

Regenerating Systemic Risk: A Case Study on Ireland

A Case Study on the Systemic
Risks in the Irish Food and Farming
System and the Impact Potential of
Regenerating Forms of Agriculture

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Preface

The European Alliance for Regenerative Agriculture (EARA) is a farmer-led organisation governed by over 100 of Europe's most pioneering regenerative land stewards. With them, and through their insights, this risk study was co-created and written. EARA holds the firm belief that regenerative land management provides cascading benefits to farmers, and well beyond the farm gate. Understanding this and living these benefits, EARA's farmer members and a wider community of land stewards farming across Ireland's arable, livestock, horticulture and mixed systems reflect on four core systemic risks running through a fragile Irish agricultural system that continues to degrade. The EARA farmers draft was then reviewed and further refined with a group of independent, committed and knowledgeable experts.

We begin with an analysis of these systemic risks, discussing them and their drivers in detail before exploring regenerating solutions available for Irish farmers to deploy. We then illustrate case studies that show farmers prioritising the regeneration of soil, animal, and farm business health for the benefit of rural communities and the wider ecosystems of Ireland. Finally, to ensure existing and future farmers have access to the support they need, we make specific recommendations to both private and public sector actors to enable this change at the farm and national level. More specifically, we propose the possible steps that each group can take to facilitate the sector-wide transition towards regenerating forms of agriculture¹.

None of what follows is prescribed. Regeneration is a context-specific journey, and no one knows an Irish farm's context like the steward who walks it. What we offer here is the lived proof of regeneration through stewardship case studies and academic literature, shared for our common learning.

¹ EARA uses the terms 'regenerative' and 'regenerating forms of' agriculture indistinguishably to highlight the diverse approaches that exist to landscape and ecosystem regeneration and to emphasise the ongoing process of regeneration.

WTo the farmers of Ireland: this paper is yours as much as ours. Written with EARA's farmer members, it aims to expose the risks squeezing your margins and your successors, and to explore with real farm data how a lower-input, holistically productive, and more resilient way of farming pays the bills. If the risks discussed in the paper match what you see under your own boots, we can act together. If your fields tell a different story, we want to hear it.

To advisors, researchers, processors, retailers, and policymakers across Ireland: Current Irish agricultural policy already recognises the importance of what is typically coined sustainable agriculture to build resilient and healthy local food systems which enhance biodiversity and mitigate the worst impacts of climate change. Yet that policy hasn't achieved what it set out to do while the recognition of wider regenerating forms of agriculture and the transition effort towards achieving them currently rests on farmers alone, because many of the levers do not sit in their hands. National policy, contracts, prices, lending terms, regulation and research priorities are set elsewhere, and they still prioritise volume over lower inputs and systemic risk. We aim to shift this reasoning, so the resilient choice becomes the profitable and obvious one rather than the brave exception.

To the communities and people in Ireland: voicing your support for the farmers seeking to create a new agri-food system can push decision-makers and enablers to build a stronger, healthier and more resilient agricultural sector. Where possible, buy from local producers, thank them for their hard work, and encourage your wider community to do the same. This ensures that current and future generations can access healthy food while securing national food and nutrition sovereignty. It also frames the sector in a new light, showing future generations that to farm is to provide security for the wider population, reinvigorating the sector and returning control of food production and consumption to Ireland. Beyond the farm gate, supporting this transition defends the uniquely beautiful ecosystems of Ireland, safeguards national water quality, rebuilds

living soils, restores biodiversity above and below ground, and strengthens the landscape's resilience to the droughts and floods of a changing climate, leaving behind a countryside richer than the one inherited.

To farmers and people across Europe: these risks are Irish in their expression but not in their origin. Systemic import dependency, input volatility, disease pressure and demographic decline run through every extractive system on the continent. The specifics will not transfer, but the logic will. Let us regenerate Europe together, from the ground up.

Ireland's agri-food system is a crucial pillar of the country's economy, culture, and social fabric. It shapes rural livelihoods and community life, underpins a major share of exports and employment, and carries a farming heritage bound up with how the country sees itself. The Irish Government's Climate Action Plan 2024, Food Vision 2030 Strategy, and a broader set of Agri-Environmental Climate Measures aim to reduce agricultural emissions by 51% by 2030 and increase the application of practices that build healthier, more resilient food systems. This paper illustrates how systemic socio-economic and ecological risks arise from current outdated agricultural production systems and degraded landscapes with reduced biological and hydrological function, manifesting as compounding disease costs, water quality failure, input dependency, and demographic decline. In contrast, it positions the transformation of the current agri-food system as central to the wider regeneration of Ireland's ecosystems, public health, and communities. The findings in this report demonstrate the value of addressing these risks through integrated land management and biological and social regeneration, rather than continuing to rely on isolated, single-problem interventions that treat symptoms while the underlying system deteriorates. The proposals and evidence base draw heavily on the Irish context, yet the analytical method and the policy logic are applicable to any mixed farming nation facing significant challenges such as environmental compliance pressure, commodity

market volatility, and an ageing farm population. Financial instruments blended with enabling policies are essential, particularly within the scope of catchment and landscape-level interventions, and farm succession programmes. But risks of this magnitude ultimately require farmers, public institutions and communities to act strategically and collectively, with shared regeneration of Ireland's land, farming culture, and rural and urban livelihoods as the common goal.

Central to this approach is recognising farmers, private actors, and public institutions as critical parts of the same system, each playing a distinct role in restoring its underlying health. This requires all actors, from Teagasc advisors and DAFM administrators to lenders, processors and retailers, to move away from viewing Irish farmland as a production unit to be optimised in isolation, and toward seeing themselves as active participants in a living system. Policymakers, citizens, farmers, and the land itself are not separate interests to be balanced against one another. They are interconnected parts of a whole, and holistic, durable solutions depend on treating them as such.

EARA produces this analysis as a continuation of a broader call to action. We invite farmers, landowners, co-operatives, local authorities, and national government departments, as well as lenders, insurers and reinsurers with exposure to systemic risk, to engage with us and with each other so we can deploy our pragmatic, action-oriented network to develop further analyses and actions for your specific context. Degenerating soils, escalating disease costs, tightening environmental compliance and a narrowing demographic window are accelerating. Unified, collaborative efforts are vital for sustainable, regenerating impact.

Executive Summary

The foundations of the current Irish agricultural system are cracking. It is supported by volatile imports, from fertiliser and feed to fruit and vegetables, while degrading the water, soils and ecosystems it depends on. As the sector grows less viable, these pressures feed into rising animal and human health costs and a dwindling flow of new entrants, leaving Ireland with weaker food security, fewer farmers and thinner farm incomes. New entrants are no longer attracted to the sector due to unstable incomes, and existing farmers struggle to pass on their farm. EARA's farmer members have identified four connected risks at the root of this fragility, namely import dependency and input volatility (National Security), animal, plant, and human health decline (The Health Nexus), water quality failure alongside drought vulnerability (Water), all of which contribute to generational decline as the sector becomes less attractive. All four are symptoms of a fragile production model built on imports, high stocking pressure, biological simplification and narrow commodity margins. Treating each risk in isolation is only reinforcing the underlying causes.

By contrast, regenerating forms of agriculture create low-input systems, prioritise the health of soil, animal, and human without sacrificing yield. Regenerating forms of agriculture entrust Irish farmers to choose the best paths ahead for their land and communities, producing food while regenerating nature and caring for their families. Evidence from the ground demonstrates how a different path is possible. One

documented journey of change comes from Irish dairy farmer Tom Stack, whose regenerative organic dairy farm in Limerick has cut all cattle feed and synthetic fertiliser, and plant protection. The herd has also been antibiotic free since 2017, and recently returned zero bovine TB reactors despite rising incidence across the surrounding area.

Tom produces less milk per cow and per hectare than intensive neighbours, having stocked his herd for resilience, with Friesian, Shorthorn, Ayrshire and Irish Moiled crosses. Yet, he does it on a fraction of the inputs, with healthier animals and improving land. Each regenerative transition is unique and context-specific. Tom chose to make drastic changes from one year to the next, while others may move more gradually. Regardless of the pace of a farmer's regeneration, support should be available in charting their own path, on their own terms, united in their diversity by a shared direction of travel. This is exemplified through phase 1 of EARA's Farmer-led Study² that mapped 78 farms in 14 European countries over >15 production systems, and found fertiliser volume down 61%, plant protection products down 75%, compared to national averages. Moreover, this was achieved with only a 2% yield disparity and a 20% improved gross margin.

Together, the convergence of our farmer-led data and the external literature points consistently towards the fact that regenerating systems can resemble the productivity of current models while achieving it on a structurally lower and more resilient cost base.

² EARA (2025) Farmer-led Research on Europe's Full Productivity The Realities of Producing More and Better with Less - Place-based Innovation for the Good of All ([LINK](#))

A national six year transition would cost between €3.7 and €9.5 billion, and can reduce imported feed, fertiliser, fuel and plant protection spending by roughly €9.1 billion, or 44% during the same timeframe, owing to reduced input costs. As these systems establish, these savings would continue to accrue, while input and import dependence would steadily decrease. Dairy-specific modelling shows a regenerative premium leaving a negligible gross economic output difference of -0.40%, cutting direct input costs by an average of 31.2%, or €337 million a year, and widening margin after inputs by €473 million.

The necessary enabling funding needed to achieve this transition is already circulating the system, and the opportunity lies in directing it toward lasting resilience. Farmers have spent over €20 billion on imported feed, fertiliser, fuel and plant protection between 2020 and 2025, the state has spent over €600 million on bovine TB eradication across recent years, despite rising herd incidence, and Ireland's water utility Uisce Éireann has earmarked €10.3 billion in capital investment to 2029, much of it addressing the consequences of catchment pollution. These are substantial commitments, and a portion of each could be redirected upstream to address the shared causes rather than the recurring symptoms.

Inaction carries its own quieter bill, and naming it clearly helps weigh the choice ahead. The potential loss of the nitrates derogation could expose the sector to income losses of around €300 million a year. The input price shocks of 2022 and 2023 restructured farm finances

right across the island. Fewer than one in twenty farmers is now under the age of 35. Regenerating forms of agriculture offer one coherent approach that works across food security, health, water quality, economic resilience and generational renewal at once. The evidence gathered in this paper is clear, and the economics behind it are compelling. What remains is the shared commitment to act together, farmers and enablers alike.

However, the public sector cannot carry the transition alone. Banks and insurers can price genuine resilience into lending and underwrite the risk of the transition years, so that farmers no longer carry the full cost. Processors and cooperatives can both reward and incentivise verified regenerative outcomes through the kind of premium modelled in this paper, while public bodies can begin to steer bovine TB research, water infrastructure and CAP spending toward performance-based payments. Place-based transition consortia offer a way to bring all of these actors together within a single landscape, pooling the contributions of those who benefit from regeneration to collectively finance and de-risk the transition for the farmers at its centre. Through this shared structure, the operational risk of the critical early years is carried between the parties rather than by the farmer alone, as detailed in the concluding appeal.



Photo: Fergal Smith

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Introduction

Irish agriculture is witnessing the culmination of long-term, man-made systemic barriers and challenges. While the full extent of these challenges and their interactions does not fall into the scope of this paper, EARA's Irish farmer members have identified four systemic risks that are leading the sector to decline. These risks concern national security and input dependence, the interconnections of soil, plant, animal, and human health, water quality and quantity, and generational renewal.

While the threat of these risks increases, innovative farmers across Ireland are showing that it is possible to mitigate them by working in symbiosis with nature, addressing the cause rather than treating the symptoms of a degraded landscape.

Current policy and market solutions remain trapped in a fragmentary logic in which investment treats the individual symptom while sidelining the systemic drivers of these systemic risks. Such an approach ensures that new symptoms continually emerge faster than the old ones can be managed. True prosperity cannot be reached by managing these symptoms in isolation, it requires a systemic redesign whereby the focus is directed toward the regenerative capacity of land, farms and communities.

Exploring how and why regenerative agriculture can serve as a useful pillar in the future of Ireland's climate and agricultural policy is a key aim of this report. The policy framework to support such a shift is already in place. At both an EU and national level, integration of regenerative principles within the Common Agricultural Policy (CAP) 2023-27, improved funding for Agri-Environmental Climate Measures (AECMs), research and funding of projects focused on regenerative approaches and recognition of the benefits of regenerative agriculture upon environmental and health factors as outlined within the Farm to Fork Strategy are a welcome first step. However, the compounding risks of supply chain instability, climate change and

shifting geo-political dynamics present a range of acute risks which must be designed into future policy solutions.

Current climate policy provides government and policymakers with clear pathways to bring forward more local, resilient and ecologically regenerative food production methods. Similarly, EU agricultural policy recognises the importance of sustainable and regenerative farming methods, particularly in relation to food security and sustainability, soil health, biodiversity and climate mitigation. Combined, there emerges a strong case for the rapid adoption of the regenerative approaches outlined in this paper and urges policy practitioners within Ireland to consider how these can be interpreted and implemented within an Irish context.

The Common Agricultural Policy (CAP) 2023-27 supports agricultural approaches rooted in ecological restoration, and provides funding mechanisms to farmers which incentivise regenerative practices. The recognition of the value of crop rotation, cover cropping, reduced tillage and agroforestry within the CAP, alongside funding arrangements to support farmers are an important first step. However, more immediate and ambitious action is required to enable regenerative agriculture to respond to the increasing scale and pace and scale of climatic and geopolitical changes. That action is possible during the reform of the CAP for the next 2028-2034 period led by the Irish Presidency of the European Council. This report explores the key risks relating to current farming practices in Ireland. EARA's CAP policy paper¹ provides a more detailed analysis of the CAP and sets out proposals for ensuring that it better supports farmers who wish to integrate and scale up regenerative approaches.

The Farm to Fork Strategy (2020), under the European Green Deal, aims to support more sustainable food productions across Europe. It seeks to enhance biodiversity through the reduction of pesticides and fertilizer use, increase organic and agroecological farming practices

¹ EARA (2024) Towards a farmer-centric CAP rooted in agroecosystem health ([LINK](#))

and provides funding to support the restoration of degraded ecosystems. The EU Soil Strategy (2021) reinforces these commitments with focus upon carbon sequestration, soil biodiversity, improved water retention to reduce runoff and prevent soil erosion, thereby helping to limit flooding and other climate associated risks. The EU Biodiversity Strategy 2030 similarly emphasises protecting and restoring degraded ecosystems through denser and more diverse planting, hedgerows, natural pest control and by reducing pollution. These measures aim to create more diverse and resilient landscapes in response to ongoing degradation caused by standard agricultural practices and to safeguard against the changing environmental risks European farmers will experience in years to come.

At a national level, Ireland has made some progress towards meeting these priorities, including a 4.6% reduction in agricultural emissions due to reduced fertiliser use. However, agriculture remains the highest CO2 emitting sector with 34.3% of all CO2eq. GHG emissions. In its 2025 Climate Action Plan² the Irish Government recognised the limited progress in this area and highlighted a need for targeted and accelerated initiatives to reduce agricultural emissions and to meet EU and national commitments.

