecological and regenerative practices requires adaptive management and innovation at the farm level. Agri-advisory services need to facilitate and enable this on-farm adaptive management and experimentation (Blackstock *et al*, 2010). Demonstration farms (Hurley *et al*., 2023) and peer-to-peer learning (Brown *et al*., 2023) play important roles. Peer communication has been shown to positively impact adoption rates (Serebrennikov *et al*., 2020). In addition to enhancing peer-to-peer networks, policies should draw on successful models like Ireland's European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) initiatives, especially the Maximising Organic Production Systems (MOPS) European Innovation Partnership (EIP) Project (2018–2021). This project demonstrated the value of on-farm monitoring, sampling and agroeconomic guidance in advancing growers' knowledge and business practices (DAFM, 2021). By supporting the formation of producer groups, facilitating information sharing and disseminating best practices through reports and videos, the MOPS project built capacity among organic vegetable growers (DAFM, 2021). These approaches should be integrated into broader policy frameworks to replicate and scale up successful organic farming practices across Ireland. Supporting digital platforms that facilitate information exchange and networking among farmers, advisors and researchers is essential.

Such an agri-advisory model is resource intensive and there will be a need to leverage other entities that already have a direct or indirect role in providing agri-advice (Byrne *et al*., 2024). The shortcomings are recognised, and the Agricultural Knowledge and Innovation System (AKIS) CAP Co-ordination Network is currently carrying out a programme of work to explore how key players in Irish AKIS could be better aligned to advance and support sustainable agricultural practices on Irish farms.

Implement market interventions

As pointed out earlier, key market impediments to engagement in organic farming include the limited availability of seed/feed and processers for organic produce and the need for many organic farmers to sell their produce through conventional market routes (Brown *et al*., 2023). The Organic Trading Hub, launched by DAFM in 2023, is an online marketing platform that links organic farmers and suppliers along the supply chain. This platform goes some way towards creating greater connectivity in and access to the organic food market in Ireland. Research into how well this platform is performing and if it could be further expanded would be beneficial. Another innovative initiative is the Leitrim Organic Farmers Co-operative, which provides options for suppliers to sell directly to the market, as well as offering advisory and knowledge transfer services (Leitrim Organic Farmers Co-operative, 2024).

Moreover, implementing policy instruments to strengthen farmer networks and associations can help drive the transition towards organic, agroecological and regenerative farming (Hurley *et al*., 2023)**.** These policy instruments could include legislation that supports (through grants or tax incentives) the creation and enhancement of producer groups or co-operatives focused on organic, agroecological and regenerative agriculture, enabling farmers to share resources, knowledge and market access. In addition to these structural changes, promoting supportive mentors, community champions and groups focused on organic, agroecological and regenerative agriculture can also play a significant role (Kenny and Castilla-Rho, 2022). An additional intervention would be establishing

regional processing and distribution centres to lower costs through scaled production (Kenny and Castilla-Rho, 2022). Kenny and Castilla-Rho (2022) suggested that increasing funding for marketing and advertising to craft compelling narratives for organic and regenerative products could also drive consumer demand and further shift attitudes towards sustainable farming.

Government incentives, including public procurement, can play a significant role in this effort (Schwarz *et al*., 2021). In Ireland, the government has implemented the Green Public Procurement (GPP) Strategy and Action Plan, which mandate that a minimum of 10% of food purchased via public procurement must be certified organic (Government of Ireland, 2024b). This strategy also emphasises the inclusion of seasonal products as a key criterion in public sector food procurement. Public procurement initiatives like GPP not only support the market presence of organic products but also drive demand for sustainable farming practices (Neto and Caldas, 2018). By prioritising organic products in public tenders, Ireland is setting a precedent for how public procurement can be leveraged to promote environmentally sustainable agriculture. Expanding and incentivising the procurement of organic foods in the private sector can further enhance their market presence, providing farmers with more stable income opportunities and helping address issues of generational replacement and farm succession (Schwarz *et al*., 2021). Moreover, establishing processing infrastructures and markets and reducing certification bureaucracy are essential steps for further improving market access and added value for agroecologically produced goods (Schwarz *et al*., 2021). To reduce the cost for the consumer, the government could subsidise the cost of local organic products through, where relevant, reducing or eliminating value added tax across retail and catering. This would help ensure greater economic sustainability by creating demand and adding value to these products.

Austria is a leader in organic farming, with strong government support dating back to the 1980s (Verburg *et al*., 2022). While Ireland has implemented similar methods, such as financial incentives for farmers converting to organic farming and AESs that are somewhat like the Austrian Agri-Environmental Programme, there are important differences in the details and context of support. By 2000, Austria was already offering substantial conversion bonuses of €330 per hectare (Musshoff and Hirschauer, 2008). This is similar to Ireland's current 2024 rates for dairy (€350), tillage (€320) and drystock farming (€300) (Government of Ireland, 2024c). Austria's farming conditions, characterised by less productive mountainous environments and relatively small, extensive farms, made the conversion to organic farming easier to implement (Musshoff and Hirschauer, 2008; Verburg *et al*., 2022). A key lesson that Ireland can learn from Austria's experience is on the role of intensive advertising in promoting organic products. In Austria, the shift to organic farming was supported by large food chains and processors, who began introducing organic brand names in 1994 (Pohl, 2003). This increased public awareness and demand for organic foods. To replicate Austria's success, Ireland could benefit from launching national campaigns to raise awareness of organic products, thereby boosting consumer demand. In addition, developing local markets for organic products, such as farmers' markets and organic sections in supermarkets, could further support this growth.

In summary, policies should focus on improving information provision, increasing farmers' access to organic markets, enhancing consumer demand and fostering willingness to pay price premiums for organic produce. This can provide opportunities for organic farmers to supplement their incomes, thereby reducing the perceived risk of adoption (Läpple and Van Rensburg, 2011). In addition, those farmers who are not yet ready to convert to organic production could be supported to engage with agroecological principles and regenerative practices on their farms and thereby take a stepped approach towards converting to regenerative organic farming (Rodale Institute, 2024).

