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Managing Ireland's Upland Fire Risk: Geographic Perspectives on Agricultural Policy and Landscape Change

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Abstract : This paper explores the intersection of agricultural policy, land management, and wildfire risk in Ireland's upland regions, with a particular focus on the unintended consequences of Common Agricultural Policy (CAP). Specifically, I investigate the shift towards extensification under recent CAP reforms, which has led to a decline in livestock numbers and subsequent reduced grazing pressure in parts of the Irish uplands. While these changes may have contributed to improvements to lands overgrazed by sheep in parts of the country; they may have also facilitated the encroachment of scrub vegetation, which can disrupt native habitats and heighten wildfire risk. I examine how CAP's Basic Income Support for Sustainability (BISS) payments may incentivise field burning to maintain grazable land, thus exacerbating fire hazards in sensitive upland ecosystems. I further consider the role of rural depopulation and an ageing farming population in diminishing active land management, complicating fire risk mitigation efforts. This paper advocates for the development of integrated policies that balance agricultural productivity with ecological and fire risk considerations, proposing more adaptive policy frameworks that address both the socio-economic and ecological dynamics of upland farming.

Introduction

Land management and agricultural practices worldwide have been heavily influenced by policies shaped by governments and other centres of power. While these policies aim to address broad objectives such as food security, sustainability, and economic viability, they often result in unintended consequences when their design does not adequately consider the multifaceted socio-economic and ecological dynamics of farming and land stewardship (Ahearn *et al*., 2005; Schmid and Sinabell, 2007; Van Zanten *et al.*, 2014; Pe'er *et al.*, 2020).

The Common Agricultural Policy (CAP) is a European Union (EU) policy supporting farmer incomes, sustainable agriculture, and food security through subsidies and

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programmes (Hill, 2012). In 2005, the EU implemented a major reform to the Common Agricultural Policy (CAP) which meant that farmers would no longer receive payments based on the quantity of crops or livestock they produced. Instead, they received a Single Farm Payment (SFP), now known as the Basic Income Support for Sustainability (BISS), based on the amount of grazeable land they farm (Schmid and Sinabell, 2007). Another form of income support is eco-schemes, introduced in the 2023–2027 CAP as a new direct payment mechanism. They are mandatory for EU member states to provide but voluntary for farmers to participate in. These schemes reward farmers for adopting environmentally beneficial practices, such as organic farming, agroforestry, and carbon farming, to support EU climate and biodiversity goals.

Since Ireland joined the European Union in 1973, its agriculture has been profoundly influenced by the evolving phases of the Common Agricultural Policy (CAP), which has shaped farming practices, land use, and subsidies (Crowley *et al*., 2001). Early CAP measures incentivised high stocking densities through production-based subsidies, leading to widespread overgrazing in Irish uplands. This resulted in significant habitat degradation, with key upland species such as ling heather (*Calluna vulgaris*), bilberry (*Vaccinium myrtillus*), and cross-leaved heath (*Erica tetralix*) being replaced by grasses like purple moor grass (*Molinia caerulea*) and, in some areas, the invasive mat grass (*Nardus stricta*). In extreme cases, overgrazing exposed large areas of peat or soil, causing erosion and loss of ecosystem function (Sansom, 1999; O'Rourke and Kramm, 2009; Kramm *et al.*, 2010; Anderson, 2013; Byrne, D., 2017). While overgrazing remains a major issue in many of Ireland's uplands, the 2005 CAP reform, which replaced the previous production-based subsidies with the decoupled BISS, also contributed to a reduction in active land management. Consequently, sensitive habitats are threatened by scrub encroachment and the growth of rank vegetation, highlighting the complex ecological implications of these CAP-driven changes in agricultural practices, highlighted by O'Rourke & Kramm (2009).