Funding through the CAP, LEADER, ACRES and Just Transition Fund provide the appropriate, policy-aligned vehicles to drive forward increased use of regenerative agriculture approaches, complimenting and enhancing the increase in organic farming methods already seen across Ireland. With appropriate targeting and implementation, the approaches outlined in this report can build on work already underway and help deliver environmental and agricultural policy objectives within the required timescales.

Irish agriculture operates over 4.7 million hectares, of which 91% is under permanent or temporary pasture³. While the distribution of

² Government of Ireland. (2025). Climate action plan. ([LINK](#))
³ Data sourced from Eurostat, Farms and hectares by crops, utilised agricultural area, economic size of the farm ([LINK](#))

utilised agricultural area (UAA) has not evolved much since 2005, there has been a proliferation of dairy cattle as a share of the total herd⁴. In 2005, dairy and beef cattle were roughly equal, while in 2025 dairy cows more than doubled sucklers⁵. A total of 56% of all Irish farms are classified as specialist beef production, while only 11% are specialised in dairy. Dairy operations are concentrated on fewer, larger, more intensive holdings, while beef is spread across many smaller farms, and a growing share of those beef animals are themselves of dairy origin. As the suckler herd has contracted, dairy-bred calves have increasingly filled the gap, with cattle of dairy origin rising from 47% of the national slaughter in 2010 to 57% by 2020⁶. The expansion of dairy has, in effect, reshaped the beef sector from within.

Ireland's grassland dominance has defined the agricultural sector in recent history, yet specialisation comes at the expense of the diversity that underpins food sovereignty and domestic food security. Commercial horticulture has contracted sharply, with the number of growers dropping to less than one fifth of what it was in the 1980's⁷. Consequently, Ireland now imports roughly 83% of its fresh produce⁸, and is self sufficient in only three of seven major food groups⁹. By specialising in a narrow band of exportable commodities, Irish agriculture has offshored the critical production of the fruit, vegetables, and grains essential to a healthy diet. Such a reliance on external production jeopardizes the food and nutrition sovereignty of the Irish population, leaving it exposed to supply chain, price, and climate shocks that a more diversified, locally-rooted sector would buffer.

Moreover, the share of land under or transitioning to organic management has grown five-fold

⁴ Teagasc: dairy and suckler cow numbers were approximately equal in 2005; dairy is now more than double suckler. CSO cattle series from Farm Structure Survey 2023 (2013-2023). ([LINK](#))
⁵ CSO (2025) Number of Cattle in June ([LINK](#))
⁶ Teagasc, Dairy calf to Beef ([LINK](#))
⁷ Bord Bia. (2023). Evidence to the Joint Oireachtas Committee on Agriculture, Food and the Marine on the horticulture sector. Houses of the Oireachtas. ([LINK](#))
⁸ Irish Examiner. (2024). Ireland importing the majority of its fruit and vegetables. ([LINK](#))
⁹ Cole, M. B., et al. (2025). EU food self-sufficiency assessment. Nature Food. ([LINK](#))



since 2005, from just 43,000 hectares to over 230,000¹⁰. This positive trend is driven by volatile input markets and human health, but still only accounts for ~5% of total UAA. While the majority of organic land is reserved for permanent pasture, dairy farms make up a mere 12% of farms under organic pasture management¹¹, and horticulture farms remain marginal. Not every farm needs to be managed organically, but reducing reliance on external inputs benefits the land, the farm economics, and the health of plants, animals, and humans.

Historical context

As global geopolitical tensions rise, so do national security concerns and the sourcing of critical agricultural commodities like energy, feed, and synthetic plant-protection and fertiliser inputs. A key turning point in agricultural history can be traced to British economist David Ricardo and the theory of comparative advantage¹². In the case of the UK, the implementation of the comparative advantage theory engendered the idea that the focus should shift from agriculture to manufacturing, industrialisation and 'free trade'. Following the repeal of the Corn Laws in 1846¹³ many countries sought to replicate the Ricardian economic model, particularly as the industrial revolution expanded beyond the UK.

Following the adoption of the Ricardian doctrine, Western countries believed that domestic agriculture no longer had to feed the nation, but be competitive on international commodity markets, leading to a series of events that now define modern agriculture. Smallholder farmers were forced to move to cities to find labour in industry as small, labour-intensive land couldn't

compete with cheap imported grain¹⁴. Surviving farms had to industrialise in order to survive on thin margins, favouring monocultures and scale over diversity and resilience¹⁵. Finally, as the intensive mechanisation of agriculture degraded soils and the invention of synthetic inputs coincided¹⁶, agricultural production became structurally dependent on these products to try and sustain declining yields¹⁷.

Ireland offers one of the earliest and most devastating illustrations of where this logic leads. Under the same free-trade, export-first doctrine that reshaped British economic policy, a dependent colony was made to keep exporting food while its own people starved.

The Great Irish Famine (1845 to 1852) can be understood as the catastrophic convergence of colonial exploitation, agricultural homogenisation, and political shortcomings from the British state. When *Phytophthora infestans* (late or potato blight) struck, roughly half the population was dependent almost exclusively on a single, high-yielding potato variety, and this lack of genetic diversity enabled this disease to decimate the entire food supply¹⁸. Yet despite this apparent scarcity, Ireland remained a net exporter. Seventy-five percent of Irish soils were dedicated to exported grain, leaving the country under military guard even as its people starved¹⁹.

Ultimately, the deeper failure was one of priorities. The British government spent close to £8 million on famine relief, with over half of this on loans, while £20 million was given as compensation to slave owners during the abolition in 1833²⁰. Throughout, the government held to the free-market orthodoxy that continued

¹⁰ Data sourced from Eurostat, Organic crops by utilised agricultural area, economic size of the farm ([LINK](#))

¹¹ Data sourced from Eurostat, Organic animal farming by utilised agricultural area, livestock unit, economic size of the farm ([LINK](#))

¹² Comparative advantage is the idealistic principle that a country benefits from specialising in the production and exportation of goods it can make at a relatively lower opportunity cost than others. All goods where the cost disadvantage is comparatively greater are imported, theoretically leaving both parties better off than if each sought to be self-sufficient.

¹³ The Corn Laws were a set of protectionist tariffs and trade restrictions on imported grain to protect against the mass importation of grain from other countries that would flood the British market and collapse domestic prices.

¹⁴ Heblich, S., Redding, S. J., & Zylberberg, Y. (2024). The distributional consequences of trade: Evidence from the grain invasion (No. w32958). National Bureau of Economic Research. ([LINK](#))

¹⁵ Mehrabi, Z. (2023). Likely decline in the number of farms globally by the middle of the century. *Nature Sustainability*, 6(8), 949-954. ([LINK](#))

¹⁶ Derpsch et al. (2024). Nature's laws of declining soil productivity and Conservation Agriculture. *Soil Security*, 14, 100127. ([LINK](#))

¹⁷ Navarro, B. B., Machado, M. J., & Figueira, A. (2025). Nitrogen use efficiency in agriculture: integrating biotechnology, microbiology, and novel delivery systems for sustainable agriculture. *Plants*, 14(19), 2974. ([LINK](#))

¹⁸ Britannica, Great Famine (Irish history): Relief efforts. ([LINK](#))

¹⁹ Woodham-Smith, C. (1962). *The Great Hunger: Ireland 1845-1849*. Sourced from Ireland's Great Hunger Museum ([LINK](#))

²⁰ RTE (2020), A policy to disaster: British famine relief measures. ([LINK](#))

food exports alongside the increasing rate of starving population and emaciation. Ireland had, and always will have, the capacity to feed its population and those beyond it, but it cannot do so if the production is directed to external markets rather than its own people first. If we reflect on the current agricultural system's dynamics, this period acts as the warning most relevant to policymakers today.

Optimising a food system for export rather than for its own population is made fragile by that dependence, not secure. As production narrows to a few exported commodities, a single shock, a crop or animal disease, a price collapse, or a closed trade route, can turn on-paper abundance into scarcity. As climate change drives the global frequency of harvest failures and supply disruptions, the nations best able to withstand a shock will be those with diverse, locally-rooted production rather than those most dependent on distant markets and imported inputs. Ireland, with its export-focused, input-intensive livestock and arable systems, has continued to place its fate at the whim of international markets and a small concentration of nations that supply its feed and fertiliser. Invoking the famine may seem extreme, but the structural lesson is unwavering. A nation that focuses on the export ledger before the security of its own people is a nation at systemic risk.



Four core systemic risks of the Irish agricultural sector

National Security

Erosion of an Outdated System

While the efficiency of agricultural products and machinery have improved over the last century, the system itself remains unchanged. Rather, European agriculture has become ever more reliant on external inputs as land consolidation and intensification continues. Between 2005 and 2023, the EU lost an average of 850 farms per day²¹, with countries like Romania, Bulgaria, and Slovenia bearing the greatest losses. Ireland, while representing only a small percentage of total farms lost, is still subject to this trend and has been losing 2.5 farmers a day since 2013. With just 4% of Ireland's farming population aged under 35, and only 3 of 5 farms with a succession plan, we are witnessing the decline of a once diverse agricultural sector. Small farms are being consolidated as they cannot absorb the costs of input shocks. Currently, incentives for new entrants do not outweigh the compounding risks embedded in the industrial agriculture model, nor the imbalanced access to cheaper capital of larger, export-oriented agricultural corporations.

In addition, comparative advantage can only work in peaceful interdependence, relying on the assumption that trading partners have too much to lose to weaponise the supply, or are unable to produce the imported inputs competitively. Recently, the flawed assumptions of this model have been globally unveiled through rising geopolitical tensions in countries with a disproportionate concentration of critical production²². Global market shocks caused by

21 European Commission. (2025, July 4). A sector in transition: Latest data on farms and farmland in the EU ([LINK](#))
22 Quitzow, R., Balmaceda, M., & Goldthau, A. (2025). The nexus of geopolitics, decarbonization, and food security gives rise to distinct challenges across fertilizer supply chains. One Earth, 8(1). ([LINK](#))

this pressure drive up the cost of critical inputs, and despite efforts from the public sector to mitigate out-of-pocket costs, much of the economic pressure is absorbed by farmers.

The security of nation states depends in the first instance on their financial resources to pay its debt and operations year in year out. Instead the security of the people of the nation of Ireland, or any other, depends on access to clean water, healthy food and shelter. More generally, recent trends can be observed as the deconstruction of the social market economy, specifically in the European Commission's proposed 2028-2034 Multiannual Financial Framework, that diverts spending away from agriculture, cohesion, and rural livelihoods to favour 'competitiveness, security, and defence'. Under the proposal, the CAP budget falls from €388 billion to €296 billion, a real-terms reduction of roughly 30%. This cut comes in the wake of a threefold increase in security and defence spending.

Specialisation and Structural Vulnerability

Following the abolition of the milk quotas in 2015, Irish agriculture underwent a significant restructuring. While dairy production has always played an integral role in the sector, the total head count of dairy cattle grew 41.6% compared to 2013 numbers. Simultaneously, the amount of beef cattle fell sharply by 24.2%, while the total hectares dedicated to grassland (permanent and temporary) declined by roughly 6%²³.

With no ceiling on the production of dairy products, the market restructured around a high-output, export-oriented model in which over 90% of milk output is now sold onto volatile international commodity markets²⁴, exposing farm incomes to price swings they had previously been insulated from.

23 Data sourced from CSO Database ([LINK](#))
24 Teagasc, Dairy Road Map 2030 (2026), citing Bord Bia Export Performance and Prospects 2025-2026: „Over 90% of milk output is exported.“ ([LINK](#))

The breeding herd restructured around dairy

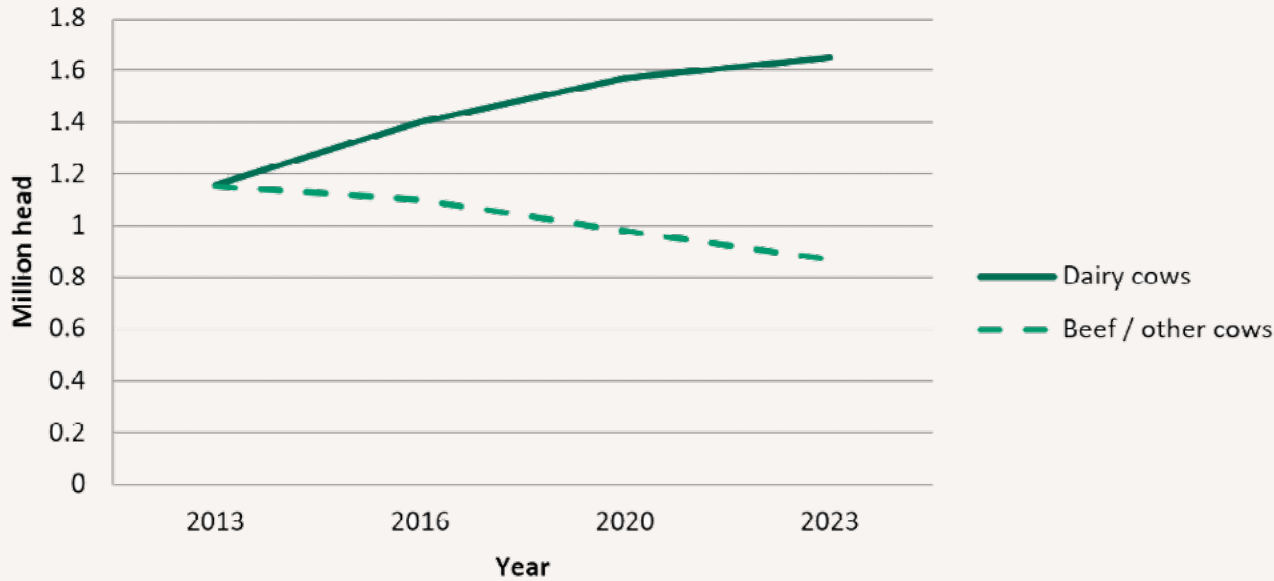


Figure 1, Evolution of Ireland's cattle herds from 2013 to 2023 in million head

Average Cattle Farm Income

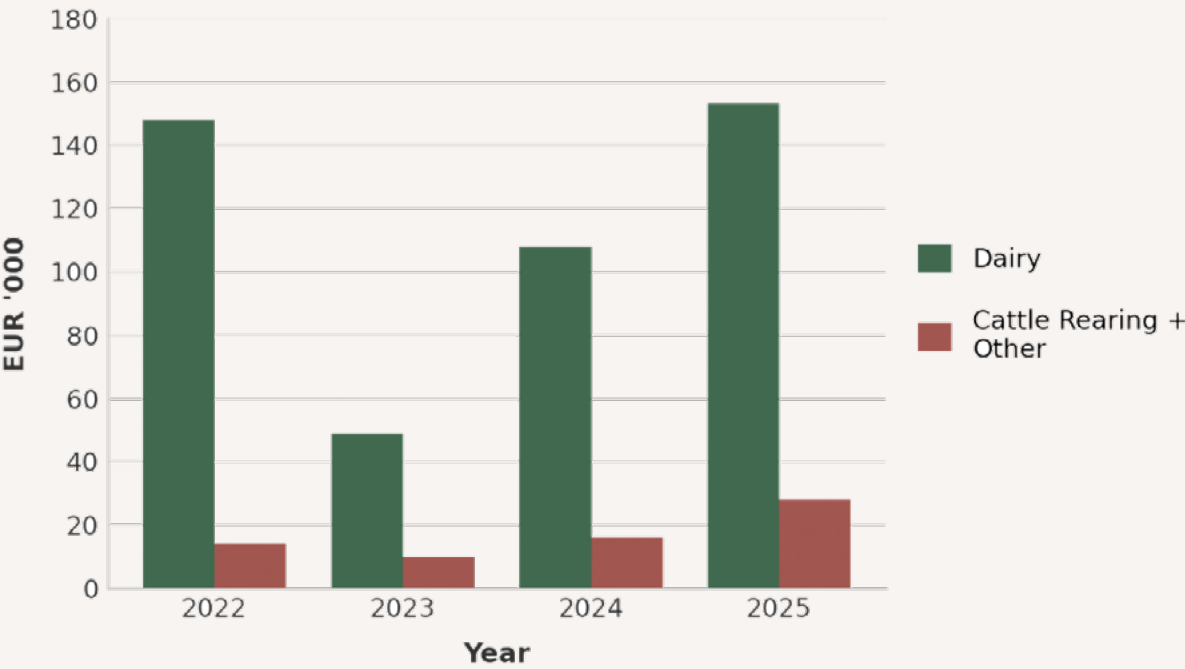


Figure 2, Average cattle family farm income in €1000's from 2022 to 2025^{25,26}

25 It is impossible to attribute exact figures to dairy and non-dairy operations, as official statistics split the herd into dairy cows, other (suckler) cows, and one large pool of „other cattle“ holding all calves, youngstock and finishing animals. A dairy replacement heifer counts as „other cattle“ until she first calves, so the „dairy“ figure captures only the mature milking herd, not the full complement of animals the dairy system rears and depends on.