Offer additional tax relief for renting out land

Engaging landowners and addressing tenure issues are vital for enabling long-term agroecological transitions (Hurley *et al*., 2023). Creating new regulations or incentives for rental agreements can facilitate access to land for agroecological farmers. For example, the Irish Government may consider offering

greater tax relief[10] for landowners who rent out their land to tenants meeting environmental standards. This would help tenant agroecological farmers compete with farmers of more profitable dairy farms for rented land, addressing the impediments of land access and tenure security. An alternative option would be to issue a contract that involves a landowner accepting lower rent payments from organic farmers on the condition that, for example, the soil is maintained at a certain quality.

3.5 Water Quality Management Practices

Nutrient pollution from agriculture is a major issue affecting Ireland's water quality. To address this deterioration, it is necessary to reduce nutrient losses from agriculture through interventions such as nutrient management planning, establishing riparian buffer zones, preventing cattle access to watercourses, implementing permanent grass cover and adopting other water pollution reduction technologies. However, the adoption of these practices faces a number of impediments.

3.5.1 Impediments to water management practices

Socioeconomic impediments

Socioeconomic impediments include farmers' fear of interfering with the current farming system, with highly productive farmers having concerns over loss of land, production and income when adopting riparian buffer zones (Buckley *et al*., 2012). Another important impediment involves issues related to land ownership. Farmers without full ownership of their land face unique challenges when it comes to adopting conservative practices such as riparian buffer zones or preventing cattle from accessing watercourses (van den Berg *et al*., 2023). The dependence on co-operation with landowners or neighbouring farmers, combined with high implementation costs, can hinder efforts to prevent cattle access to watercourses (van den Berg *et al*., 2023). Farmer characteristics like age also play a role in the adoption of water quality management measures. Older farmers are more risk averse when it comes to nutrient management planning (Daxini *et al*., 2018) and less likely to adopt manure-based fertilisers, manure treatment technologies, and soil and water conservation practices (Serebrennikov *et al*., 2020). Farm characteristics, such as farm size, further influence farmers' decisions. Smaller farms are less likely to adopt nutrient management planning because economies of scale are insufficient to justify the investment (Gachango *et al*., 2015; Daxini *et al*., 2018). Some farmers operating with a high gross margin might be less likely to adopt water conservation schemes, as the financial incentive to continue with their current practices outweighs the perceived benefits from engaging with conservation efforts (Serebrennikov *et al*., 2020). Moreover, low subsidy levels hinder the adoption of nitrate reduction programmes, as farmers feel that the financial support is insufficient to offset the potential economic losses (Gachango *et al*., 2015).

Behavioural impediments

Behavioural impediments include risk aversion, with farmers expressing concerns about the risk of weeds spreading due to buffer zones, coupled with scepticism towards government regulation (Buckley *et al*., 2012) and perceptions of conflicting policies (Houses of the Oireachtas, 2024). Psychological factors play a significant role, including a lack of positive attitudes towards the profit and productivity benefits of nutrient management planning, as well as a lack of subjective norms, meaning that there is an absence of social pressure within farming communities to apply fertiliser based on soil test results (Daxini *et al*., 2018). Farmers also perceive a lack of resources (time and finance), confidence and autonomy in relation to implementing nutrient management planning (Daxini *et al*., 2018). In addition, fear of external factors like unforeseen changes in the weather can hinder the adoption of nutrient management planning (van den Berg *et al*., 2023). Attitudes and beliefs also contribute to resistance, with some farmers perceiving conservation subsidies to be low and, therefore, unlikely to cover the costs of adopting soil and water conservation practices (Serebrennikov *et al*., 2020). Finally, a significant "behavioural hurdle" identified by Osawe and Curtis

10 Current tax relief is as outlined at https://www.revenue.ie/en/personal-tax-credits-reliefs-and-exemptions/land-and-property/leasing-farm-land/index.aspx (accessed 6 January 2025).

(2024) is that some farmers remain reluctant to believe that agriculture is a primary contributor to water quality issues, believing instead that the farming sector has already done enough to address these concerns.

Knowledge-related impediments

Knowledge-related impediments include dependence on others, as many farmers must wait for advisors to take soil samples and provide advice on nutrient management planning (van den Berg *et al*., 2023). A lack of information about the products they are advised to consider, such as advice on the right type of fertiliser to use or the rate of application, in nutrient management planning further hinders adoption (van den Berg *et al*., 2023). Farmers with lower levels of formal education and agricultural training are less likely to adopt nutrient management planning, and limited access to context-specific agricultural extension services, including advisors or discussion groups, exacerbate this issue (Daxini *et al*., 2018). In addition, Osawe and Curtis (2024) pointed out that farmers lack awareness of the quality of their local waterways, which limits their understanding of the urgency and importance of implementing water quality management practices.

3.5.2 Interventions for improving water management

Provide tailored advisory services

Results from research by Buckley *et al*. (2012) show that higher adoption rates of nutrient management practices in Ireland are associated with contact with agricultural advisors and participation in farmer discussion groups. Daxini *et al*. (2018) further highlighted that the involvement of an agricultural advisor is positively associated with the intention to apply fertiliser based on soil test results. In other words, agricultural advisors play a key role in helping farmers implement nutrient management practices by providing essential knowledge and technical expertise (Daxini *et al*., 2018).

Agri-advisory services could tailor their outreach and support activities to specific farmer groups, namely those who are less likely to adopt these practices, such as older farmers, operations with a high gross margin, small farms and low-density livestock farms (Gachango *et al*., 2015; Daxini *et al*., 2018; Serebrennikov *et al*., 2020). Older farmers, especially those without a clear successor, often have shorter planning horizons and may resist adopting new technologies because of perceived risks and a lack of long-term incentives (Gebrezgabher *et al*., 2015). Agri-advisory services could address these concerns by offering more tailored advisory services that highlight the longer-term economic benefits of water quality management, such as improved soil health, cost savings and compliance with future regulations. This is the intention of the Nitrates Derogation Renewal Plan, which involves the recruitment of 50 water quality advisors in priority areas and the commencement of an advisory programme called Better Farming for Water (DAFM, 2024b).