Human activity in these ecosystems has shaped a complex relationship between people and biodiversity. In the Irish uplands, this balance is evident: while activities such as intensive agriculture and overgrazing have led to biodiversity loss and altered ecosystems in some areas, low-intensity land management has helped maintain diverse semi-natural habitats overall (O'Rourke *et al*., 2012; Anderson, 2013; O'Rourke, 2016). These landscapes now rely, to some degree, on human practices like grazing, cutting and burning to sustain their biodiversity (Lloret *et al.*, 2024). At the same time, biodiversity in the uplands also encompasses processes independent of human activity, such as natural succession towards scrub and woodland, which contribute positively to carbon storage, hydrological regulation, and habitat diversification (Marriot *et al.,* 2004; Hilmers *et al.,* 2018).

However, as human activity in these landscapes' declines, significant ecological changes emerge. While reduced farming and grazing pressures can bring benefits, such as the recovery of soil fertility, native vegetation, and wildlife, many of these ecosystems have been shaped over millennia by agricultural practices (Queiroz *et al.*, 2014). As a

result, removing human influence can sometimes lead to unintended consequences, such as scrub encroachment which may alter habitat composition (MacDonald *et al.*, 2000; Lasanta *et al.*, 2017)and increase wildfire risk (Salis *et al.*, 2022). In recent years, there has been a shift towards lower-intensity land use and reduced agricultural activity – a process known as extensification – which has led to a decline in active land management on Ireland's uplands, resulting in reduced grazing pressure and the consequent build-up of dense vegetation (O'Rourke and Kramm, 2009; Kramm *et al.*, 2010; O'Rourke *et al.*, 2012). For clarification, in this paper, when I refer to "scrub" or "scrub encroachment", I refer to the expansion of dense stands of emergent upland vegetation, which, while part of natural succession, also contribute to higher fuel loads and increased fire risk (Moreira *et al.*, 2011; Lasanta *et al.*, 2017).

This paper examines how policy-driven changes in land management, particularly under the Common Agricultural Policy (CAP), have influenced vegetation dynamics and wildfire risk in Ireland's uplands. It explores the consequences of extensification, rural depopulation, and shifting agricultural incentives on fire regimes and landscape sustainability, while highlighting the governance challenges of wildfire risk management and the need for more adaptive policy approaches. The paper assesses changes in grazing practices, rural demography, and burning; evaluates governance arrangements such as CAP, eco-schemes, and commonage systems; draws on a socio-ecological systems perspective to link governance, land use, and ecological outcomes; and identifies practical, pilotable pathways for adaptive upland fire governance. The central research question guiding this analysis is how agricultural policy, demographic change, and evolving land management practices interact to shape vegetation dynamics and wildfire risk in Ireland's uplands (Fig. 1).

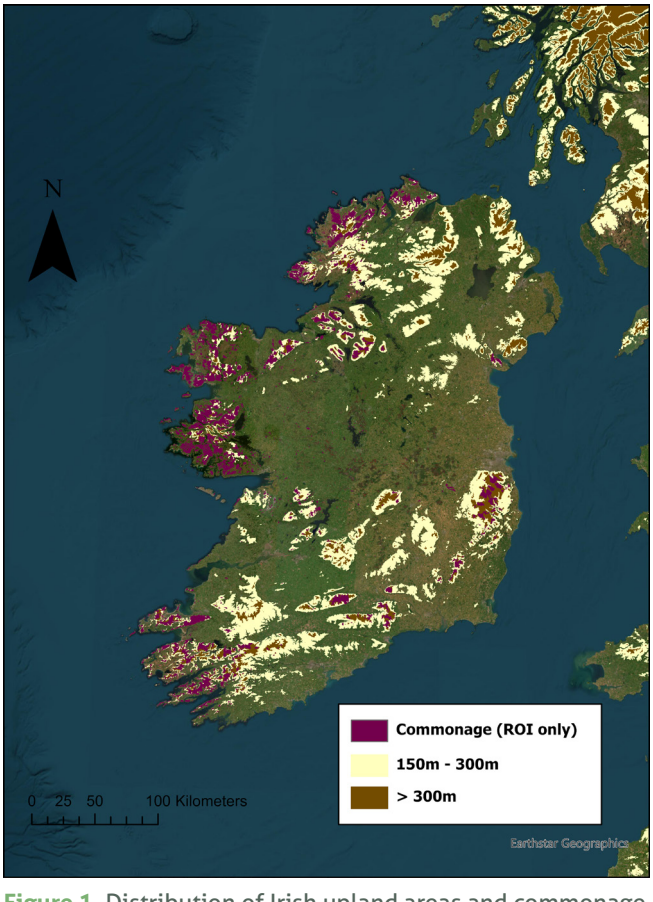

Figure 1. Distribution of Irish upland areas and commonage lands, with mid-elevation uplands (150–300 m) shown in cream, higher uplands (>300 m) in brown, and commonages highlighted in purple within the Republic of Ireland.