26 Data sourced from Teagasc farm surveys ([LINK](#))

Despite this increased fragility, milk production typically represent 30% - 40% of Ireland's total agricultural output²⁷. Still, dairy farmers' average income has been flung across a threefold range, from roughly €50,000 to €140,000 and back toward €80,000 within a few short seasons²⁸. Average family beef income is similarly erratic as it is equally dependent on purchased inputs, ranging from €10,380 to €26,500 over the same period.

As of October 2026, average farm incomes in Ireland are predicted to drop yet again by a staggering 38%, driven largely by consistently high input prices and commodity price decreases²⁹. This collapse will be felt most by dairy farmers, who will experience a reduction in average income by 49%, while cattle rearing and other cattle farm incomes will drop by 21% and 36%, respectively. At the same time, consumer prices for dairy products remain elevated.

The severity of this dynamic is unique to agriculture. The core driver is the lag between the production and delivery of the output, so that producers invest on today's prices but sell months or years later into a market that has already shifted. When demand is too slow to respond to close the gap, supply and price never settle but oscillate instead. So, even though the products made from farmers produce are expensive, they are paid as if there is an overproduction, further widening the gap between producers and consumers.

Ireland's farming systems are substantially oriented towards livestock operations. Over-specialisation, partly due to export contracts, the removal of milk quotas, and an abundance of grassland leaves Ireland deeply exposed to global market shocks on two fronts³⁰. With over 90% of beef, dairy, and other livestock products destined

for export³¹, Irish farms are effectively beholden to international commodity markets, which are inherently volatile³². Similarly, imported inputs are equally exposed to global shocks in feed, fertiliser and fuel, of which Ireland imports the vast majority.

In addition, the impact of this dynamic is not evenly distributed between all farms³³. When milk prices surge alongside input costs, larger, industrial operations are better positioned to absorb the costs of production³⁴. With the capital and scale to absorb higher input bills, large farms can maintain input-use needed to maintain their current production system. Smaller and more marginal farms experience disproportionate risk as they are less likely to carry the cost, leaving them less resilient in these conditions compared to their larger competitors³⁵. This precarity is not only financial, as sustained income volatility, debt and the threat of losing a family holding take a heavy toll on farmer mental health³⁶. Diminished wellbeing and heightened suicide risk³⁷ create effects which ripple outward through families, rural communities and the social fabric that depends on them. The result is that each successive shock tends to accelerate the sector's concentration, consolidating land, output and market power into fewer, larger, and more input-dependent hands³⁸. This will not, however, protect these farms from future shocks.

Irish agriculture is highly concentrated, with the highest share of agricultural land under grassland in Europe, at over 90%. Ireland's climate has

been largely determinant of this, with many agricultural areas being well-suited to pasture, but within this there is also a bias toward livestock meat and dairy production as more exportable commodities, the result of which has been a sharp decline in other types of production. There are now over 110,000 livestock farms³⁹ in Ireland, yet less than 5,000 specialist arable farms, and only 270 horticultural producers⁴⁰. Historically, this was not always the case. In the mid-19th century, arable land accounted for roughly 1.44 million hectares of Irish farmland. Following the collapse in grain prices and the upheaval of the famine, it fell sharply, to about 550,000 hectares by 2000,⁴¹ and stands at roughly 450,000 hectares under arable production today. Over the same period the share of grassland rose dramatically, as livestock became the primary output of Irish agriculture. Substituting critical production of fruits, vegetables, and grains with livestock indicates a significant reliance on imported foods to meet nutritional requirements.

Ireland is one of Europe's largest food exporters, yet simultaneously imports around 83% of its fresh produce. Nature Food's 2025 assessment of EU food self-sufficiency⁴² examines nations' food sovereignty, comparing domestic food production against a recommended diet (known as the WWF Livewell diet). It assesses food sovereignty among seven food groups, namely meat, dairy, fish and seafood, starchy staples, legumes, nuts and seeds, fruits and vegetables. Ireland is self-sufficient in just three of seven food groups, meat, dairy, and fish, scoring similar to Germany, Sweden and Finland but well behind Spain, Romania and the Baltic states. The report sits within the broader context of European weakness in fruit and vegetable production, yet Ireland remains comparatively worse than most. Paradoxically, the Global Food Security Index (GFSI) places Ireland near the top of all assessed countries for potential food security⁴³, indicating Irish agriculture is theoretically capable of meeting its nutritional demands. This dependence is striking for a country with an otherwise world-leading, export-oriented agri-food sector. This

27 Data sourced from CSO, Output, Input, and Income for Agriculture ([LINK](#))
28 Teagasc, National Farm Survey (2025) ([LINK](#))
29 Teagasc. (2026). Farm incomes to fall in 2026 as milk and cattle prices ease - Teagasc | Agriculture and Food Development Authority. Teagasc | Agriculture and Food Development Authority. ([LINK](#))
30 De Roest, K., Ferrari, P., & Knickel, K. (2018). Specialisation and economies of scale or diversification and economies of scope? Assessing different agricultural development pathways. Journal of rural studies, 59, 222-231. ([LINK](#))

31 Minister Heydon publishes annual review and outlook. (2025b). Gov.ie. ([LINK](#))
32 Rezitis, A. N., & Kastner, G. (2021). On the joint volatility dynamics in international dairy commodity markets. Australian Journal of Agricultural and Resource Economics, 65(3), 704-728. ([LINK](#))
33 Eurostat (2025). Farms and farmland in the European Union – statistics, Statistics Explained. ([LINK](#))
34 Eurostat (2025). Farms and farmland in the European Union – statistics, Statistics Explained. ([LINK](#))
35 Eurostat (2026). Agriculture statistics – family farming in the EU, Statistics Explained. ([LINK](#))
36 Malone et al. (2025). "Lacking the rural empathy"; Irish farmers' and stakeholders' opinions on current mental health services and preferences for support. Journal of Rural Studies, 114, 103508. ([LINK](#))
37 Cox et al., (2025). Probable suicide among men in farming and agricultural-related occupations in the republic of Ireland: exploring coronial data. Journal of Agromedicine, 30(4), 801-811. ([LINK](#))
38 Boccaletti, S., Maranzano, P., & Viegas, M. (2024). Inequality and concentration in farmland production and size: regional analysis for the European Union from 2010 to 2020. arXiv preprint arXiv:2409.00111. ([LINK](#))

39 CSO (2023) Farm structure survey ([LINK](#))
40 Bord Bia Growers HIF ([LINK](#))
41 Eaton et al., (2008). Land cover change and soil organic carbon stocks in the Republic of Ireland 1851-2000. Climatic change, 91(3), 317-334. ([LINK](#))

42 Stehl et al., (2025). Gap between national food production and food-based dietary guidance highlights lack of national self-sufficiency. Nature Food, 6(6), 571-576. ([LINK](#))
43 Global Food Security Index report (2022) ([LINK](#))

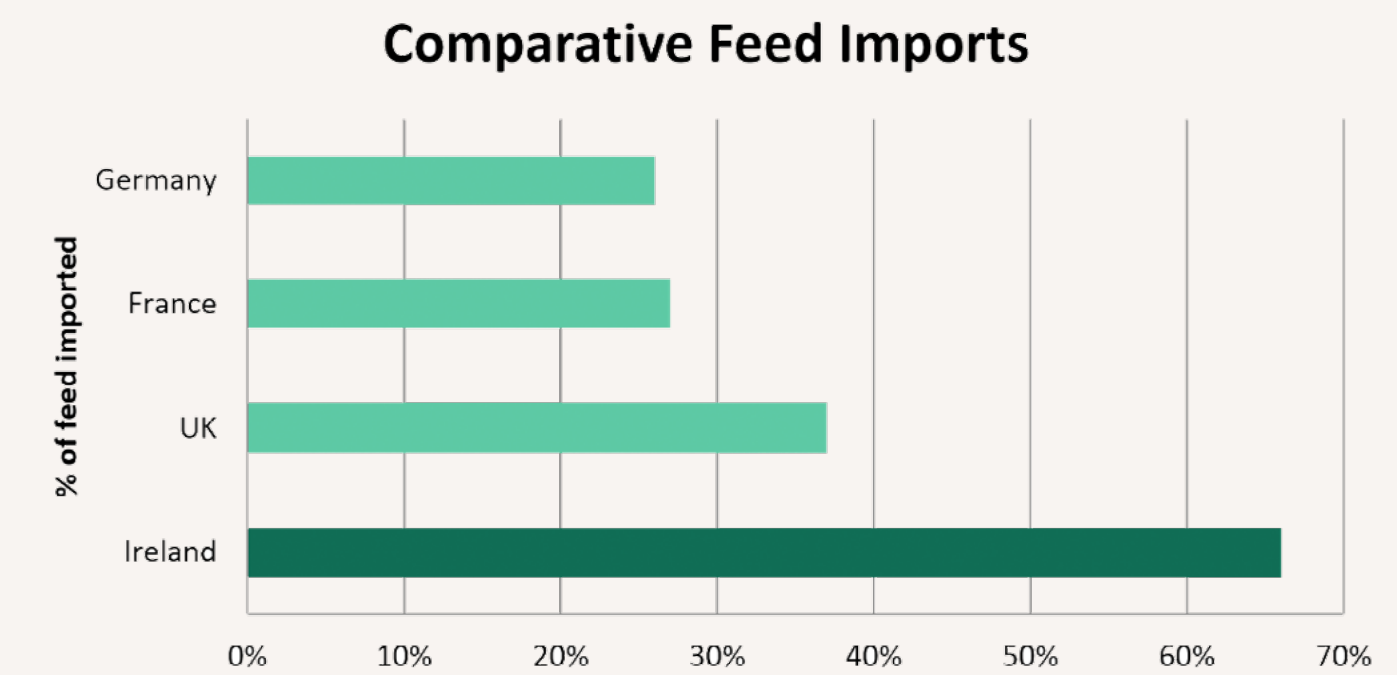


Figure 3, Comparative feed imports of Ireland against other European countries

is a structural vulnerability to Ireland’s national food security, exposing the agricultural sector to supply-chain shocks, transport disruption, and extreme weather⁴⁴. If Irish food production were more diversified, it would embed national and nutritional security in the fabric of the agricultural sector, while stimulating local supply-chains.

International Commodity Markets

Ireland is disproportionately exposed to global input markets, with about two thirds of animal feeds marketed in Ireland imported⁴⁵, compared to 37% in the UK, 27% in France, and 26% in Germany⁴⁶. Moreover, the sourcing of these

44 Critical issues and food security. (2023). Bordbia [\(LINK\)](#)
45 Hennessy, T. (2024). Food security is a concern in Ireland. Irish Examiner. [\(LINK\)](#)
46 Irish examiner (2018) We depend two times more on imported animal feed than our neighbours. [\(LINK\)](#)

imports has historically been concentrated among a few countries, making Irish agriculture reliant on the production of other nations. Up to 90% of soybean and maize products come from Argentina, Brazil, and the USA⁴⁷. Similarly, Ireland has virtually no capacity to domestically produce fertilisers, and remains fully dependent on imported products to fuel conventional agriculture⁴⁸.

Reliance on global agriculture markets, which have been exceptionally volatile since 2020, creates an additional layer of vulnerability to Ireland’s food security⁴⁹.

47 Irish examiner (2018) We depend two times more on imported animal feed than our neighbours. [\(LINK\)](#)
48 Bhriain, N. U. (2026). Minister admits: Ireland produces almost no domestic fertiliser. Gript. [\(LINK\)](#)
49 Zunaisar et al. (2026). Drivers of Agricultural Commodity Market Volatility and Food Supply Chain Resilience: A Systematic Review. F1000Research, 15, 1208. [\(LINK\)](#)

Moreover, this persistent volatility indicates a pressing need for more government policy which recognises these risks at local and national levels. The COVID-19 pandemic of 2020 led to a demand shock as the sharp contraction in global economic activity pushed international dairy prices down by an estimated 4% to 7% and meat prices down by 7% to 18% in 2020, even as it disrupted labour supply, processing and shipping across major exporting regions⁵¹. Consequently, the lack of demand destabilised the supply chain through border closures, labour shortages, and container and freight disruptions, leaving global input logistics fragile and vulnerable to following shocks⁵².

In 2021, this fragility was met with a steep

51 Elleby et al. (2020). „Impacts of the COVID-19 Pandemic on the Global Agricultural Markets.” Environmental and Resource Economics, 76, 1067–1079. [\(LINK\)](#)
52 FAO (2020). COVID-19 pandemic – impact on food and agriculture. [\(LINK\)](#)

rebound in global demand that supply chains were not able to meet. China prioritised its pig production after widespread cases of swine fever devastated it. Global soya prices soared 20-30% due to the sharp increase in demand and lack of supply⁵³. Finally, the escalation of the Russia-Ukraine war in 2022 triggered a major increase in global energy prices and temporarily removed one of the world’s largest grain exporters from the market, compounding the pressure on an already strained and inflated agriculture sector. This resulted in the amplification of global costs of production and transportation for key commodities like animal feed.