These initiatives could be supported by mentorship programmes where experienced farmers share success stories with peers to foster trust and overcome resistance to change. For farmers operating with a high gross margin, targeted agri-advisory services could emphasise the potential economic and environmental risks of inaction, including the threat of future regulations and market pressures favouring sustainable practices. Small farms and those with low-density livestock also tend to resist adopting water quality management practices, because of misconceptions. Some believe that reducing livestock numbers alone will sufficiently address manure management (Gebrezgabher *et al*., 2015) or that their farms have minimal environmental impact or limited impact on water quality (van den Berg *et al*., 2023). However, even farms with low stocking rates can contribute to water quality issues (van den Berg *et al*., 2023). It is crucial for any agri-advisory programme to dispel these misconceptions, emphasising that all farms, regardless of size and type, have a role in improving water quality. To encourage adoption, mentorship programmes, complemented by on-farm demonstrations and workshops that highlight the economic benefits of adopting these practices, should be tailored to these groups, focusing on profitability, soil health and long-term sustainability. Advisory support should also be tailored to the particular soil context to be useful and effective. This approach would address concerns about fear of change, perceived misalignment with farming goals and misinformation about the environmental impact of small or low-density farms. Policies should promote

farmer-to-farmer learning platforms to stimulate social pressure, especially among farmers who trust peer recommendations (Daxini *et al*., 2019).

Promote collaborative and catchment-level approaches to water quality

As water quality issues may not appear at the point source but further downstream in the water body, water quality management is a landscape challenge. This requires a collective and landscape-scale approach, in addition to individual advisory programmes. The Agricultural Sustainability Support and Advisory Programme (ASSAP), in collaboration with the Local Authority Water Programme (LAWPRO), offers farmers targeted water quality advice in 190 priority areas for action as identified in Ireland's River Basin Management Plan (Teagasc, 2025). It has been noted that, even with the tailored advice and one-to-one interaction approach of ASSAP, a significant number of farmers within the programme still hold the belief that agriculture is not the primary factor in deteriorating water quality and that farmers are "doing enough" in this space (Osawe and Curtis, 2024).

In addition to tailored advice, various authors (e.g. Lokhorst *et al*., 2010; Osawe and Curtis, 2024) have made an argument for mechanisms that allow farmers to make a "public commitment" to implementing sustainable practices. Lokhorst *et al*. (2010) noted an example of when this commitment was voiced by farmers at a public meeting. This commitment could also be achieved through a scoring mechanism within a farming group, as was done using biodiversity scoring in the EIP-AGRI Biodiversity Regeneration in a Dairying Environment (BRIDE) Group. Many of the results-based approaches have this public or within-group commitment element to lesser and greater extents.

The success of ASSAP is dependent on the "innate interpersonal skills of advisors and their personal rapport with farmers are indispensable in encouraging the adoption of new behaviours and farming practices" (Osawe and Curtis, 2024:10), which, as Osawe and Curtis (2024) indicated, results in variable success across catchments. These authors pointed to the importance of resourcing a farmer engagement platform approach within ASSAP (Osawe and Curtis, 2024), enabling a central focus on the advisor–farmer relationship. As also highlighted by Osawe and Curtis (2024), a significant number of ASSAP farmers surveyed in their work (42%) were not aware of the quality status of the river closest to them and were also more open to diffuse or non-point rather than point source mitigation measures. This highlights that, despite the intervention of the ASSAP, there is a lack of landscape-based thinking among these farmers (Arts *et al*., 2017). While the ASSAP model involves collaboration between bodies (co-operatives, Teagasc, LAWPRO, DAFM, EPA), there may be a gap in enabling collaboration between farmers themselves within a water catchment area. This may be addressed through the Waters of LIFE programme, which is an EU LIFE Integrated Project that aims to help reverse the deterioration of Ireland's most pristine waters. It has six pilot catchment-scale demonstration projects to "test and validate the effectiveness of implementing locally-tailored 'best practice' measures across a range of landscapes and land uses typically associated with the catchments of high-status waters" (Waters of LIFE, 2025). This project is particularly important in terms of developing catchment and multi-stakeholder approaches to improving water quality and enabling farmer-to-farmer collaboration, which is possibly lacking in the ASSAP approach. The Waters of LIFE approach addresses the governance concerns raised by O'Riordan *et al*. (2022) and goes some way towards the development of an experimental governance framework.

The challenge going forward will be to extend the learning from these pilots to a wider number of catchments. The Water Action Plan 2024 will go a long way towards supporting collaborative approaches; particularly important will be the development of the Catchment Community Fora, which will develop local community plans. Funding has also increased under the Community Water Development Fund (DHLGH, 2024).

Design agri-environmental schemes for water quality

Osawe *et al*. (2024) reviewed the effectiveness of AESs on water quality and highlighted that the there is a lack of evidence indicating that past AESs have been effective at improving the quality of water bodies to "good status" as defined by the EU Water Framework Directive. These researchers highlighted the complex