This paper is informed by a socio-ecological systems (SES) perspective (Ostrom, 2009), which is applied as an overarching lens to connect governance, actors, and ecological dynamics rather than as a detailed diagnostic framework. SES conceptualises integration not simply as policy alignment but as the interaction of actors, institutions, and resource dynamics. This framing highlights how EU policy, national regulation, local institutions such as commonage systems (Fig. 1), and informal norms like field burning combine with ecological processes to shape vegetation change, biodiversity, and fire risk in Ireland's uplands.

Extensification and Changing Land Use in Ireland's Uplands

Changes to the Common Agricultural Policy (CAP), particularly the move towards extensification and eco-schemes, aimed at mitigating environmental degradation from overgrazing and other damaging activities, can have unintended negative effects on upland peatlands and heather moorlands (O'Rourke and Kramm, 2009; Byrne, D., 2017; Schillings *et al.*, 2024). These policy changes, which incentivise less intensive farming and lower livestock stocking rates, were designed to reduce the pressure on the land caused by overgrazing (McCarthy *et al.,* 2023). However, in practice, these adjustments can result in reduced grazing pressure, where stocking densities are lowered to the point that, while alleviating overgrazing, they no longer prevent the establishment and expansion of shrub and woody species. This reduced grazing pressure causes a shift towards scrub-dominated landscapes in parts of Ireland's uplands (Fig. 2).

Figure 2. An area of reduced grazing pressure on a commonage in the uplands of Kerry, featuring predominantly gorse and bell heather. *Image from Will Hayes.*

Reduced grazing pressure alters ecological processes in upland habitats by removing natural disturbances such as grazing and trampling, which help maintain open habitats and species diversity. In the short term, less grazing allows grasses, herbs, and some flowering species to expand, benefiting pollinators and invertebrates. However, ruderal plants such as rushes (*Juncus spp.),* thistles (*Cirsium spp.),* and purple moor-grass often dominate, reducing diversity and altering soils. Over time, scrub species like willow (*Salix spp.),* gorse (*Ulex europaeus*), and bracken (*Pteridium aquilinum*) can initially add biodiversity, but this diminishes as canopies close or single species outcompete others. The result is a decline in upland biodiversity, including that of heather moorlands and blanket bogs (Deenihan *et al.,* 2009; Halada *et al.,* 2011; Schulz, 2015), habitats of high conservation value. Moreover, the shift to scrubby habitats is expected to heighten wildfire risks, a trend already being observed in parts of Ireland (O'Rourke and Kramm, 2009; Jeffers, 2021).

Climate change, combined with less active land management, is increasing wildfire risk by creating landscapes with higher fuel loads and dry vegetation. Climate projections for Ireland indicate reduced summer rainfall, with winter and autumn experiencing more frequent heavy precipitation (EPA, 2024). Drier summers in particular contribute to the build-up of dry overgrown gorse, heather, and grasses in undergrazed areas, significantly raising fire risk (Nikonovas *et al.,* 2024). The rising incidence of summer gorse and heather fires reflects these changes (O'Rourke and Kramm, 2009). Gorse, in particular, is a highly flammable, fire-adapted species that burns intensely year-round. Fire not only facilitates its rapid regeneration by activating dormant seeds and stimulating resprouting but can also contribute to its further spread (PBCP, 2012). Purple moor-grass adds to risk, as its dense, dry thatch becomes highly combustible during drought. Similar patterns of scrub encroachment in southern Europe (Moreira *et al.,* 2011; Graus *et al.,* 2024) offer a cautionary lesson for Ireland.