Figure 5, Fertiliser sales by nutrient, total spending in € millions, and average price per tonne from 2020 to 2025⁵⁴

53 S&P Global Platts (2020) Commodities 2021: China’s soybean demand set to remain strong in 2021 on swine herd recovery from ASF [\(LINK\)](#)
54 Data sourced from CSO database [\(LINK\)](#)

Imported feed: spend and unit price

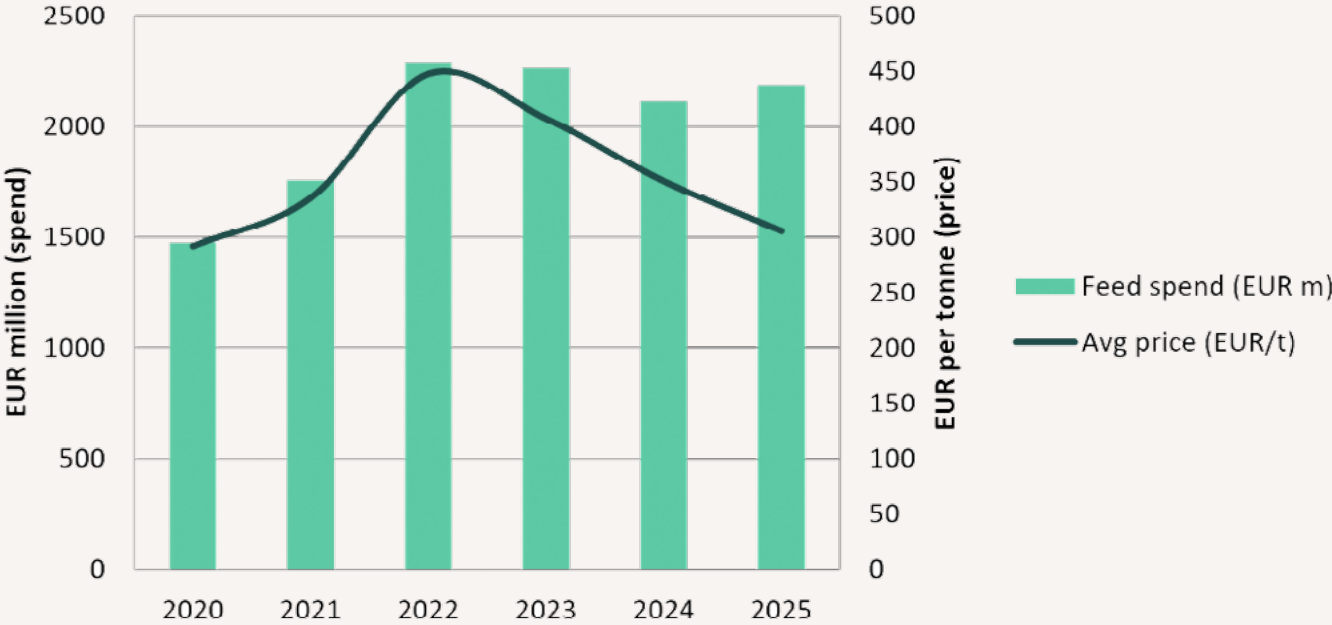
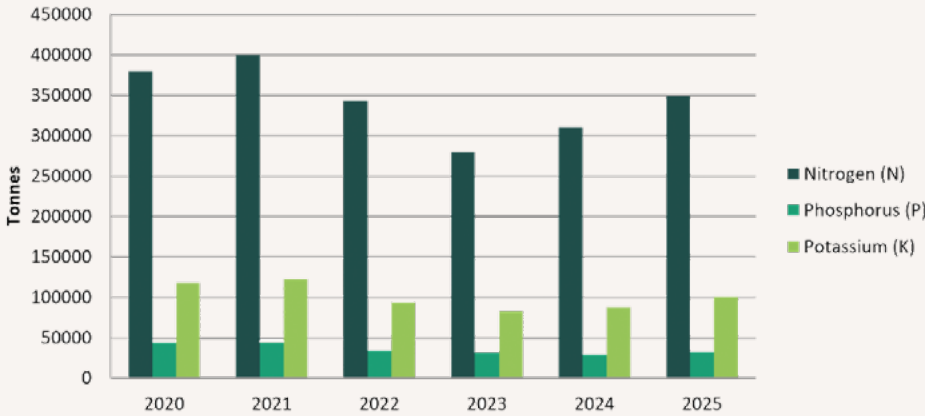


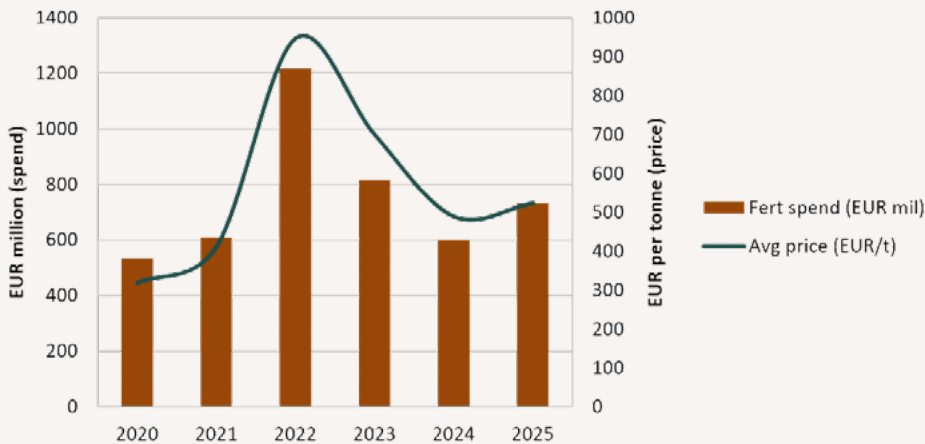
Figure 4, National feed imports in € million, and feed price per tonne⁵⁰

50 Irish examiner (2018) We depend two times more on imported animal feed than our neighbours. [\(LINK\)](#)

Fertiliser sales by nutrient, 2020-2025



Imported fertiliser: spend and unit price



Irish livestock is, fortunately, a largely pasture-based system with an average of 240 days on pasture. However, there are structural vulnerabilities that nonetheless leave it fragile to global market shocks. Much of Ireland's permanent pasture is fertilised with imported synthetic fertilisers, and is primarily monoculture of permanent ryegrass. Moreover, the livestock-dominant farms remain focused on feed concentrates during lactation and for beef cattle finishing. In the years leading up to 2021, the animal feed market was relatively stable.

Before the escalation of the war Russia supplied the EU with roughly 45% of its total gas and 27% of its total oil supply⁵⁵⁶. Natural gas is also the primary feedstock for nitrogen fertilisers, which had a drastic impact on global agricultural input markets. With global instability threatening the supply of these critical resources needed to fuel and fertilise the global agricultural sector, production and transportation costs rose suddenly and severely.

Input-dependent countries like Ireland saw an average increase of 33% for imported animal feed⁵⁷, which remained elevated until 2024 before settling at 5%-16% increased cost relative to pre-war prices⁵⁸. Overall spending on animal feed rose by 55.18% from the period of 2020-2022⁵⁹, despite the total head of animals increasing by only 3%. To an agricultural sector specialised in livestock, this is a significant blow to those who steward the land and the public institutions that support them, and challenges the resilience of Ireland's conventional agricultural system. Moreover, shown in figure 4 is the comparative cost per tonne of imported feed, and the total spending. From 2022, the price per tonne has decreased by roughly 30%, yet volume and spending remains high, primarily due to unfavourable weather conditions causing a shortage of available silage in 2024⁶⁰, and 2025's price drop further increased spending as

feed became more available. What this shows is that despite the current system requiring a large volume of feed, there is a ceiling after which it simply becomes too expensive to feed the animals.

In 2021, total Irish fertiliser sales reached 1.7 million tonnes, a 6% increase from the year prior, with 399,164 tonnes of nitrogen⁶¹. Consequently, this heavy reliance on nitrogen left the sector exposed to the 2022 shock, disrupting nitrogen production and supply and placing many farmers under immense economic strain, with a substantial decrease in average farm income. Nitrogen (N) remains the leading nutrient in fertiliser sales, with fertilisers like Calcium Ammonium Nitrate (CAN) and Urea making up the majority of direct N fertiliser sales. Between 2020 and 2022, their prices rose by 251% and 204% per tonne, respectively⁶².

As a result, fertiliser imports fell 18% year-on-year in 2022 to 1.4 million tonnes, and by a further 18% in 2023 to 1.1 million tonnes⁶³, reaching the lowest point in 20 years⁶⁴. Despite this decreased volume, the total spending on fertilisers doubled in 2022, at 1.2 billion, compared to 608 million in 2021⁶⁵. What this shows is a sector without the capacity to absorb these price shocks, despite leaning heavily on synthetic inputs for production.

Existing pressure on input supply and trade routes was compounded earlier this year following the closure of the strait of Hormuz, through which an estimated 25-30% of global nitrogen fertiliser exports pass⁶⁶. With the extended closure of the strait, the price of most fertilisers remains nearly double its value in 2020 after experiencing another 15-18% increase in price/tonne earlier this year. Such instability is reflected in the economics of Irish farms, with Teagasc's 2022 farm survey classifying only 43% of farms as economically viable, with a further 25% considered

'sustainable' purely through off-farm income⁶⁷. This comes despite a roughly 30% increase in average farm income, compared to 2021⁶⁸. Public bodies are not blind to this trend, with the Internal Department of Agriculture briefings from 2026 describing Ireland a „structurally vulnerable“ and „import-dependent island“⁶⁹. The statement was made in response to the intensification of the Iran war, referring to the fact that more than a third of the country's annual fertiliser requirement was yet to be secured at the height of the disruption.

The recent instability of global markets alongside increasing risk of extreme weather and climate related events, reinforces the urgent need for targeted solutions which move beyond input-dependent systems to rebuild domestic production of commodities such as grains, fruits, and vegetables. Prioritising food sovereignty and input independence would embed resilience against future shocks directly into the fabric of Irish agriculture, while stimulating

local supply chains and securing access to the products the sector and its consumers depend on. Policies which proactively anticipate systemic vulnerabilities and local risks and build adaptive regenerative policies can also mitigate compounding and cascading risks including ecosystem degradation, public health and economic impacts. A farm that runs on biology rather than chemistry has a structurally different risk profile when geopolitical or climate shocks move commodity markets.

Competitive Energy Demand and Dependence

Agricultural inputs are not the sole driver of financial pressure on Irish farms. Ireland's energy system is structurally exposed to the same threats, leading to rising costs and reduced supply.

Ireland's overall energy import dependency reached 79.7% in 2024⁷⁰, among the highest in the EU and well above the EU-27 average of 57.2%⁷¹. Of the energy Ireland does import, 94% is fossil fuel⁷², and fossil fuels overall account for 81.4% of the country's total primary energy requirement. Mounting pressure on the grid is not only coming from volatile global markets⁷³, but through increased demand as data centres establish themselves in the country. In 2024, Irish data centres consumed 22% of all metered electricity, up from just 5% in 2015⁷⁴. Already, they take more energy from the grid than all urban and rural homes combined, with this share forecast to reach ~30% by the early 2030's⁷⁵. Every additional unit of grid capacity absorbed by this growth is a unit not available to a farm, a food processor, or the renewable buildout the state itself has committed to.

Straining the grid with excessive demand resulted in wholesale electricity prices soaring for the population. In the years prior to 2021, wholesale prices in Ireland typically averaged from €38 to €60 per megawatt hour⁷⁶. During the aftermath of Russia's invasion of Ukraine, the wholesale price peaked at almost €400 per megawatt hour, a rise of roughly tenfold from the pre-crisis norm. Despite prices easing since, they remain substantially higher than their pre-2021 range⁷⁷.

55 International Energy Agency (IEA) A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas ([LINK](#))
56 Al Jazeera (2025), How much of Europe's oil and gas still comes from Russia? ([LINK](#))
57 Figures calculated with data sourced from CSO ([LINK](#))
58 Figures calculated with data sourced from CSO ([LINK](#))
59 CSO, Agricultural Output, Input, and Income ([LINK](#))
60 Teagasc (2024) Situation and Outlook 2024 ([LINK](#))

61 CSO, Fertiliser sales 2021 ([LINK](#))
62 Data sourced from CSO, Fertiliser Price Euro per tonne ([LINK](#))
63 Data sourced from CSO 'Fertiliser sales (tonnes)' ([LINK](#))
64 Teagasc (2024). 'Fertiliser sales at lowest point in two decades.' ([LINK](#))
65 CSO, Agricultural Output, Input, and Income ([LINK](#))
66 Taylor, S. (2026, July 28). Global fertilizer markets feel impact of conflict in the Middle East. Rabobank. ([LINK](#))

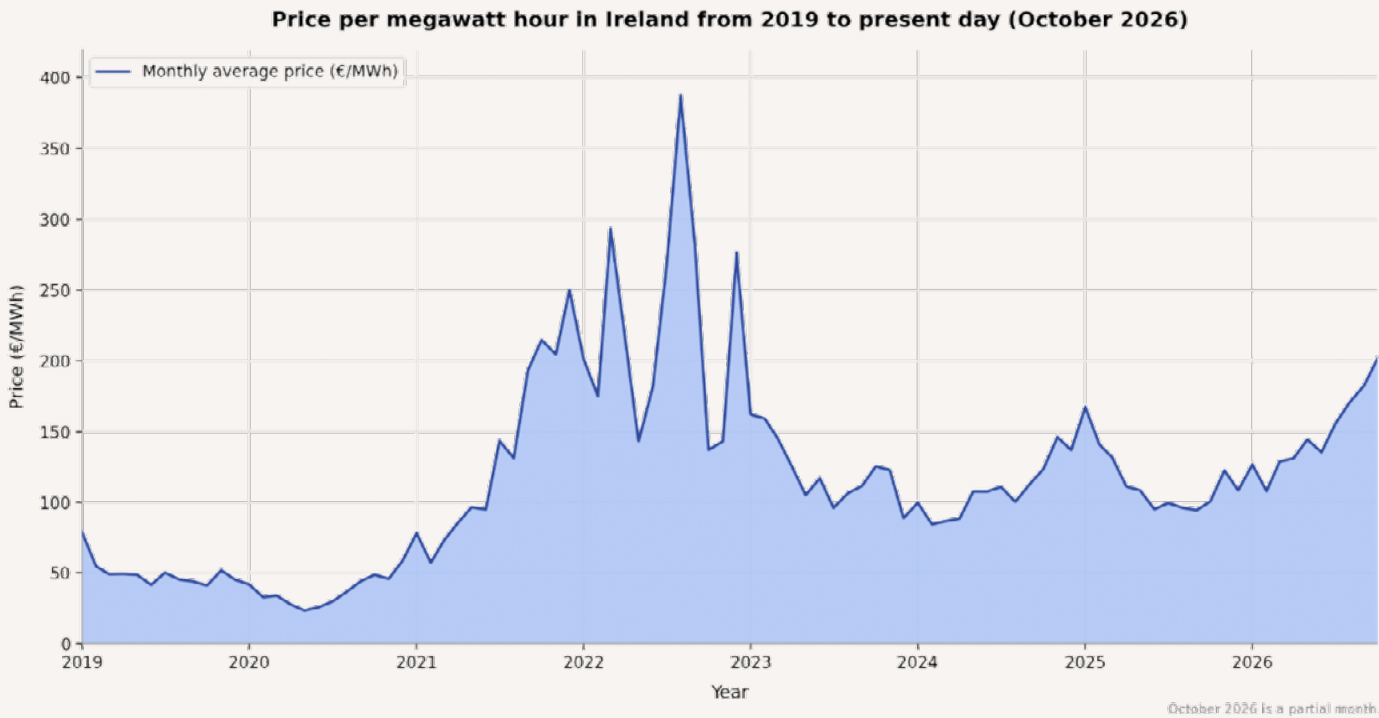
67 Teagasc, National Farm Survey (2022) ([LINK](#))
68 Teagasc. (2023). Increase in farm incomes largely confined to dairy and tillage farms in 2022 - teagasc | agriculture and Food Development Authority. Teagasc | Agriculture and Food Development Authority. ([LINK](#))
69 RTÉ News. (2026, May 21). Agriculture Dept worried about panic buying of fertiliser. RTÉ. RTE.Ie. ([LINK](#))