nature of achieving good water quality and stress the importance of considering interactions along the production chain, including inputs (farm inputs, subsidies, regulations), farm activity and outputs (farm production, water/air quality, landscape/biodiversity). They indicated that many of the AESs to date have primarily focused on inputs (e.g. tree planting) rather than outputs (water improvements). While outputs require a results-based payment model, the time lag between input and actual output improvement may require a "blended incentive approach" over a limited time frame, with a majority of input-based payments being made in the initial year before switching to results-based payments in later years (Osawe *et al*., 2024). These researchers also advocate a shift from farm-level payments to universal catchment-based payments, where payments are made on the basis of water quality at catchment rather than farm level. This will involve delineating catchments along water flows, measuring water quality and calculating the assimilative capacity (in terms of nitrates and phosphates) in each catchment. A natural capital approach could help with documenting the natural resources in a catchment (Stout *et al*., 2023; Natural Capital Ireland, 2024). Osawe *et al*. (2024) suggested that a trading quota system could exist within the catchment, with more extensive farmers trading their quotas with more intensive farmers. AES payments would be based on a "whole-catchment" basis, where if the catchment receives a "good status" all farmers within the catchment would share the associated payment. This universal approach would also facilitate an internal monitoring system, where peer pressure from neighbouring farms influences on-farm behaviour. Participation would be universal rather than mandatory or voluntary. This model would be supplemented with bespoke agri-advice and training, which could be supported by those already in the catchment who are engaging with agri-advisory services either directly or indirectly (Byrne *et al*., 2024). Osawe *et al*. (2024) indicated that this proposal would be a shift away from an "inputs-focused, farm-holding-level scheme to one with a focus on catchment-level outcomes". The Organisation for Economic Co-operation and Development (OECD, 1998, 2013) has long advocated this type of territorial payments model and lessons can also be learned from environmental co-operative payments models in other parts of the EU (OECD, 2013; Terwan, 2016). Osawe *et al*.'s (2024) proposal outlines the technical and softer details of how such a model would work. Drawing on these works, now would seem to be a good time to seriously engage with the research, data gathering and design of these catchment-based payment models.

Implement long-term land tenure and investment incentives

Insecure land tenure remains a significant impediment to the adoption of water quality-enhancing practices for sustainable land management in Ireland (van den Berg *et al*., 2023). Policies should focus on creating a more stable and secure environment for farmers to invest in sustainable practices. Implementing further tax incentives to promote long-term land leases can provide farmers with the security needed to invest in environmental sustainability, which could include practices beneficial for water quality management (Adenuga *et al*., 2023). This approach would not only incentivise sustainable land use but also ensure that environmental considerations, such as water quality and biodiversity conservation, are integral to land management strategies (Adenuga *et al*., 2023). In addition, policies should emphasise the importance of environmental stewardship in land-leasing agreements. By linking access to government grants with the adoption of environmentally sustainable practices, such as those aimed at improving water quality, farmers may be more inclined to adopt these practices, even in the context of insecure land tenure (Adenuga *et al*., 2023). Providing secure, long-term land leases can enhance farmers' ability to invest in productive fixed assets (Bradfield *et al*., 2023), including those necessary for effective water quality management. This would not only foster environmental stewardship but also contribute to the sustainability of agricultural practices.

3.6 Agri-environmental Schemes

AESs are generally voluntary and include schemes offering payment incentives for farmers and/or landowners in exchange for managing land for some form of ecological service (Piñeiro *et al*., 2020). AESs constitute a crucial component of agricultural policy across Europe and signify a substantial investment in conservation efforts, as they encourage environmentally sensitive practices among farmers. However, various impediments hinder their adoption.

The impediments discussed below were identified prior to the commencement of ACRES.

3.6.1 Impediments to agri-environmental schemes

Socioeconomic impediments

Social and economic impediments to AESs include social norms, such as the importance attributed to community-based networks and conventions, which prioritise traditional notions of success and prestige such as the "good farmer" identity. This identity, which values high yields and visually well-maintained land, may deter the adoption of new practices perceived as less productive or economically rewarding (Macken-Walsh, 2009; Cusworth and Dodsworth, 2021). Farm-specific characteristics also influence AES adoption, such as farm income, with more profitable and productive farms being less likely to participate in AESs (Zimmermann and Britz, 2016; McGurk *et al*., 2020). Dairy farmers were found to be the least likely to consider participating in AESs in Ireland, as they operate within a highly intensive and profitable farming system and therefore require larger financial incentives to engage (McGurk *et al*., 2020). Farm size has a positive effect on farmers' willingness to consider AESs, with smaller farms being unlikely to participate (McGurk *et al*., 2020). Younger farmers, who tend to operate more efficient and production-oriented farms, are less likely to participate. However, beyond a certain point, older farmers become less likely to participate, which may be due to a certain conservativism among this group (McGurk *et al*., 2020). The complexity of AES contract types, such as results-based contracts, may necessitate extensive knowledge and infrastructure. The financial uncertainty associated with these contracts (Bradfield *et al*., 2024), as well as delays and uncertainty in payments (Murphy, 2022; Raollaigh, 2024), can deter farmers from participating in AESs. ACRES, which includes results-based contracts, is discussed in section 3.6.5.

Behavioural impediments

Behaviour-related impediments include a mismatch between farmers' environmental concerns and scheme objectives (McGurk *et al*., 2020). AESs are often perceived to undermine farmers' decision-making autonomy and this deters farmers who value their independence and wish to maintain control over their practices (Bartkowski *et al*., 2023). In addition, Kingston *et al*. (2021) found that 43% of Irish farmers surveyed agreed that others should not get involved in environmental decisions concerning their property. This belief was due to a strong sentiment that the way EU legislation on nature conservation and restoration had been implemented in Ireland was unfair, lacked transparency and led to unrealistic demands (Kingston *et al*., 2021). Cullen *et al*. (2020) found that farmers with a forward-looking self identity are the most likely to have participated in an AES in Ireland. These farmers were described as being innovative and looking to continue farming into the future.

Knowledge-related impediments

Knowledge-related impediments include a low educational level, with higher levels of education being positively correlated with AES participation, indicating that less well-educated farmers may lack the knowledge needed to engage with these schemes (McGurk *et al*., 2020). Findings from European countries show that a lack of availability and the limited extent of advisory services also limits farmers' participation (Bartkowski *et al*., 2023). Bureaucratic tasks involved in AESs and the design and complexity of the schemes, especially for schemes with overly complex or restrictive requirements, may discourage farmers from participating (Bartkowski *et al*., 2023). Furthermore, non-familiarity with AESs among famers further exacerbates these challenges (Bradfield *et al*., 2024).