This situation is particularly acute in parts of rural Ireland, especially along the west coast, where a declining farming population has resulted in reduced grazing pressure, allowing vegetation like gorse, heather, and grasses to accumulate more biomass. Driven by broader socio-economic challenges such as an ageing farming population and rural depopulation, landscapes are not being managed as actively (McCarthy *et al.,* 2023). For example, Ireland's farming workforce has declined from 647,000 people in 1912 to just 59,000 full-time equivalents by 2002 (Haase, 2016), a figure I cite to illustrate the extent of demographic change rather than as a benchmark for policy. While rural depopulation reflects multiple factors, including poor labour market conditions and lifestyle shifts, it is particularly pronounced in remote rural areas where traditional farming practices are most common. Similar processes of land abandonment are documented in southern Europe, where rural-urban migration and reduced land management have led to shrub encroachment and abandoned croplands, further increasing wildfire risk (De Aranzabal *et al.*, 2008; Martínez-Abraín *et al.*, 2020). As farmlands have been abandoned, fire dynamics have shifted, with increased fuel loads leading to more devastating wildfires (Ursino and Romano, 2014). Modelling of wildfire regimes in the Mediterranean

suggests that progressive land abandonment, coupled with shifting climatic conditions, drives ecosystems toward more extreme fire behaviour, transitioning from infrequent, low-intensity fires to chaotic, high-intensity fire regimes as fuel loads accumulate (Ursino and Romano, 2014). Without intervention, Ireland's uplands may experience similar fire dynamics as land-use change contributes to increased fuel accumulation and more frequent, severe wildfires.

It is important to stress that the continuation of farming in inaccessible or low-productivity uplands is not taken here as an unquestioned necessity. Rather, the focus is on how reductions in land management alter vegetation dynamics and fuel accumulation, with implications for wildfire risk. Decisions about whether and how farming persists in these landscapes must therefore be weighed against ecological outcomes, fire-risk and broader socio-economic considerations.

Policy Incentives, CAP, and the Role of Burning in Upland Management

Burning has long been a part of upland management practices in Ireland, used historically to control vegetation and improve grazing conditions (Penman *et al.,* 2011; Carroll *et al.,* 2021). However, the practice is increasingly difficult to manage effectively due to a combination of socio-economic challenges and environmental conditions. Farmers face multiple barriers to controlled burning, primarily the legal restrictions set by Section 40 of the Wildlife Act, 1976, which prohibits burning between March and September to protect biodiversity during the breeding season (PBCP, 2012). This restriction is vital for protecting ground-nesting birds and other wildlife, whose nests, eggs, and habitats would be vulnerable to fire damage during these months.

Outside the restricted season, conditions often complicate burning efforts. Wet and windy weather conditions in winter, when burning is legally permitted, can make it difficult to conduct controlled burns. Projections indicate that, due to climate change, the frequency of heavy precipitation events in winter and autumn will increase, further hindering burning activities (EPA, 2024). As a result, many areas that cannot be grazed or mechanically cleared remain unmanaged and overgrown, allowing scrubland such as gorse and heather to spread and creating conditions for large, uncontrolled wildfires when fire does eventually occur.

Other factors also make it difficult to control these fires effectively on Irish uplands. A declining farming population mean that farmers often have less assistance in managing fires. In the past, farmers would help each other, particularly in commonages, through a system of mutual aid known as *meitheal*. This practice, rooted in traditional rural Irish communal norms of reciprocity, involved groups of workers coming together to accomplish tasks that were too large for individuals or nuclear families to manage alone (Arensberg and Kimball, 1968; Carroll *et al.,* 2021). However, today, fewer people are available to control a burn, making it more challenging to manage fire risk effectively. Additionally, the knowledge of when and how to burn was traditionally passed down

through generations via informal, hands-on learning. This process, closely tied to the land and its changes, is increasingly at risk due to rural depopulation and urban migration, further complicating fire management (Chiswell, 2018).