70 ([LINK](#))
71 Central Statistics Office. (2026). Energy use and import dependency: Business in Ireland 2025 — Circular economy and resource use. ([LINK](#))
72 Central Statistics Office. (2026). Energy use and import dependency: Business in Ireland 2025 — Circular economy and resource use. ([LINK](#))
73 Central Statistics Office. (2026). Energy use and import dependency: Business in Ireland 2025 — Circular economy and resource use. ([LINK](#))
74 Central Statistics Office. (2026). Data centres metered electricity consumption 2025 - Central Statistics Office. CSO. ([LINK](#))
75 Central Statistics Office. (2026). Data centres metered electricity consumption 2025 - Central Statistics Office. CSO. ([LINK](#))
76 Data sourced from Kilowatt Irish electricity database. ([LINK](#))
77 Data sourced from Kilowatt Irish electricity database. ([LINK](#))

As natural gas influences both the price of electricity and nitrogen fertiliser conventional agriculture depends on, a single geopolitical shock to gas supply results in an outsized increase in the cost of production. Electricity cost surges compound the economic pressure farmers already face during geopolitical shocks. Because these costs are largely outside a farm's control, reducing the inputs that are controllable, fertiliser, feed, fuel, offers a way to ease pressure elsewhere. Further reducing this exposure to electricity costs would require a shift toward input-independent systems, supplemented by on-farm, community-scale renewables. Yet, such a transition remains constrained by chronic underinvestment in Irish renewable infrastructure, leaving the whole country short of capacity. Passivity and underinvestment are leaving the country reliant on imported fossil fuels, with individual farms as well as local communities footing the bill.

Figure 6, Price per megawatt hour in Ireland from 2019 to present day (October 2026)⁷⁸

78 Data sourced from Kilowatt Irish electricity database. (LINK)



Health

Global health concerns have risen alongside dietary shifts and the explosion of processed and ultra-processed foods⁷⁹. A growing body of research supports the causal influence of agricultural management on the diffusion of inflammatory bowel diseases like Crohn's and ulcerative colitis⁸⁰. The link between nutrition and health is inextricable and well established across all forms of life. Plants⁸¹, animals⁸², humans, and ecosystems⁸³ all depend on balanced nutrition to thrive. Yet as dietary patterns shift⁸⁴ and modern production optimises for a narrow set of performance metrics, overall ecosystem, animal,

79 Zhang, Y., & Giovannucci, E. L. (2023). Ultra-processed foods and health: a comprehensive review. *Critical reviews in food science and nutrition*, 63(31), 10836-10848. (LINK)
80 Caio et al., (2021). Nutritional treatment in Crohn's disease. *Nutrients*, 13(5), 1628. (LINK)
81 Tripathi et al., (2022). Plant mineral nutrition and disease resistance: A significant linkage for sustainable crop protection. *Frontiers in Plant science*, 13, 883970. (LINK)
82 Villalba, J. J., Ramsey, R. D., & Athanasiadou, S. (2024). Review: Herbivory and the power of phytochemical diversity on animal health. *Animal*, 18(9), 101287. (LINK)
83 Provenza, F. D., Kronberg, S. L., & Gregorini, P. (2019). Is grassfed meat and dairy better for human and environmental health? *Frontiers in Nutrition*, 6, 26. (LINK)
84 GBD 2017 Diet Collaborators. (2019). Health effects of dietary risks in 195 countries, 1990–2017: A systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 393(10184), 1958–1972. (LINK)

and human health have declined⁸⁵. Moreover, while diversity has long been hailed as a dietary necessity, little research has focused on the nutrient density and quality of the food that nourishes us.

The interdependence at the heart of this section finds a name in international health policy, namely 'One Health'. The World Health Organisation (WHO) defines it as an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems, one that recognises that the health of humans, domestic and wild animals, plants, and the wider environment, including ecosystems, are closely linked and interdependent⁸⁶. Notably, the WHO frames antimicrobial resistance and food safety not as isolated medical or regulatory problems but as challenges needing a cross-sectoral solution to protect the health and integrity of ecosystems alongside that of animals and people.

This is precisely the logic that runs through the soil, plant, animal and human relationships discussed within this section. A soil's biological function determines the mineral and phytochemical density of the plants growing from it, these plants then determine the nutritional and immune status of the animals that graze them, with those animals, in turn, determining the quality of the food that reaches people. Health is not added to the system through intervention at the end of the chain, but a property that emerges from the condition of the whole chain. Soil, plants, animals, and humans all reflect this same pattern across the chain. Every living thing needs a healthy and balanced source of macro- and micronutrients. For example, a wheat crop deficient in silicon⁸⁷ or manganese⁸⁸ shows early signs of stress⁸⁹ and heightened disease

85 Popkin, B. M. (2022). The nutrition transition to a stage of high obesity and noncommunicable disease prevalence dominated by ultra-processed foods is not inevitable. *Obesity Reviews*, 23(1), e13366. (LINK)
86 WHO (2024) 'One Health' (LINK)
87 Fauteux, F., Rémus-Borel, W., Menzies, J. G., & Bélanger, R. R. (2005). Silicon and plant disease resistance against pathogenic fungi. *FEMS Microbiology Letters*, 249(1), 1–6. (LINK)
88 Graham, R. D., & Rovira, A. D. (1984). A role for manganese in the resistance of wheat plants to take-all. *Plant and Soil*, 78(3), 441–444. (LINK)
89 Coskun, D., Britto, D. T., Huynh, W. Q., & Kronzucker, H. J. (2016). The role of silicon in higher plants under salinity and drought stress. *Frontiers in Plant Science*, 7, 1072. (LINK)

susceptibility. In fact, synthetic fertilisers can further increase this susceptibility by growing too fast, weakening the protective cell walls and blocking essential nutrients in the soil. An animal raised or finished on concentrate achieves rapid daily weight gain but becomes more prone to illness⁹⁰ through systemic inflammation and impaired immune function. It is now a widely accepted fact that humans are no exception, as diets dominated by processed and ultra-processed foods⁹¹ are now a leading driver of the global rise in non-communicable disease⁹² and diet-related mortality⁹³. Underlying all of this, soils degraded by decades of high-intensity synthetic inputs and mechanical disturbance or mismanaged grazing lose the capacity to supply the balanced nutrition⁹⁴ they once passed to plants⁹⁵, animals, and people, and so themselves fall into decline.

As this nutritional balance is disturbed, so too is the functioning⁹⁶ of the system as a whole⁹⁷. Modern medicine and pharmaceuticals have indisputably improved the treatment and prevention of critical diseases in both animals and humans. Yet, the connection between diet and disease susceptibility remains underexplored, and many treatments manage symptoms without addressing the underlying conditions that allow disease to establish and spread. One such warning sign is antimicrobial resistance, now recognised by the WHO as one of the defining One Health challenges of the age, driven in

90 Plaizier et al. (2008). Subacute ruminal acidosis in dairy cows: The physiological causes, incidence and consequences. *The Veterinary Journal*, 176(1), 21–31. (LINK)
91 Elizabeth, L., Machado, P., Zinöcker, M., Baker, P., & Lawrence, M. (2020). Ultra-processed foods and health outcomes: A narrative review. *Nutrients*, 12(7), 1955. (LINK)
92 Popkin, B. M. (2022). The nutrition transition to a stage of high obesity and noncommunicable disease prevalence dominated by ultra-processed foods is not inevitable. *Obesity Reviews*, 23(1), e13366. (LINK)
93 Suksatan et al. (2022). Ultra-processed food consumption and adult mortality risk: A systematic review and dose–response meta-analysis of 207,291 participants. *Nutrients*, 14(1), 174. (LINK)
94 Tripathi, S., Srivastava, P., Devi, R. S., & Bhadouria, R. (2020). Influence of synthetic fertilizers and pesticides on soil health and soil microbiology. In *Agrochemicals detection, treatment and remediation* (pp. 25–54). Butterworth-Heinemann. (LINK)
95 Fan, M. S., Zhao, F. J., Fairweather-Tait, S. J., Poulton, P. R., Dunham, S. J., & McGrath, S. P. (2008). Evidence of decreasing mineral density in wheat grain over the last 160 years. *Journal of Trace Elements in Medicine and Biology*, 22(4), 315–324. (LINK)
96 Delgado-Baquerizo et al. (2016). Microbial diversity drives multifunctionality in terrestrial ecosystems. *Nature Communications*, 7, 10541. (LINK)
97 Wagg et al. (2014). Soil biodiversity and soil community composition determine ecosystem multifunctionality. *Proceedings of the National Academy of Sciences*, 111(14), 5266–5270. (LINK)

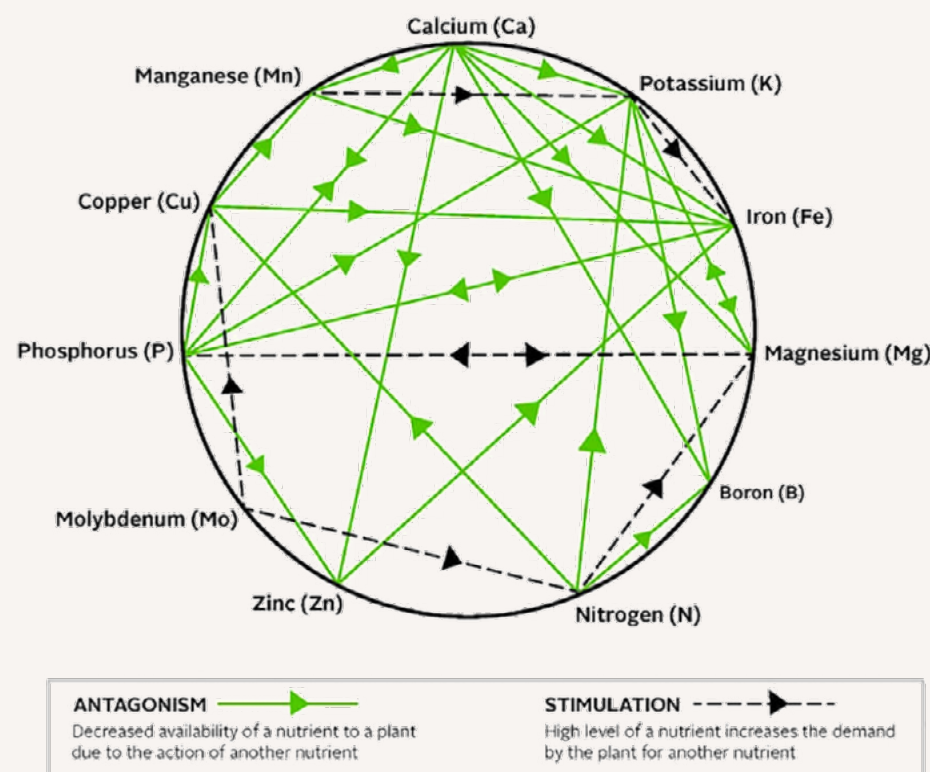


Figure 7, Mulder's chart of nutrient antagonisms and stimulations

significant part by the routine and preventative use of antibiotics in livestock systems. Through this lens, rather than asking only how to treat disease once it appears, we ask what conditions, in the soil, the diet, the animal and the environment, make disease more or less likely in the first place. Because these same processes govern the health of ecosystems and humans, agriculture can then be positioned as a part of a broader solution to address public health issues like inflammatory bowel diseases and non-communicable diseases.

Understanding the nexus of soil, plant, animal and human health means holding many interacting factors in view at once. For the scope of this section, we focus on those most relevant to the prevention of livestock disease transmission and to the expression of effects that lead to death or permanent harm:

Genetics and genetic predisposition, including inherently weak or compromised immune systems

Dietary diversity, the range of foods and nutrients an organism draws on

Diet quality and nutrient density, the nutritional value carried within that diet

Physiological and psychological stressors, such as chronic stress and the lowered immune function that follows from it

Gut and microbiome condition: the microbial diversity and redox imbalance linking soil exposure to immune regulation in animals and humans

These factors share a common premise, that lasting health depends on addressing the underlying causes of disease rather than treating its symptoms once they appear. Taken together, they reframe resilience as something built across the whole chain from soil to human, where a weakness at one level propagates to the next and a strength at one level buffers the others.

The Health Nexus

While nutrient density of food has been the subject of a long-running scientific debate, two things are reasonably well established. Firstly, the „dilution effect“ illustrates the decline in nutrient density and diversity. As crops have been bred and fertilised for maximum yield, the additional bulk is largely water and carbohydrate, so the concentration of minerals per unit of food falls⁹⁸. Secondly, historical comparisons of food-composition data consistently demonstrate declines of the order of 5 to 40% in minerals such as calcium, iron and magnesium in fruit and vegetables over the second half of the twentieth century⁹⁹. Exact figures on the magnitude and cause of these declines remain disputed, but the trend of decreasing mineral density per calorie remains present.

Intensive tillage and heavy machinery break down soil aggregates and compromise soil structure, driving erosion and the steady loss of soil organic matter. Organic matter is the principal source of a soil's cation exchange capacity, any loss of organic matter directly reduces the soil's capacity to retain and cycle minerals¹⁰⁰. Decades of fertilisation focused narrowly on nitrogen, phosphorus and potassium have compounded these losses by ignoring the wider spectrum of nutrients. Plant nutrients are not independent, and an excess of one can antagonise and lock up others, as depicted below in Mulder's chart.

Heavy synthetic fertiliser applications can suppress the availability of critical trace elements needed for plant health and production. Soil is a living system whose microbiome is itself a line of defence, therefore diverse microbial communities that suppress soil-borne pathogens¹⁰¹ through competition and the stimulation of plant

defences¹⁰² are critical to the health of the soil, and the food produced from it. Degrading soil does not simply lower yields but changes the environment in which our food is produced.