3.6.2 The characteristics of successful agri-environmental schemes

Piñeiro *et al*. (2020), in their widescale scoping review, indicated that AES adoption depends on many factors, ranging from the complexity of the AES; the incentives offered (whether the incentives compensate sufficiently for any loss of productivity, cost of implementation and opportunity costs forgone); the environmental outcomes (whether farmers perceive that the AES will actually lead to positive environmental outcomes); and the experience of the farmer and the farmer's capability to act. Piñeiro *et al*. (2020) outlined the following key policy recommendations for a successful AES: balance the incentives and outcomes; know your farmers; keep it simple; offer complementary

interventions (single interventions are less likely to succeed than a combination of policy instruments); remember that behavioural preferences matter (and these vary depending on the target population); be prepared for a long-term horizon (this depends on agricultural practice, the production system, the biological cycle and a need to ensure that cash flow problems do not compromise the intervention); and create an enabling environment (consider the many factors that influence the capacity and willingness of farmers to invest in environmental practices). Osawe *et al*. (2024) outlined key dimensions of successful AESs, including results-based incentives, area-based payments, being catchment-based, simplicity and flexibility (along with bespoke advisory services and clear consistent messaging on environmental impact to the farmer). They also explored past and current AESs according to these five success criteria. This is presented in Table 3.1.

As shown in Table 3.1, only ASSAP is catchment based. None of the payment-based schemes (i.e. those that involve results-based incentives or area-based payments) meet the catchment, simplicity or flexibility criteria. ACRES is an evolution of early schemes in that, while not meeting any of these three criteria, it does meet the results-based payments AES success criteria.

The design of an AES should not undermine the agency (Ellerman, 2000) or "stifle the innovativeness" of the farmer (Osawe *et al*., 2024). Consideration must be given to the internal agency of the farmer and Mills *et al*. (2016:15) indicated that "an internalisation of the values underpinning environmental management activities is required" and that unless sustainable practices become "habituated, their influence can diminish over time" (drawing on the work of Alcott and Rogers (2012)). This requires the farmer to take ownership over sustainable practice and its evolution. Osawe *et al*. (2024) highlighted the importance of farmer engagement and re-engagement in the design of policy and schemes. Kingston *et al*. (2021), in their research on the success story of the Burren Life Programme, highlighted the importance of "consultation, local knowledge and the involvement of local farmers in rule-making and enforcement". Ecological benefits were evidenced by the fact that the average farm score, as assigned by the programme's farm advisors, increased from 6.61 in 2010 to 7.43 in 2019[11] (Burren Programme, 2024). The learnings from successful AESs such as the Burren Life Programme can be utilised in the development of future place-based approaches to sustainable land management in Ireland.

3.6.3 Agri-Climate Rural Environment Scheme

As previously noted, the impediments to AESs discussed were identified prior to ACRES. This new scheme is likely to reduce impediments due to financial unattractiveness and a desire to retain autonomy, as the results-based nature of the scheme allows farmers to dictate their own practices and results. However,

Table 3.1. Agri-environmental scheme attributes

	Scheme					
Attribute	**REPS**	**AEOS**	**GLAS**	**ACRES**	**ASSAP**	**Signpost**
Results-based incentives	X	X	X	✓P	X	X
Area-based payments	✓P	✓P	✓P	✓P	X	X
Catchment-based	X	X	X	X	✓	X
Simplicity	X	X	X	X	✓	✓
Flexibility	X	X	X	X	✓	✓

✓P indicates a partial implementation of the attribute.

AEOS, Agri-Environment Option Scheme; GLAS, Green, Low-Carbon Agri-Environment Scheme; REPS, Rural Environment Protection Scheme.

Source: Reproduced from Osawe *et al*., 2024; reproduction licensed under CC BY 4.0 (https://creativecommons.org/licenses/by/4.0/).

11 More details on this methodology can be found at http://burrenprogramme.com/impact/outputs/ (accessed 6 January 2025).

a remaining impediment is expected, as ACRES enrolment may not be attractive for intensive or high-profit farms. There are two reasons for this argument. High-profit farms have a greater opportunity cost in converting their land to more extensive practices and the ACRES co-operation scheme is offered only to farms in high-priority geographical areas, which tend to be farmed less intensively than those in other parts of the country (DAFM, 2024c).

At the time of this report, evidence on the perception of ACRES was mainly anecdotal and published in the media. The Irish Farmers' Association's representatives have been quoted as describing ACRES as too complex and they have concerns over delays in payments (IFA, 2024). However, these may be teething issues, and thorough research is required to identify the perceptions of ACRES and its influence on land use change.

3.6.4 Contract design within agri-environmental schemes

Bradfield *et al*. (2024) assessed perceptions of innovative contract types within AESs. They found that results-based contracts are understood and considered economically beneficial by most farmers surveyed in Ireland. This is important, as results-based contracts are a feature of ACRES. Bradfield *et al*. (2024) found that young farmers are the most likely to consider results-based contracts economically beneficial and that the farming system is not the deciding factor.

Contracts that provide payments based on collective action can be ecologically beneficial for water quality and peatland restoration, which typically need to be managed on a landscape basis. However, Bradfield *et al*. (2024) found that these collective action contracts are considered economically beneficial by only 38% of farmers surveyed, which creates an impediment. Bradfield *et al*. (2024) identified longer contracts as one way to encourage adoption. In addition, as part of research conducted by NESC (2023), stakeholders identified the co-operation project model under ACRES, which emerged from learning gained from previous EIPs, as providing a strong model that should be scaled up further. Local action planning and the role of farmers as the leading actors of change were identified as potential contributors to its success. Importantly, ACRES, like previous AESs, is voluntary for farmers.