While burning is widely recognised as a valuable tool for land management (Penman *et al.,* 2011; Fernandes *et al.,* 2013) (Fig. 3), in certain instances, such burns can escalate uncontrollably, as evidenced in Ireland (Wildfire Today, 2023) and parts of Europe (Salis *et al.,* 2022). Despite the lack of reliable data on the specific causes of wildfires in Ireland (Jeffers, 2021), when these areas do eventually burn, they pose a heightened wildfire risk due to the large accumulation of fuel. Such conditions create highly flammable landscapes, making any ignition more likely to escalate into an uncontrolled fire. This risk is compounded by the fact that illegal burning continues to occur outside the permitted season, as seen in 2023, when 665 farmers were identified engaging in burning activities that violated the regulations (Agriland, 2023), exacerbating both ecological and wildfire risks.

Despite these challenges, the governance of Irish uplands cannot be understood solely through national instruments, as EU membership mediates sovereignty over land management through CAP structures. The Basic Income Support for Sustainability (BISS) incentivises farmers to maximise grazeable land by keeping it open and accessible, often through vegetation management that is costly to achieve by cutting or tillage in remote uplands. As a result, burning small strips of scrub has persisted as a practical means of promoting grass growth and maintaining land eligibility (Schmid and Sinabell, 2007; Carroll *et al.*, 2021). More recently, the CAP Strategic Plan 2023–2027 introduced Good Agricultural and Environmental Condition 8 (GAEC 8), allowing some scrub and semi-natural features to be retained within eligible parcels, signalling a gradual shift away from penalising non-grazeable land (European Union Common Agricultural Policy, 2023). Yet these measures also reveal tensions between collective responsibility in systems such as commonage and the individualised logic of CAP payments, with policy resonating unevenly across upland communities where farming is closely bound to identity and lifestyle as well as economic viability (Ostrom, 2009).

Figure 3. Recently burnt commonage in West Cork (burning occurred the year prior to the photograph), showing the aftermath of a burn, with signs of possible compounding effects from sheep grazing visible in the background. *Image from Will Hayes.*

Furthermore, the risk of fire is compounded by understocking, especially of cattle, in the uplands, as fewer animals graze the land and help keep it "productive." Historically, before the 1900s, cattle dominated upland grazing systems in Ireland, with the Kerry cow being particularly prominent in regions such as southwest Munster (O'Rourke *et al.*, 2016). The shift from cattle to predominantly sheep grazing has altered land use and vegetation dynamics. This transition was largely driven by agricultural policy changes, particularly the CAP, which introduced headage payments – subsidies based on the number of sheep rather than land area. These payments, especially in the 1980s and 1990s, incentivised higher stocking rates of sheep, making them more economically viable than cattle in upland areas. Beyond policy, several additional factors contributed to this shift. Sheep farming required less labour and infrastructure, making it more practical as rural depopulation and declining farm labour reduced the number of people available to manage cattle herds. Upland terrain also played a role, as many areas were poorly suited for cattle grazing, particularly for larger commercial breeds, whereas sheep were better adapted to rough, heather-dominated landscapes, and this shift has significant implications for fire risk and habitat dynamics. Cattle reduced fire risk by consuming vegetation that sheep avoid and trampling down areas of scrub which prevents the spread of invasive and pioneer scrub species (Ratcliff *et al.*, 2022; Hesseln, 2023). However, as cattle numbers declined, upland habitats have become increasingly characterised by large shrubs and woody vegetation in parts where sheep avoid grazing, creating higher fuel loads and greater wildfire risk.

Future Policy Directions: Managing Fire, Biodiversity, and Agricultural Change

Policies aimed at reducing livestock numbers, combined with a decline in farmer numbers, and an ageing farming population, have led to increased fuel loads in Ireland's uplands (Fig. 4). This decline in active land management has allowed large areas of scrub and dense vegetation to develop, heightening the risk of wildfire. At the same time, efforts to expand grazable land, driven by the need to maximise agricultural subsidies under the CAP, may inadvertently increase fire risk due to greater reliance on burning. Moreover, the introduction of eco-schemes, which discourage burning in the interest of biodiversity, creates a conflict for farmers, particularly those with large areas of scrub. This tension between agricultural productivity and conservation goals is not new as CAP has faced criticism in the past for its conflicting incentives (Palacin and Alonso, 2018).