All of the dynamics discussed above have an impact on the human body and immune system, specifically the human gut microbiome. Humans co-evolved in constant contact with soil microorganisms¹⁰³, and evidence suggests that this exposure was essential to the development of the human gut microbiome and its immunological resilience¹⁰⁴. Yet, as diets and environments have industrialised, gut microbial diversity has fallen into decline alongside ecosystems, while non-communicable disease and chronic inflammatory disease has risen¹⁰⁵. Modern processed diets are characteristically low in fibre and diverse plant compounds, yet high in synthetic additives and emulsifiers. This combination is now known to reduce gut microbial diversity, lower levels of beneficial bacteria, and disrupt the intestinal barrier¹⁰⁶. Together, these effects drive the low-grade chronic inflammation increasingly implicated in a wide range of disease¹⁰⁷. Food and soils that lack nutritional density and diversity therefore contribute to a less diverse and more inflamed gut. So, the condition of the soil as transmitted through the quality of the food, becomes a determinant of the condition of the gut.

These specific pathways sit within a larger and well-established picture. Diet is among the foremost modifiable risk factors for non-communicable diseases, with cardiovascular disease and cancer chief among them, that now account for the greatest share of mortality in high-income countries. Similarly, Irish paediatric

98 Davis, D. R. (2009). Declining fruit and vegetable nutrient composition: What is the evidence? *HortScience*, 44(1), 15–19. [\(LINK\)](#)

99 Mayer, A. M. (1997). Historical changes in the mineral content of fruits and vegetables. *British Food Journal*, 99(6), 207–211. [\(LINK\)](#)

100 Nair, P. R., Kumar, B. M., & Nair, V. D. (2022). Soil organic matter (SOM) and nutrient cycling. In *An introduction to agroforestry: Four decades of scientific developments* (pp. 383–411). Cham: Springer International Publishing. [\(LINK\)](#)

101 Schlatter et al., (2017). Disease suppressive soils: New insights from the soil microbiome. *Phytopathology*, 107(11), 1284–1297. [\(LINK\)](#)

102 Mendes, R., et al. (2011). Deciphering the rhizosphere microbiome for disease-suppressive bacteria. *Science*, 332(6033), 1097–1100. [\(LINK\)](#)

103 Ma, H., Cornadó, D., & Raaijmakers, J. M. (2025). The soil-plant-human gut microbiome axis into perspective. *Nature Communications*, 16(1), 7748. [\(LINK\)](#)

104 Banerjee, S., & Van Der Heijden, M. G. (2023). Soil microbiomes and one health. *Nature Reviews Microbiology*, 21(1), 6–20. [\(LINK\)](#)

105 Wall, D., et al. (2023). Scoping review on soil microbiome and gut health: Are soil microorganisms missing from the planetary health plate? *People and Nature*, 5(4). [\(LINK\)](#)

106 Cenni, S., et al. (2025). The detrimental impact of ultra-processed foods on the human gut microbiome and gut barrier. *Nutrients*, 17(5), 859. [\(LINK\)](#)

107 Zinöcker, M. K., & Lindseth, I. A. (2018). The Western diet-microbiome-host interaction and its role in metabolic disease. *Nutrients*, 10(3), 365. [\(LINK\)](#)

inflammatory bowel disease incidence more than doubled between 2001 and 2010¹⁰⁸. This generational divergence, rising fastest in those raised on the most industrialised diets¹⁰⁹, is consistent with the gut-microbiome pathway set out above. Food quality, notably nutrient density and diversity, is therefore central to public health policy and initiatives. Renationalising production of critical foodstuffs for both humans and animals begins in the soil, and deserves cross-sectoral and cross-department support.

It is with this understanding of soil, plant, animal and human health as one connected system, that the specific case of bovine tuberculosis in Irish cattle must be understood. The current eradication programme focuses on exposure while largely overlooking susceptibility, namely the conditions, built from the soil up, that determine whether an exposed animal becomes infected.

108 Hope et al., (2012). Rapid rise in incidence of Irish paediatric inflammatory bowel disease. Archives of disease in childhood, 97(7), 590-594. (LINK)
109 Daly, A. N., O'Sullivan, E. J., & Kearney, J. M. (2022). Considerations for health and food choice in adolescents. Proceedings of the Nutrition Society, 81(1), 75-86. (LINK)

Antimicrobial Resistance (AMR)

Antimicrobial resistance (AMR) occurs when microorganisms develop the ability to withstand the drugs meant to kill or inhibit them, rendering treatment ineffective and driving recurrent infection, higher mortality and poorer animal performance¹¹⁰. Globally, concerns over AMR have been growing as resistance has now been documented even to last-line drugs such as colistin, with mobile colistin-resistance genes found in animals, humans, and ecosystems¹¹¹, raising the prospect of untreatable infection crossing from the food chain into the general population.

An estimated 70% of global antibiotic use occurs in animal production¹¹², and every use applies selection pressure favouring resistant organisms, which spread rapidly given bacteria's short generation times. Those resistant genes are passed to the population through contaminated produce, direct contact, and environmental pathways such as manure-spread land and

110 Trinchera et al., (2025). Antimicrobials in livestock farming and resistance: public health implications. Antibiotics, 14(6), 606. (LINK)
111 Prakash et al., (2026). Patterns of antimicrobial resistance genes in pathogens across One Health sectors in Ireland: an in silico approach. Microbiology Spectrum, e00044-26. (LINK)
112 Van Boeckel, T. P., et al. (2015/2017). Global trends in antimicrobial use in food animals. PNAS, 112(18), 5649-5654. (LINK)

contaminated water. Irish agriculture is aware of this growing threat, shown through a 27% reduction in national sales of veterinary antimicrobials between 2011 and 2022¹¹³. At 33.6 mg/PCU Ireland is now a comparatively low user, well below the EU-27 average, having voluntarily eliminated the use of colistin in food animals. However, sales have plateaued since 2022 at around 76 tonnes a year, proving progress is neither automatic nor guaranteed.

Holding this progress is conditional on antimicrobial stewardship, whereby antibiotics are only applied when clinically warranted. Treatment would require veterinary prescription, optimally with laboratory confirmation, favouring targeted over broad-spectrum drugs and completing full courses, all of which reduce selection pressure. Underpinning this, better farm hygiene and biosecurity cut the incidence of infection itself, and with it the need for antibiotics in the first place, which is precisely where a lower-stress, lower-density, more resilient production system does its work.

Health through the case of Bovine Tuberculosis (bTB)

In Ireland, bovine tuberculosis (bTB) is an endemic and growing threat, while avian influenza (HPAI) has historically caused problems, and bluetongue (BTV-3) has re-emerged as serious external biosecurity threats to the national herd. However, bTB remains Ireland's most persistent, economically damaging, and emotionally draining endemic livestock disease. In 2023, only 3 countries in the EU had a bTB herd incidence above 1%¹¹⁴. Spanish livestock herd incidence sat at 1.5%, Greece at 1.3%, and Ireland at 5.9%¹¹⁵, growing further in 2024 to 6.04%, the highest in 21 years¹¹⁶. Rates peaked again in 2025, with the one-year-rolling herd incidence at 6.4% before

113 Teagasc. (2025b, June 26). Antimicrobial use - still a major concern worldwide. (LINK)
114 Nodal, S. G. D. C. A. (2025). Tuberculosis in bovine animals eradication. (LINK)
115 Nodal, S. G. D. C. A. (2025).
116 Office of the Comptroller and Auditor General (2025) Report on the Accounts of the Public Services 2024 (LINK)

settling in December at 5.77%.

In the 10-year period leading up to 2024, the Irish Department of Agriculture, Food and the Marine (DAFM) spent €500 million on its eradication programme. Over €100 million was spent in 2024 alone, representing a 35% increase from the previous year¹¹⁷. 2025 saw another 20% increase to €121 million¹¹⁸, and the DAFM's 2026 budget earmarked €157 million¹¹⁹ to boost the eradication programme. As both herd incidence and annual cost increase, the current treatment and management system must be put into question.

Between 2019-2024, Ireland's herd incidence has increased from 3.7% to 6.04%, a relative increase of 62%, while reactors-per-1000 tests have increased 153%¹²⁰. Figure 8 shows the evolution of bTB herd incidence across the island from 2019-2024. Evidently, the increase is also unevenly distributed. Herd incidence in Cork rose from just over 4% (2019) to 9% (2024), Meath from 5.5% to 10.3%, and Longford from 2% to 8%¹²¹. Only one county (Clare) reduced its herd incidence relative to 2019, and even there reactor numbers rose by roughly 50%. Reactors-per-1000 tests are rising significantly faster than herd incidence, suggesting increased susceptibility and a growing threat to Irish livestock.

Ireland's response to the bTB crisis has evolved over the past two decades to include badger vaccination, genetic selection for resistance, improved diagnostics, and ongoing cattle-vaccine trials. However, national responses remain anchored to the same test-and-cull paradigm, which has not meaningfully changed in over 70 years. Test-and-cull combined with wildlife intervention remains the central strategy, and it is not only politically unpopular with the public, but is also not proving effective. As a result, the government has effectively conceded it can no longer hit the 2030 eradication target, with a

117 Office of the Comptroller and Auditor General (2025)
118 McDonnell, F. (2026). Expenditure on TB soared to more than €121m in 2025 - DAFM. In Agriland. (LINK)
119 Aisling O'Brien. (2025). Budget 2026: Over €157m to implement bovine TB action plan. In Agriland. (LINK)
120 Data sourced from the Department of Agriculture, Food and the Marine (DAFM) (LINK)
121 DAFM (LINK)

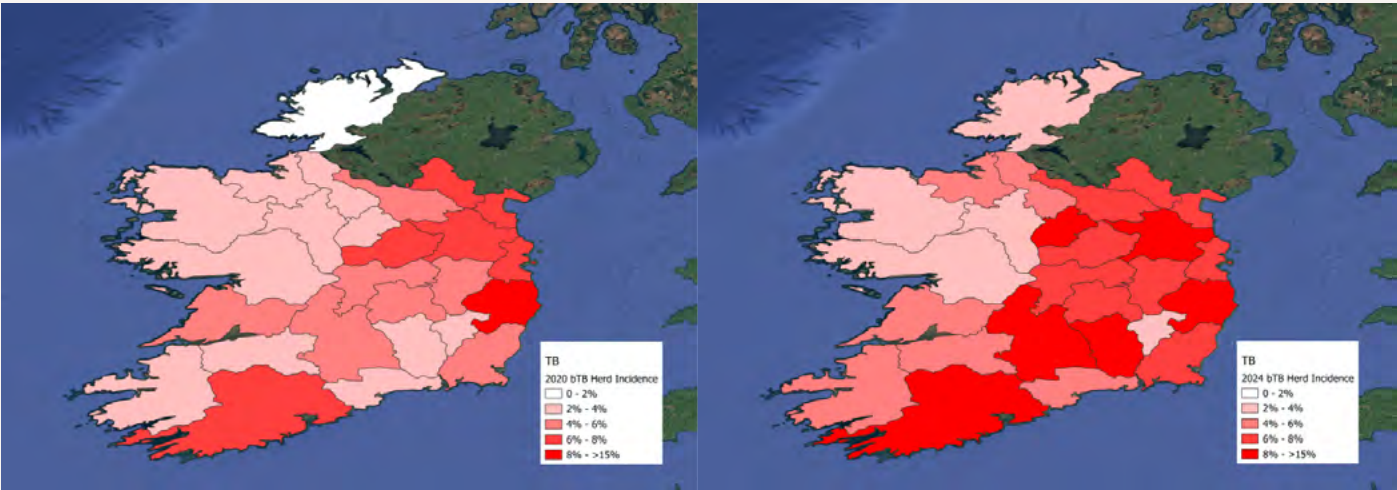


Figure 8, Evolution of bovine Tuberculosis % herd-incidence in 2020-2024.

DAFM official claiming they could not confidently say TB would be eradicated by 2030 given current disease levels¹²².

What is absent from the official framework is any serious engagement with the farm-level factors that determine whether an exposed animal becomes a reactor. The programme remains centred on exposure, and does little to address host susceptibility, i.e., whether bTB establishes in an exposed animal. Stocking density, chronic stress, monoculture grazing, immunosuppression from poor mineral status, and the genetic narrowness of high-EBI dairy lines all affect immune function and therefore disease susceptibility. A herd in good biological condition, on diverse pasture, with low stress and strong mineral status, has a different immunological environment from a high-stocking, primarily ryegrass fed herd. The current eradication programme does not distinguish between the two.

Drivers of Disease Susceptibility

Global rates of animal illness and disease are increasing. This is happening alongside the decline in ¹²³pasture-based systems, and the prioritisation of intensive, input-reliant farms. Increasing evidence suggests a link between intensive farming systems and the rate of disease in livestock¹²⁴.

Redox (reduction-oxidation) chemistry is the balance between reactive (free radical) molecules the animal's immune cells use to kill bacteria like TB, and the antioxidants that keep those molecules in check. Redox chemistry is largely

influential on the immune control of bTB¹²⁵. It acts to make an animal's antioxidant and trace-mineral status directly relevant to whether it can contain infection¹²⁶. Oxidative stress manifests when there is an excess of free radical molecules, or a lack of antioxidants within the host animal.

Once exposed to bTB, an animal's immune cells attack the bacteria by releasing a burst of these highly reactive molecules to combat the disease¹²⁷. Because these same molecules can harm the animal's own tissue, the body holds them in balance using antioxidant defences, of which glutathione is the most important¹²⁸. Glutathione plays a dual role, both aiding the immune cells in killing the bacteria and protecting the animal's tissues, and experimental studies show that when it is depleted, the immune response's ability to control infection is measurably weakened¹²⁹. Chronic oxidative stress drains glutathione and other antioxidant reserves, therefore weakening an exposed animal's immune-response, while driving the tissue damage that characterises progressive disease.

In a study of 400 cattle from British herds, animals with lower levels of glutathione in their blood were nearly twice as likely to have confirmed bTB¹³⁰. This link was strongest in exposed but still-healthy animals rather than those already infected, suggesting that antioxidant status helps determine whether an exposed animal develops disease rather than simply reflecting an existing infection¹³¹.

Dysfunctional inflammatory responses and chronic inflammation drive the release of reactive,

oxidising molecules, again leading to oxidative stress in livestock¹³². Ruminants on a high-starch, low-fibre diet like feed concentrate lower the pH of the rumen, which can lead to subacute ruminal acidosis¹³³ (SARA). Animals with SARA release bacterial toxins into the bloodstream, triggering persistent, body-wide inflammation¹³⁴. The impact of high-concentrate feed on SARA is widely recognised as a limiting factor to production, with a call for this specific cause to be renamed 'high-concentrate syndrome'¹³⁵. Nevertheless, industrial livestock operations continue the supply of animal feed, either for calving or fattening, thus increasing the risk of SARA. Given the demonstrable impact of oxidative stress on disease susceptibility, managing this imbalance by regenerating antioxidant defences should be a crucial part of the bTB eradication response.

Antioxidant defences depend largely on diet¹³⁶, drawing on vitamins, trace minerals and many plant compounds like polyphenols, flavonoids, and carotenoids¹³⁷ supplied uniquely by varied forage¹³⁸. Pasture that consists predominantly of ryegrass lacks the diversity needed to produce these benefits. Yet, in Ireland ryegrass accounts for 95% of commercial seed sales for forage¹³⁹. Often, fertilised ryegrass monocultures are high in rapidly degradable proteins¹⁴⁰ and low in effective fibre and plant secondary compounds¹⁴¹, which can raise rumen ammonia load and metabolic demand¹⁴².