Alternative contract options include value chain contracts, where other actors in the food supply chain, whether they be processors, customers, etc., pay a higher price to farmers for products that are produced in an environmentally friendly way. Bradfield *et al*. (2024) found that this is particularly favoured by renting farmers. These contracts create a greater sense of equity in the efforts of society to protect the environment. The results of Bradfield *et al*. (2024) also suggest that renting farmers would like to see landowners bear more environmental responsibility by accepting lower rent payments under the agreement that tenants manage farmland to agreed environmental standards.

Effective contract design within AESs may help to support fairness. For example, Murphy *et al*. (2022) found that beef farmers in Ireland noted an unequal distribution of the benefits and burdens of social co-operation and the effects of climate action, with small farms carrying the greatest burdens and the most powerful actors, including processors and large farms, reaping the greatest benefits.

4 Conclusions and Policy Recommendations

4.1 Common Impediments to Land Use Change

Table 4.1 provides an overview of the impediments to afforestation, peatland restoration and rewetting, renewable energy generation, organic and regenerative farming, and water management. The impediments listed are those that were found in the review of existing literature and evidence, and the absence of an impediment from this list is not confirmation that such an obstacle does not exist. It is also important to highlight that, as previously mentioned, the literature reviewed on impediments dates from prior to ACRES and the Afforestation Scheme (2023–2027), which means that some impediments may soon be less relevant than they once were. Much of the literature on impediments to peatland restoration was drawn from international sources, as this topic is relatively under-researched in Ireland.

It is clear from Table 4.1 that financial concerns are a strong impediment to land use change. However, many of these can be reduced by grants. Impediments regarding knowledge are also relatively easily remedied. Attachment to land and traditional farming practices are central to land use decision-making. These are long-term sentiments that are unlikely to be heavily influenced by individual sets of policies. Therefore, it may be more feasible from a policy perspective to support these sentiments through initiatives that encourage incremental land use changes or those that support practices that complement traditional farming, such as agroforestry.

4.2 A Summary of Interventions to Encourage Land Use Change

A summary is provided below of the interventions identified for encouraging land use change and the types of support to prioritise.

4.2.1 Socioeconomic aspects

- **Improve financial support and incentives:**
  - Increase and diversify financial incentives (e.g. grants, subsidies, tax relief) to reduce high upfront costs, compensate for opportunity costs and enhance profitability of practices.
  - Introduce tailored funding mechanisms for smaller farms and tenant farmers and to support collective efforts to manage land sustainably.
- **Simplify administrative procedures:**
  - Streamline the bureaucracy involved in applying for policy support and funding, reducing administrative complexity and delays.
- **Enhance market access and infrastructure:**
  - Support equitable market development for sustainable products to ensure that farmers receive a fair return for their environmental protection efforts. In some cases (e.g. organic produce and renewable energy), government procurement may be required to generate demand.
- **Strengthen land tenure security:**
  - Implement policies that provide greater security for tenant farmers and those without succession plans, ensuring access to land for long-term environmental commitments.

4.2.2 Behavioural aspects

- **Foster farmers' autonomy and participation:**
  - Empower farmers to retain decision-making autonomy while providing co-operative models that still allow flexibility in land use choices, mitigating concerns over external control. This can involve a mix of results-based and collective action contracts.
  - Engage farmers in the co-design of policies and interventions, making sure they feel ownership of the solutions being proposed.
- **Leverage social identity and cultural values:**
  - Promote incremental change and complementary farming practices (e.g. agroforestry and paludiculture) that align with the cultural and social identity of farmers who enjoy traditional farming.

Table 4.1. An overview of impediments to land use change, by type of land use

Impediment	Afforestation	Peatland restoration and rewetting	Renewable energy generation	Organic and regenerative farming	Water management
Financial impediments					
Low level of financial attractiveness	X	X	X	X	X
Market uncertainty			X	X	
Long period required to recoup financial benefits	X				
Perception that land use change devalues land	X		X		
High start-up costs		X	X	X	X
Irreversibility may limit future decisions	X				
Uncertainty over long-term financial benefits	X	X	X	X	
Demographics					
Small farms	X			X	
Younger farmers			X		X
Older farmers				X	X
Lack of successor				X	
Support systems					
Lack of peer support	X	X		X	X
Administrative burden in applying for funding		X			
Lack of cross-farm co-operation		X			X
Lack of trust in policies and legislation				X	X
Lack of co-operatives to eliminate intermediaries			X		
Resistance to institutional support		X			
Resistance from local or planning authorities			X		
Practical resources					
Lack of labour and infrastructure				X	
Lack of time to implement changes		X			X
Insecure land tenure			X	X	X
Interference with current farm practices		X	X		X
Knowledge					
Low levels of formal education	X		X		X
Lack of access to tailored extension services			X	X	X
Lack of knowledge and expertise	X		X	X	X
Uncertainty over environmental benefits		X		X	
Social factors and perceptions					
Desire to remain an active farmer	X		X		
Attachment to traditional practices	X	X	X	X	
A desire for autonomy		X		X	X
Fear of change/risk aversion				X	X
Personal or regional identity		X	X		
Being a “good farmer” is not consistent with this practice	X				
“Good land should be used more productively”	X				
External factors such as weather					X
“Farmers already do their fair share to protect the environment”					X

4.2.3 Knowledge-related aspects

- **Increase knowledge and awareness:**
  - Tailor communication to local contexts and farmer needs, using respected leaders in sustainable practices to ensure maximum outreach and understanding.
  - Develop communication programmes that enable farmers to recognise the value of their work to nature restoration, identifying opportunities and building trust. Part of this communication would involve highlighting a clear link between payments and nature-related actions. It would also involve leveraging the significant data already gathered as part of ACRES. It is also important to communicate with the wider public about the role of farming and the need for solidarity and market support.
- **Expand advisory services and support networks:**
  - Use learnings from the success of previous or existing successful AESs and projects (e.g. the Burren Life Programme) to develop place-based approaches, thus counteracting scepticism about government programmes and the perceived lack of tangible benefits.
  - Expand agricultural extension services, offering specialised advice and technical support on adopting sustainable practices and navigating policy requirements. As noted by Gorman *et al*. (2023), the use of land for generating renewable energy can present a trade-off when the protection of biodiversity is considered. Tailored support to individual farmers may help to ensure that renewable energy generation is considered on land that provides mutual benefits for the farmer and nature.
  - Continue support of ongoing agricultural education, particularly for younger or less experienced farmers, to equip farmers with the knowledge needed to engage in sustainable practices confidently.