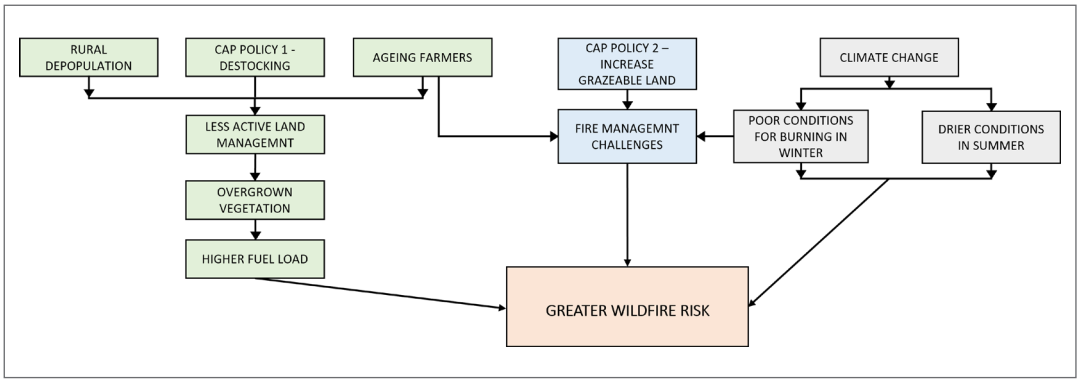

Figure 4. Flowchart depicting how land use changes, policy decisions, and ecological processes interact to exacerbate wildfire risk under shifting environmental and climatic conditions in Ireland.

The 2023–2027 CAP reforms attempt to address some of these conflicts by aiming for a "greener and fairer CAP," with measures tackling biodiversity loss and climate change while supporting rural communities. Initiatives such as protecting carbon-rich habitats like peatlands by 2025 and incentivising biodiversity-friendly practices through eco-schemes are positive steps (EU CAP, 2023). However, significant challenges remain in ensuring these reforms address upland wildfire risks and promote sustainable landscape management, highlighting the need for more comprehensive, integrated policies in the next round of reforms.

Future CAP reforms must address the unintended consequences of extensification, particularly reduced grazing pressure and scrub encroachment, which elevate fire risk by increasing fuel loads and the likelihood of high-intensity wildfires. To this end, targeted payments for maintaining low intensity grazing on ecologically sensitive uplands, support for mixed livestock systems, and recognition of the role of cattle in scrub control and fire risk reduction are potential adjustments. High Nature Value Farming (HNVf),

which emphasises traditional, low-intensity farming practices that maintain biodiverse semi-natural habitats, could play a key role in mitigating these issues. HNVf encourages active land management, benefiting both biodiversity and the livelihoods of farming communities in upland areas (Pötsch *et al.*, 2011; Lomba *et al.*, 2014; Benedetti, 2017). Further integrating HNVf into CAP reform for upland areas could incentivise practices that balance ecological conservation with agricultural productivity, reducing the risk of scrub encroachment and wildfire. In practical terms, this could be advanced through pilot initiatives under the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI), which offer a mechanism for testing integrated approaches that combine low-intensity grazing, scrub control, and fire management within a locally co-designed framework (Ecker *et al.,* 2018; Schreuder *et al.,* 2022)

Addressing the ageing farming demographic is also vital, with only 11% of all farmers in the European Union under 40 years old (EU CAP, 2023). Broader socio-economic measures, including support for young farmers, improved market access for upland agricultural products, and grants for habitat restoration aligned with biodiversity goals, are critical. The CAP 2023–2027 specifically addresses generational renewal by dedicating resources to support young farmers, with at least 3% of direct payments allocated for this purpose. This support may take the form of additional income aid, start-up grants, or investment funding (EU CAP, 2023). This can help counter the ageing farming population by incentivising younger generations to stay in farming in Ireland's uplands.