Irish livestock operations typically graze on perennial ryegrass pasture while supplementing with concentrate to boost energy intake, particularly around the ,transition period¹⁴³, or towards finishing for slaughter. For dairy cows, the transition period is already characterised by immunosuppression and increased disease susceptibility, driven partly by the hormonal and metabolic upheaval of calving¹⁴⁴. However, this increases the risk of SARA-induced oxidative stress, as the nutritional needs of a functioning immune system are not met. This inflammatory load compounds the existing immune suppression and is associated with a higher incidence of mastitis and metritis, and is a likely contributor to reduced resistance to bTB.

Consequently, a lack of dietary diversity can result in a high inflammatory load¹⁴⁵ and increased oxidative stress, either through concentrate-intensive periods that boost the production of reactive molecules, or monocultured pastures that lack the diversity needed for antioxidant defences. Intensive systems commonly combine both, raising inflammation while narrowing antioxidant supply¹⁴⁶, so that the animal is left in a state of oxidative stress and reduced immune competence precisely where exposure pressure is highest. Diverse pasture provides secondary metabolites critical for rebuilding antioxidant reserves in livestock¹⁴⁷.

Genetics also play a determining role in disease susceptibility, and Ireland has spent over two decades preparing to act on it. The Economic Breeding Index (EBI) was developed in the early 2000's by the Irish Cattle Breeding Federation in collaboration with Teagasc, and has served as a

(*Bromus valdivianus* Phil.) swards during spring. *Agronomy*, 12(8), 1953. ([LINK](#))
143 The 'Transition Period' is the (roughly) three weeks either side of calving where energy dips and must be offset by high-energy feed.
144 Esposito et al., (2014). Interactions between negative energy balance, metabolic diseases, uterine health and immune response in transition dairy cows. *Animal Reproduction Science*, 144(3–4), 60–71. ([LINK](#))
145 Khiaosa-Ard, R., & Zebeli, Q. (2018). Diet-induced inflammation: From gut to metabolic organs and the consequences for the health and longevity of ruminants. *Research in veterinary science*, 120, 17–27. ([LINK](#))
146 Ayemele et al., (2021). Oxidative stress in dairy cows: insights into the mechanistic mode of actions and mitigating strategies. *Antioxidants*, 10(12), 1918. ([LINK](#))
147 Poutaraud, A., Michelot-Antalik, A., & Plantureux, S. (2017). Grasslands: a source of secondary metabolites for livestock health. *Journal of Agricultural and Food Chemistry*, 65(31), 6535–6553. ([LINK](#))

122 House of Oireachtas (2026) COMMITTEE OF PUBLIC ACCOUNTS debate ([LINK](#))
123 World Organisation for Animal Health. (2025). The state of the world's Animal Health. ([LINK](#))
124 Jones BA, Grace D, Kock R, et al. (2013). Zoonosis emergence linked to agricultural intensification and environmental change. *PNAS* 110(21): 8399–8404. ([LINK](#))
Hayek MN (2022). The infectious disease trap of animal agriculture. *Science Advances* 8(44): eadd6681. ([LINK](#))
Stevenson P (2023). Links between industrial livestock production, disease including zoonoses and antimicrobial resistance. *Animal Research and One Health* 1(1): 24–36. ([LINK](#))

125 Abuelo et al. (2019). Redox biology in transition periods of dairy cattle: Role in the health of periparturient and neonatal animals. *Antioxidants*, 8(1), 20. ([LINK](#))
126 Sordillo, L. M., & Aitken, S. L. (2009). Impact of oxidative stress on the health and immune function of dairy cattle. *Veterinary Immunology and Immunopathology*, 128(1–3), 104–109. ([LINK](#))
127 Gassó et al. (2016). Oxidative stress in wild boars naturally and experimentally infected with *Mycobacterium bovis*. *PLoS ONE*, 11(9), e0163971. ([LINK](#))
128 Downs et al. (2008). Trace micro-nutrients may affect susceptibility to bovine tuberculosis in cattle. *Preventive veterinary medicine*, 87(3–4), 311–326. ([LINK](#))
129 Venketaraman et al. (2003). Role of glutathione in macrophage control of mycobacteria. *Infection and Immunity*, 71(4), 1864–1871. ([LINK](#))
Venketaraman et al. (2005). Glutathione and nitrosoglutathione in macrophage defense against *Mycobacterium tuberculosis*. *Infection and Immunity*, 73(3), 1886–1889. ([LINK](#))
130 Downs et al., (2008)
131 Downs et al., (2008)

132 Sordillo, L. M., & Mavangira, V. (2014). The nexus between nutrient metabolism, oxidative stress and inflammation in transition cows. *Animal Production Science*, 54(9), 1204–1214. ([LINK](#))
133 Plaizier et al. (2008).
134 Gozho et al., (2005). Subacute ruminal acidosis induces ruminal lipopolysaccharide endotoxin release and triggers an inflammatory response. *Journal of Dairy Science*, 88(4), 1399–1403. ([LINK](#))
135 Calsamiglia et al., (2012). Is subacute ruminal acidosis a pH related problem? Causes and tools for its control. *Animal Feed Science and Technology*, 172(1–2), 42–50. ([LINK](#))
136 Beck, M. R., & Gregorini, P. (2020). How dietary diversity enhances hedonic and eudaimonic well-being in grazing ruminants. *Frontiers in Veterinary Science*, 7, 191. ([LINK](#))
137 Villalba, J. J., Ramsey, R. D., & Athanasiadou, S. (2024)
138 Provenza, F. D., Kronberg, S. L., & Gregorini, P. (2019)
139 Tubritt et al., (2021). The agronomic performance of perennial ryegrass varieties evaluated as monocultures and mixtures of varying complexity under animal grazing. *European Journal of Agronomy*, 124, 126226. ([LINK](#))
140 Peyraud, J. L., & Astigarraga, L. (1998). Review of the effect of nitrogen fertilization on the chemical composition, intake, digestion and nutritive value of fresh herbage: consequences on animal nutrition and N balance. *animal Feed science and technology*, 72(3–4), 235–259. ([LINK](#))
141 McCarthy et al., (2023). Rumen fermentation and forage degradability in dairy cows offered perennial ryegrass, perennial ryegrass and white clover, or a multispecies forage. *Livestock Science*, 269, 105185. ([LINK](#))
142 Beltran et al., (2022). Nitrogen use efficiency and partitioning of dairy heifers grazing perennial ryegrass (*Lolium perenne* L.) or pasture brome

useful guide for Irish dairy breeding. While a sub-index exists that covers traits such as mastitis, somatic cell count, and lameness, much of the index deals primarily with traits related to milk production and fertility, with only 4% dedicated to health traits¹⁴⁸. More deliberate selection for bTB and broader disease resilience can be leveraged from this same tool, incorporating the antioxidant, immune and redox-related traits discussed above. Because genetic gain through EBI is cumulative and permanent, weighting host resilience more heavily within an index Irish farmers already use and trust would compound over successive generations, offering a structural, low-cost complement to the dietary and management interventions set forth within this report.

Water

Drivers, Assumptions, and Responses to Water Pollution in Agricultural Systems

Agriculture’s influence on water differs substantially depending on how the land is managed. Typically, declining water quality is considered an unfortunate side-effect of agriculture as it pollutes groundwater, extracts water resources, and degrades the hydrological function of the soils. However, understanding water pollution requires looking beyond a single cause but at a sequence of them. Industrial systems that prioritise production at the cost of ecosystem health are structurally polluting. However, regenerating forms of land management prioritise the health of the ecosystem, for the benefit of their production. Under regenerative management, landscapes have the potential to increase water infiltration and holding capacity¹⁴⁹, filter pollutants¹⁵⁰, and restore landscape-level hydrology to reduce climate extremes¹⁵¹.

Currently, the EPA's data on Irish water quality makes for uncomfortable reading. Half of Irish rivers and two thirds of estuaries are polluted¹⁵². Particularly striking is the instability of the current situation, with 2% less waterbodies at good ecological status now than there were three years ago¹⁵³. Rather, overall water quality has declined for more than fifteen years¹⁵⁴, with excess nitrogen and phosphorus losses from agriculture identified as the single greatest pressure across every category of water body¹⁵⁵. Agriculture is not

solely to blame, however, and the contribution of urban and domestic wastewater warrants direct acknowledgement as it is frequently raised in discussions of agricultural water quality. Still, degraded soils cannot hold what is applied to it, so nutrients and sediment wash off into rivers, lakes and groundwater rather than feeding the land. Mismanagement that hollows out the soil simultaneously loads the water with the nutrients it has failed to retain.

Competition for water is now tightening due to data centres now using as much water in a single year as more than 340,000 Irish homes¹⁵⁶, a demand that doubled over the dry summer months even as households faced hosepipe bans¹⁵⁷. The challenges with water pollution due to data centres is a growing concern in other countries, but remains underexplored in Ireland. Further research as to the impact of this on the Irish water system should be explored. Wastewater is a material pressure on Irish waters, particularly for phosphorus, and the EPA has reported that a significant proportion of the country’s domestic wastewater treatment does not yet meet required standards. The two pressures are, however, distinguishable by pollutant and by scale. Agriculture accounts for approximately 84% of the nitrogen load entering Irish waters at the national level, and the EPA identifies it as a significant pressure on roughly five times as many water bodies as urban wastewater¹⁵⁸. Existing policy and regulation are proving ineffective as the trend data proves, while agricultural land remains underutilised as a living water infrastructure to combat the decline.

The political architecture governing water pollution in Irish agriculture rests on the EU Nitrates Directive, which caps organic nitrogen loading at 170kg/ha and permits derogation farms up to 220kg/ha across most of the country¹⁵⁹. Ireland secured a three-year extension of that derogation in December 2025, but on tightening

terms, including a 5% cut to chemical fertilisation rates from 2028 for derogation farms in priority catchments and annual inspections on at least 10% of them¹⁶⁰. Losing the derogation entirely is estimated to remove up to €43,555 per farm¹⁶¹ per year by forcing dairy herd cuts of up to 15%¹⁶². Repeated extensions also create policy uncertainty whereby farmers are encouraged to invest in an intensified production model while the long-term viability of the derogation remains politically and environmentally contested. A credible transition policy should now provide a clear pathway away from dependence on the derogation, while supporting farmers to reduce stocking pressure and nitrogen losses without imposing an unmanaged income shock.

However, the derogation is a volume-based instrument that treats every kilogram of organic nitrogen as equivalent, regardless of the form it takes or how efficiently the sward captures it. This logic equates a tonne of untreated slurry that loses much of its nitrogen to volatilisation and leaching to a tonne of stabilised slurry whose nitrogen stays largely plant-available. This constrains the quantity of nutrients applied and ignores the quality of nutrient management. We are then left with a policy conversation that stalls around lower caps, wider buffer strips and more inspections, each managing the symptom of loading rather than the underlying inefficiency of loss. Restoring soil biological activity should be a priority in catchment zones, since a buffer strip on biologically inactive soil does little to improve the land’s capacity to manage nutrient leaching.

Under typical slurry management, much of the nitrogen in slurry is lost to ammonia as it transforms into gas. During this process, up to 60% of the available ammoniacal nitrogen (TAN) is lost. Volatilised nitrogen does not simply disappear, but is redeposited elsewhere on land and water, polluting sensitive habitats and providing a substrate for nitrous oxide. Therefore, poor slurry management leads to

148 Twomey, A. J., et al. (2020). Genome wide association study of passive immunity and disease traits in beef-suckler and dairy calves on Irish farms. [\(LINK\)](#)

149 Khangura et al., (2023). Regenerative agriculture—A literature review on the practices and mechanisms used to improve soil health. *Sustainability*, 15(3), 2338. [\(LINK\)](#)

150 Rhodes, C. J. (2017). The imperative for regenerative agriculture. *Science progress*, 100(1), 80-129. [\(LINK\)](#)

151 Mulvey, F., & Mulvey, P. (2024). Ensuring Soil Security to Secure Our Planetary Future. *Environmental Policy and Law*, 54(4-6), 287-297. [\(LINK\)](#)

152 Environmental Protection Agency. (2025). Water quality has improved in some areas but continues to decline overall. [\(LINK\)](#)

153 Environmental Protection Agency. (2025). Water quality has improved in some areas but continues to decline overall. [\(LINK\)](#)

154 RTÉ News (2025) Quality of surface water continues to decline, says EPA. [\(LINK\)](#)

155 Catchments.ie (2025) Water quality in Ireland: Pressures, trends and targeting measures. [\(LINK\)](#)

156 The Irish Times (2026) Data centres 'may have used as much water' last year in Ireland as more than 340,000 homes. [\(LINK\)](#)

157 The Journal Investigates (2026) Data centre water use almost doubled during Ireland's long, hot summer months. [\(LINK\)](#)

158 EPA. (2023). Water quality and agriculture. [\(LINK\)](#)

159 Teagasc (2025), Nitrates Derogation / DAFM confirms changes to Nitrates Regulations [\(LINK\)](#)

160 DAFM; European Commission Implementing Decision C(2025) 9263 (December 2025)

161 Teagasc (2025) Publish reports to inform Nitrates Derogation [\(LINK\)](#)

162 O'Donnell, C. (2025, August 27). DII fears €555m annual fall in milk cheques without derogation. *Agriland*. [\(LINK\)](#)

reduced nitrogen use efficiency (NUE), and yet farmers are still governed by the cap of 170kg/ha. Slurry treatments exist that can drastically reduce ammonia and methane losses, leading to increased NUE and consequent reductions in the total volume of nitrogen applied. A range of solutions will be explored further in the recommendations section.

Synthetic fertilisers place significant pressure on ecosystems, and are regulated more freely than organic fertilisers. Irish dairy farms apply an average of around 173 kg of chemical nitrogen per hectare each year, roughly three times the rate used on beef and sheep systems¹⁶³. Perennial ryegrass, the sown species across most of the country, responds to nitrogen but with diminishing returns beyond roughly 200 kg N per hectare per year¹⁶⁴. Above that point additional fertiliser produces little extra grass and instead accumulates as mineral nitrogen in the soil, available to be carried downward as nitrate whenever drainage exceeds plant uptake¹⁶⁵. When coupled with untreated slurry, there is an evident excess of nitrogen supplied to the field. Because much of the most intensive dairying sits on free-draining soils in the very catchments the EPA has flagged, the nitrogen that the plant does not capture has a short and direct route to groundwater and watercourses.