4.2.4 Types of support that should be prioritised

From the extensive list of impediments identified and a review of interventions aimed at supporting sustainable land use change, some types of support, to provide opportunities in the short to medium term, have been identified for prioritisation. They are:

- **Complementary practices and farm diversification:** in relation to forestry and the rewetting of peatlands, complementary practices (e.g. agroforestry and paludiculture) or incremental changes should be supported, to remove economic impediments and concerns over how land use change may influence the satisfaction that farmers gain from traditional farming practices. This would also reduce concerns over the perceived irreversibility of these land use changes. For agroforestry, this could be achieved by providing flexibility regarding replanting obligations. The number of hectares within the Native Tree Area Scheme that can be planted without a licence could also be increased. Additional financial support could be provided for paludiculture through government subsidies or a privately funded carbon credit scheme, which is currently being explored in Donegal.
- **Pilot universal catchment-based or collective action payments:** such schemes would see farmers collectively rewarded for the good status of waterways or peatlands. This would require collaboration across a waterway or region and the payments that participants receive would be dependent on the actions of all group members. Such payment schemes would help to create a sense of shared responsibility among farmers in the area. These schemes should be locally led to benefit from experiential learning and the strong role that peer support plays in fostering land use change, as well as being flexible to allow for the emergence of innovation from local implementation. This could be implemented within ACRES as an extension of its co-operation approach. A long-term commitment to providing such payments is important, to reduce financial uncertainty for farmers.
- **Market opportunities:** guaranteed demand is important for encouraging renewable energy generation, and the government could support this through increased procurement of energy from such sources in Ireland. Moreover, it is important that organic farmers receive a fair price for their produce and this is currently a challenge, as there is leakage into the conventional sector.

Organic food competes with conventional food within the same supply chains and does not receive a sufficient premium to reflect costs. Support is required to enable the development of a processing, distribution and marketing infrastructure for organic foods. Lessons could be learned from the Leitrim Organic Farmers Co-operative, the Organic Trading Hub and other short supply chain initiatives to enable the development of this side of the supply chain. An extension of the requirement that 10% of produce purchased via public procurement must be organic would also help to generate additional demand within the market.

4.3 Study Limitations and Other Considerations

Limitations of this work include the lack of information available on how new or newly revised schemes affect impediments to land use change. For example, evidence on farmers' opinions and experiences of ACRES is anecdotal and the Afforestation Scheme 2023–2027 is still very new. There is also limited evidence, from an Irish perspective, on some of the categories of land use change, particularly in relation to peatland restoration. Greater and more frequent primary data collection on impediments to land use change would reduce these limitations.

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Abbreviations

ACRES	Agri-Climate Rural Environment Scheme
AES	Agri-environmental scheme
AKIS	Agricultural Knowledge and Innovation System
ASSAP	Agricultural Sustainability Support and Advisory Programme
CAP	Common Agricultural Policy
DAFM	Department of Agriculture, Food and the Marine
DECC	Department of the Environment, Climate and Communications
EIP	European Innovation Partnership
EIP-AGRI	European Innovation Partnerships for Agricultural Productivity and Sustainability
GPP	Green Public Procurement
LAWPRO	Local Authority Water Programme
MOPS	Maximising Organic Production Systems
NESC	National Economic and Social Council
OFS	Organic Farming Scheme

Glossary

Agroecology	Agroecology focuses on the interconnectivity of plants, animals, people and their environment, with an application to agriculture.
Agroforestry	Agroforestry is the practice of combining trees with crops and/or livestock on the same land.
Paludiculture	Paludiculture involves the production of wetland crops on peat soils.
Organic farming	This refers to an agricultural system that uses fertilisers of organic matter and crop rotation for improving soil fertility. Synthetic fertilisers and pesticides are prohibited.
Peatland rewetting	This is the process of maintaining a stable water level at the surface of peat soils to reduce carbon loss.
Peatland restoration	Peatland restoration involves taking measures to restore the original form and function of peatlands, or wet peat-rich areas. This can include rewetting, paludiculture or replanting native plant species.
Regenerative farming	This is a farming approach focusing on soil health to create adaptive, resilient and holistic farming systems.

An Ghníomhaireacht Um Chaomhnú Comhshaoil

Tá an GCC freagrach as an gcomhshaol a chosaint agus a fheabhsú, mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialáil: Rialáil agus córais chomhlíonta comhshaoil éifeachtacha a chur i bhfeidhm, chun dea-thorthaí comhshaoil a bhaint amach agus díriú orthu siúd nach mbíonn ag cloí leo.

Eolas: Sonraí, eolas agus measúnú ardchaighdeáin, spriocdhírithe agus tráthúil a chur ar fáil i leith an chomhshaoil chun bonn eolais a chur faoin gcinnteoireacht.

Abhcóideacht: Ag obair le daoine eile ar son timpeallachta glaine, táirgiúla agus dea-chosanta agus ar son cleachtas inbhuanaithe i dtaobh an chomhshaoil.