However, the effectiveness of these initiatives is closely linked to broader land management and governance challenges, particularly in relation to fire. As farming activity declines in some upland areas, shifts in vegetation and land abandonment are increasing fire risks, yet Ireland lacks a central agency dedicated to wildfire management. Instead, fire regulation is dispersed across various legislative frameworks. The Wildlife Act, 1976 & Wildlife (Amendment) Act, 2000 restricts burning vegetation between 1st March and 31st August, while the Forestry Act, 1946 mandates that landowners notify authorities before burning near forests. The Fire Services Act, 1981 & 2003 assigns fire response responsibilities to local fire services, which can charge landowners if fires require emergency intervention. Additionally, fire use is regulated under agricultural policy, where the Good Agricultural and Environmental Condition (GAEC) requirements of the CAP impose penalties for illegal or irresponsible burning under schemes like the BISS and Disadvantaged Areas payments (PBCP, 2012). This fragmented governance reflects overlapping mandates across the Department of Agriculture, Food and the Marine (DAFM), which regulates agricultural burning; the National Parks and Wildlife Service (NPWS), responsible for conservation and managing fires in protected areas; and local authorities and fire services, which oversee fire suppression and emergency response. Each operates at different scales and with distinct priorities, making coordination difficult where agricultural, conservation, and safety objectives intersect. Addressing these challenges requires not just better policy alignment but more deliberate institutional design, for example through commonage- or catchment-level fora involving farmer representatives, shared indicators of fuels and biodiversity across agencies, and

co-funded pilot initiatives (e.g. via EIP-AGRI) that test integrated fire management approaches in practice.

Yet these regulations primarily focus on preventing land degradation and unauthorised burning rather than establishing a coordinated wildfire management strategy. Without a national framework for wildfire preparedness, it is crucial to develop localised fire management plans for rural upland areas. Such plans should integrate local knowledge from farmers and land managers alongside national policy directives to ensure practicality and efficacy. Engagement with stakeholders, including farmers, conservation organisations, local communities, and policymakers, is essential for co-developing solutions (Ryan and Hamin, 2008; Bradshaw, 2019; Palsa *et al.*, 2022). Participatory approaches, such as community workshops and advisory panels, could help align fire management strategies with both local needs and ecological priorities.

Fire management strategies must also incorporate the increasing risks posed by climate change. Investment in early warning systems, fire prevention infrastructure, and the integration of wildfire management within broader climate adaptation policies will be crucial. Advances in remote sensing already demonstrate considerable potential for fire detection and monitoring in Ireland, offering valuable tools for tracking fire occurrence, severity, and long-term trends (Sorkhabi, 2024).

Enhanced monitoring and research are likewise needed to evaluate the effectiveness of management practices, better understand wildfire dynamics, and assess the ecological and social impacts of policy changes and wider shifts in upland land use (Bowman *et al.,* 2020). In this context, it is important to recognise that both open-habitat management and natural succession contribute distinct biodiversity values and that fire governance must balance these trajectories alongside risk reduction.

Conclusion

By adopting a comprehensive and forward-looking approach, Ireland can address the interconnected environmental and socio-economic challenges facing its upland communities. Applying a socio-ecological systems (SES) lens makes clear how governance (CAP, eco-schemes), actors (farmers, agencies), and resource dynamics (grazing, vegetation) interact to produce emergent fire risks (Ostrom, 2009). Implementation pathways must therefore move beyond top-down prescriptions towards co-designed, locally embedded governance. Commonage- or catchment-level fora that bring together farmers, agencies, and communities offer one mechanism for aligning fuel management, biodiversity conservation, and policy compliance. Attention to institutional capacity is also vital: upland fire governance depends not only on policy design but also on the resources and authority of State agencies, the organisational strength of farming communities, and the persistence of traditional knowledge systems such as intergenerational fire and farming knowledge. Policy responses must recognise these interdependencies, supported by pilot schemes, ideally trialled through EIP-AGRI, that integrate targeted grazing, patch-mosaic fire management, and co-designed governance structures, alongside coordination

mechanisms such as shared monitoring indicators and co-funded initiatives. Together, these measures can bridge the mandates of agriculture, conservation, and fire services while building resilience to future wildfire risk.

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