I measc ár gcuid freagrachtaí tá:

Ceadúnú

- Gníomhaíochtaí tionscail, dramhaíola agus stórála peitril ar scála mór;
- Sceitheadh fuíolluisce uirbigh;
- Úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe;
- Foinsí radaíochta ianúcháin;
- Astaíochtaí gás ceaptha teasa ó thionscal agus ón eitlíocht trí Scéim an AE um Thrádáil Astaíochtaí.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Iniúchadh agus cigireacht ar shaoráidí a bhfuil ceadúnas acu ón GCC;
- Cur i bhfeidhm an dea-chleachtais a stiúradh i ngníomhaíochtaí agus i saoráidí rialáilte;
- Maoirseacht a dhéanamh ar fhreagrachtaí an údaráis áitiúil as cosaint an chomhshaoil;
- Caighdeán an uisce óil phoiblí a rialáil agus údaruithe um sceitheadh fuíolluisce uirbigh a fhorfheidhmiú
- Caighdeán an uisce óil phoiblí agus phríobháidigh a mheasúnú agus tuairisciú air;
- Comhordú a dhéanamh ar líonra d'eagraíochtaí seirbhíse poiblí chun tacú le gníomhú i gcoinne coireachta comhshaoil;
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Dramhaíola agus Ceimiceáin sa Chomhshaol

- Rialacháin dramhaíola a chur i bhfeidhm agus a fhorfheidhmiú lena n-áirítear saincheisteanna forfheidhmithe náisiúnta;
- Staitisticí dramhaíola náisiúnta a ullmhú agus a fhoilsiú chomh maith leis an bPlean Náisiúnta um Bainistíocht Dramhaíola Guaisí;
- An Clár Náisiúnta um Chosc Dramhaíola a fhorbairt agus a chur i bhfeidhm;
- Reachtaíocht ar rialú ceimiceán sa timpeallacht a chur i bhfeidhm agus tuairisciú ar an reachtaíocht sin.

Bainistíocht Uisce

- Plé le struchtúir náisiúnta agus réigiúnacha rialachais agus oibriúcháin chun an Chreat-treoir Uisce a chur i bhfeidhm;
- Monatóireacht, measúnú agus tuairisciú a dhéanamh ar chaighdeán aibhneacha, lochanna, uiscí idirchreasa agus cósta, uiscí snámha agus screamhuisce chomh maith le tomhas ar leibhéil uisce agus sreabhadh abhann.

Eolaíocht Aeráide & Athrú Aeráide

- Fardail agus réamh-mheastacháin a fhoilsiú um astaíochtaí gás ceaptha teasa na hÉireann;
- Rúnaíocht a chur ar fáil don Chomhairle Chomhairleach ar Athrú Aeráide agus tacaíocht a thabhairt don Idirphlé Náisiúnta ar Ghníomhú ar son na hAeráide;
- Tacú le gníomhaíochtaí forbartha Náisiúnta, AE agus NA um Eolaíocht agus Beartas Aeráide.

Monatóireacht & Measúnú ar an gComhshaol

- Córais náisiúnta um monatóireacht an chomhshaoil a cheapadh agus a chur i bhfeidhm: teicneolaíocht, bainistíocht sonraí, anailís agus réamhaisnéisiú;
- Tuairiscí ar Staid Thimpeallacht na hÉireann agus ar Tháscairí a chur ar fáil;
- Monatóireacht a dhéanamh ar chaighdeán an aeir agus Treoir an AE i leith Aeir Ghlain don Eoraip a chur i bhfeidhm chomh maith leis an gCoinbhinsiún ar Aerthruailliú Fadraoin Trasteorann, agus an Treoir i leith na Teorann Náisiúnta Astaíochtaí;
- Maoirseacht a dhéanamh ar chur i bhfeidhm na Treorach i leith Torainn Timpeallachta;
- Measúnú a dhéanamh ar thionchar pleananna agus clár beartaithe ar chomhshaol na hÉireann.

Taighde agus Forbairt Comhshaoil

- Comhordú a dhéanamh ar ghníomhaíochtaí taighde comhshaoil agus iad a mhaoiniú chun brú a aithint, bonn eolais a chur faoin mbeartas agus réitigh a chur ar fáil;
- Comhoibriú le gníomhaíocht náisiúnta agus AE um thaighde comhshaoil.

Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéil radaíochta agus nochtadh an phobail do radaíocht ianúcháin agus do réimsí leictreamaighnéadacha a mheas;
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha;
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta;
- Sainseirbhísí um chosaint ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Ardú Feasachta agus Faisnéis Inrochtana

- Tuairisciú, comhairle agus treoir neamhspleách, fianaise-bhunaithe a chur ar fáil don Rialtas, don tionscal agus don phobal ar ábhair maidir le cosaint comhshaoil agus raideolaíoch;
- An nasc idir sláinte agus folláine, an geilleagar agus timpeallacht ghlan a chur chun cinn;
- Feasacht comhshaoil a chur chun cinn lena n-áirítear tacú le hiompraíocht um éifeachtúlacht acmhainní agus aistriú aeráide;
- Tástáil radóin a chur chun cinn i dtithe agus in ionaid oibre agus feabhsúchán a mholadh áit is gá.

Comhpháirtíocht agus Líonrú

- Oibriú le gníomhaireachtaí idirnáisiúnta agus náisiúnta, údaráis réigiúnacha agus áitiúla, eagraíochtaí neamhrialtais, comhlachtaí ionadaíocha agus ranna rialtais chun cosaint chomhshaoil agus raideolaíoch a chur ar fáil, chomh maith le taighde, comhordú agus cinnteoireacht bunaithe ar an eolaíocht.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an GCC á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóir. Déantar an obair ar fud cúig cinn d'Oifigí:

1. An Oifig um Inbhunaitheacht i leith Cúrsaí Comhshaoil
2. An Oifig Forfheidhmithe i leith Cúrsaí Comhshaoil
3. An Oifig um Fhianaise agus Measúnú
4. An Oifig um Chosaint ar Radaíocht agus Monatóireacht Comhshaoil
5. An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tugann coistí comhairleacha cabhair don Ghníomhaireacht agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

epa Research

Evidence Synthesis Report 12

Impediments to Agricultural Land Use Change and Interventions for Multifunctional Land Use Outcomes

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