Finally, current pasture management is structured in a way that limits its capacity to hold the nitrogen moving through the system. Irish grassland is dominated by protein-rich ryegrass monocultures designed for high productivity, high fertiliser inputs, and low climate and economic resilience. A monoculture offers a single rooting depth and a single seasonal growth pattern, so nitrogen that becomes available outside the narrow window of active ryegrass growth, or below its rooting zone¹⁶⁶, is lost rather than captured¹⁶⁷. Highly fertilised monocultures also

163 Teagasc (2023) Farm Structure Survey 2023 (2013–2023). [\(LINK\)](#)
164 Cottney, P. (2026). Scientific Review of Nitrogen Fertiliser Rates for Silage Production in Northern Ireland (Short Version). [\(LINK\)](#)
165 Baker et al., (2023). Multispecies swards outperform perennial ryegrass under intensive beef grazing. Agriculture, Ecosystems & Environment, 345, 108335. [\(LINK\)](#)
166 Egan et al. (2025). Ribwort plantain inclusion reduces nitrate leaching from grass-clover swards: A multi-year five-soil study. Agriculture, Ecosystems & Environment, 380, 109376. [\(LINK\)](#)
167 Jaramillo et al., (2025). Multispecies grasslands produce more

carry a correspondingly higher risk of nitrate leaching than higher-yielding diverse swards grown on lower inputs¹⁶⁸. The maintenance of these monocultures also depends on periodic reseeding, and the cultivation this involves disturbs the soil and mineralises stored organic nitrogen, releasing further flushes of nitrate that are vulnerable to loss¹⁶⁹.

Collectively, these mechanisms unveil a system that is inherently polluting. Nitrogen applications exceed the plants’ and animals’ capacity at several points in the same cycle, and are then held in forms that make loss the path of least resistance. Adjusting a single lever can not dismantle the structurally degrading nature of this system. Applying a lower stocking cap in one place or a wider buffer strip in another, will not reverse the systematic erosion of Irish waterways. Sediment swirls offer another insight to the pollution problem present in Ireland, as they demonstrate nutrient presence after 40 years in waterways. Taking the example of Lough Neagh, even if all runoff was to cease today, it would take up to 40 years for the landscape to restore itself to pre-polluted levels¹⁷⁰. As it exists, current regulation acts on the quantity of nitrogen at one point in the chain despite losses being generated throughout. Additionally, biodiversity loss and ecosystem degradation is a key factor within the EU Climate Risk Assessment (EUCRA), which notes the risks of eutrophication from agricultural fertilisation and livestock.

yield from lower nitrogen inputs across a climatic gradient. Science, 388(6748). [\(LINK\)](#)
168 Baker et al., (2023)
169 Necpálová, M., Casey, I., & Humphreys, J. (2013). Effect of ploughing and reseeding of permanent grassland on soil N, N leaching and nitrous oxide emissions from a clay-loam soil. Nutrient Cycling in Agroecosystems, 95(3), 305–317. [\(LINK\)](#)
170 Rippey et al., (2021). Timescale of reduction of long-term phosphorus release from sediment in lakes. Water Research, 200, 117283. [\(LINK\)](#)

Drought: A Rising Threat to Irish Agriculture

Ireland is undoubtedly a water-rich country, with the 7th highest annual precipitation in Europe¹⁷¹. However, this does not provide immunity from a rapidly changing environment and mounting climate extremes. Compound extremes lead to lasting impacts greater than the sum of the individual impacts from individual climate extremes. Multiple cases of extreme climate events have occurred over the last decade, each further degrading the resilience of Ireland’s agricultural sector.

In 2018, Ireland experienced two consecutive extreme climate events that resulted in substantial agricultural losses, a winter storm referred to as ‘The Beast from the East’, and a subsequent summer drought¹⁷². As weather patterns in Scandinavia and the Iberian peninsula converged, Ireland was hit by incredibly cold weather and enormous snowfall, with areas reporting over 2 metres¹⁷³. Following the cold snap, 52 of the next 73 days were significantly below historic averages. Consequently, many regions of Ireland

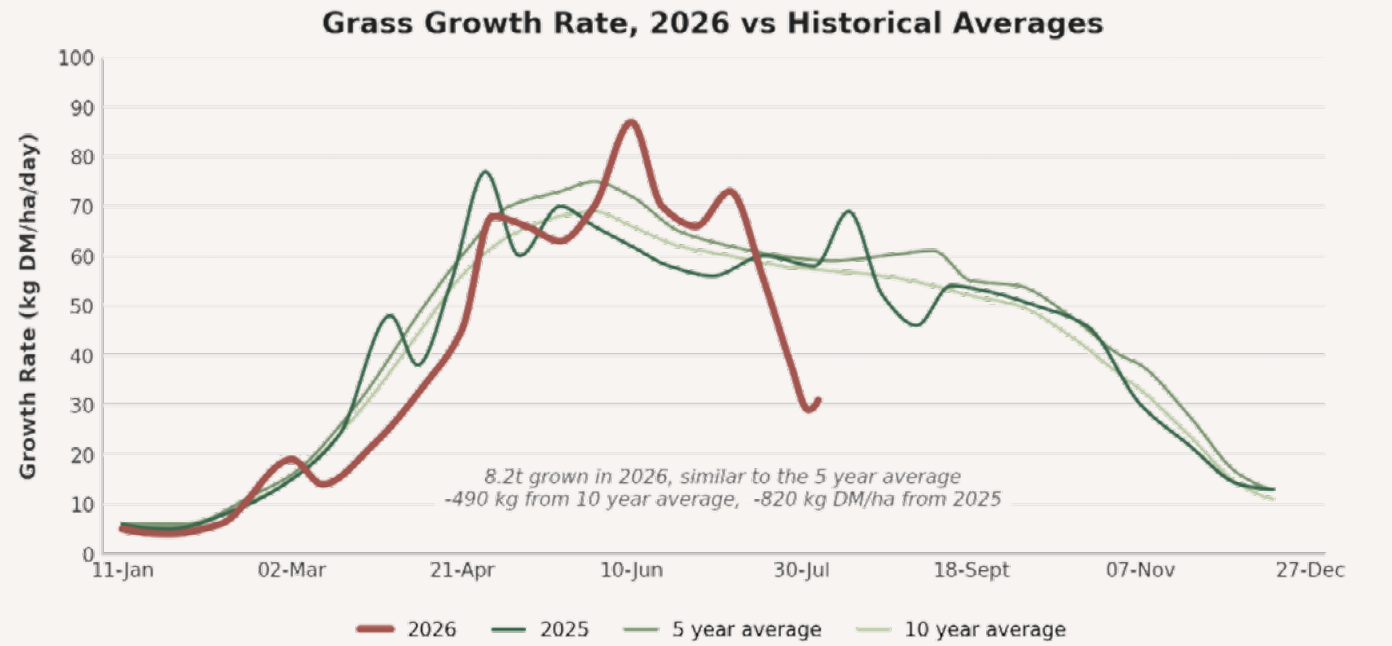
171 Data sourced from The Global Economy [\(LINK\)](#)
172 Noone, S., et al. (2025). The Beast from the East and drought of summer 2018: an example of compound event impacts upon Ireland’s agricultural sector. Weather. [\(LINK\)](#)
173 Noone, S., et al. (2025).

scrambled to meet the emergency needs of the population, with over 100,000 homes without electricity, 23,000 homes without water, and an extra 39,000 with limited access¹⁷⁴.

Only a few months later, Ireland was in drought. Regions surrounding Dublin recorded the period between May and July 2018 as the driest 3-month period since at least 1850¹⁷⁵. As a result, the soil’s moisture was essentially depleted, particularly in the South of Ireland. A soil moisture deficit (SMD) is a reliable drought metric that measures the required precipitation to bring a soil back to capacity, and in the same region it peaked at 94mm, close to the maximum possible deficit¹⁷⁶. During this period water usage increased, as the population sought to reduce the impact of the drought on their land, as well as their health. In July, water restrictions were imposed, as the increased demand and significant lack of rainfall placed the water system under immense pressure¹⁷⁷.

Figure 9, Comparative dry matter production, 2026 against a 5-year and 10-year average¹⁷⁸.

174 Noone, S., et al. (2025).
175 Falzoi et al., (2019). Analysis of the severe drought in Ireland in 2018. Weather, 74(11), 368–373. [\(LINK\)](#)
176 Falzoi et al., (2019)
177 Murphy, A. 2020. Drought Summary – Met Éireann – The Irish Meteorological Service. Met.ie. [\(LINK\)](#)
178 Graph sourced from Teagasc (2026) Impact of 2026 drought on grass production and fodder supply [\(LINK\)](#)



Irish agriculture suffered under these compounding extremes. With predominantly grassland-based agriculture, production depends critically on the characteristics of the growing season, its onset, cessation and total productivity. The system is optimised so that animals graze pasture during the season while surplus growth is cut for silage to feed through the fallow months, on thin margins and with expensive feed additives as backup. However, in 2018, the double impact of intense winter storms and prolonged drought culminated in extended indoor wintering of livestock, delayed seeding of fodder, and a significant reduction in fodder yield as the growing season experienced climate stress. Below average temperatures resulted in elevated levels of winter feeding of cattle and late planting of spring-sown tillage crops. A subsequently high level of spring rainfall, pushed farmers to remove cattle from pasture and re-housed for a period¹⁷⁹.

As cattle remained indoors, and the spring growing season was delayed, fodder stocks were depleted while future shortages became evident. Grass production fell sharply on both dairy and drystock farms, with silage yields the lowest and grazing the second lowest of the 2013–2023 period, making it comfortably the worst year in the eleven-year record. The deficit was most severe in the southeast, where the soil moisture deficit ran highest¹⁸⁰. The net impact of this on farms was a 15% decrease in overall farm profitability in 2018, with dairy farms alone suffering a 31% reduction¹⁸¹. Overall, the combination of the storm and the subsequent drought as a compound event produced reduced grazing and acute fodder shortages that neither event would have caused alone.

8-years later and Irish farmers are in the same situation, albeit from drought alone.

July 2026 was Ireland’s driest on record¹⁸², and as of 30 July 2026, the growth rate of dry matter per day is 50% lower than the 10-year average¹⁸³. This is not an anomaly, but an insight to future seasons as these events become more frequent, and as the landscape becomes less capable to deal with them. As in 2018, the regions most affected by the drought are located in the east and southeast of Ireland, areas that derogation zones coincide with the intensive dairy and tillage zones, and the catchments found within the fertiliser derogation. As the frequency of extreme climate events increases, Ireland will have no choice but to embed resilience in the agricultural sector or risk losing it entirely. Doing so requires separating agricultural production from the management practices like tillage, synthetic fertilisation, synthetic plant protection, and monoculture pasture or short crop rotations that actively erode that resilience. Each degrades the soil’s capacity to take in and hold water, which is the property that determines whether a landscape buffers a drought or amplifies it.

Tillage is a well-established driver of drought vulnerability¹⁸⁴. Repeated cultivation breaks apart the aggregates that give soil its porosity, and the loss of those aggregates reduces both the rate at which water infiltrates and the volume the soil can store (Blanco-Canqui & Ruis, 2018; Nunes et al., 2020). Below plough depth, the pressure of machinery smears a compacted plough pan that water struggles to cross, so rainfall that cannot enter the profile runs off the surface instead. On the heavier, structurally weaker soils that dominate Ireland’s eastern and south-eastern tillage zones, the effect is compounded by surface crusting. This occurs when rain falls on bare, tilled ground, dispersing fine particles that seal the surface pores, shedding the next rainfall rather than absorbing it. A soil in this state sheds water it has the underlying capacity to hold, which is precisely the failure a drought exposes.

Generational Renewal

Ireland has a long history of stewarding its land and feeding populations well beyond its own borders. Yet the compounding, structural risks set out across this paper underpin the deeper risk of generational renewal. Beyond these risks, the current lack of new entrants or farm successors is jeopardising the long-term social fabric of many rural communities, national food security, and regional economies. Currently, policy treats this as an isolated problem to be solved alongside the others, but the increasing rates of input dependency, price volatility, tightening regulation, soil degradation, disease and declining rural livelihoods are collectively disincentivising new entrants and threatening the sector’s future. For existing farmers, the impact of these compounding risks extends beyond the land and into the health and wellbeing of those who steward it. Ireland reflects the global narrative that rural communities and farmers are disproportionately affected by anxiety, depression, and suicide.¹⁸⁵ As unpredictable markets, climate, and policy are coupled with the strain of succession itself, farmers are left to carry the psychological weight of the wider sector. The impact of the mental pressure of these threats is communicated through the sobering statistic that, between 2014 and 2020, Irish farmers died by suicide at a higher rate than from farm accidents¹⁸⁶. This erosion of social wellbeing sits astride the broader trajectory of a rural exode, with isolation driven by declining farm numbers, rural services, and support networks¹⁸⁷.

From the perspective of a potential young entrant, the sector as currently structured offers little security. Volatile input markets cause incomes to swing across a threefold range from one year to the next, with no floor and little within the farmer’s control. Unpredictable and ineffective regulation is tightening, from the nitrates derogation to

emissions ceilings. In many cases, the land is passed on in poorer biological condition than it was received, and the economic return from this land is frequently marginal. Collectively, these systemic stresses are leading to a decline in farms and overall farmer wellbeing, positioning agriculture as a demanding, high-risk, low-margin occupation on a declining asset, in a policy environment few can predict.

Ireland’s farming population is among the oldest in Europe, with an average farm holder age of 59.4 years old¹⁸⁸. Nearly 37.8% of farm holders are aged 65 or over, and only 4.3% are under 35¹⁸⁹. CSO data has noted that the share of farmers under 35 has roughly halved in the last 20 years¹⁹⁰, and the IFA has linked this directly to income precarity, regulatory burden and difficulty accessing land as the primary challenges deterring new entrants¹⁹¹. One of the primary structural barriers is the delayed or absent transfer of farm ownership, with many older farmers continuing to operate well beyond typical retirement age without a clear succession plan in place. Still, income instability is equally threatening and increasingly acute. The dairy income swing from €50,000 in 2023 to €140,000 in 2025 to a forecast €80,000 in 2026 is indicative of a commodity model with no price floor and no ceiling on input costs. A financial environment beholden to this model deters the long-term commitment that farm succession requires.

Regenerative agriculture models do not solve the land transfer problem directly, but offer a more realistic and appealing prospect to take on, through lower costs of entry and increased security.

179 Teagasc. 2018b. Long winter and summer drought set to impact farm incomes in 2018. (LINK)
180 Teagasc. 2018a. Teagasc Heavy Soils Programme 2018: summary of weather data across programme farms. (LINK)
181 Dillon, E., Donnellan, T., Hanrahan, K. et al. 2018a. Outlook 2019 Economic Prospects for Agriculture. Teagasc.ie. (LINK)

182 Boland, L. (2026). You can see how the Irish landscape changed during the drought through satellite images. TheJournal. (LINK)
183 Teagasc (2026) Impact of 2026 drought on grass production and fodder supply (LINK)
184 Quinton, J. N., Öttl, L. K., & Fiener, P. (2022). Tillage exacerbates the vulnerability of cereal crops to drought. Nature Food, 3(6), 472-479. (LINK)

185 O'Hagan et al., – Teagasc (2024) Why farmers are a group at risk of developing mental health issues. (LINK)
186 O'Connor et al., (2025). “Skills for Resilience in Farming”; an evidence-based, theory driven educational intervention to increase mental health literacy and help-seeking intentions among Irish farmers. Plos one, 20(10), e0333115. (LINK)
187 Sinn Féin. (2025, May 25). Rural isolation is driving a mental health crisis; government must deliver joined-up strategy . Sinn Féin. (LINK)

188 CSO (2023) Farm Structure Survey (LINK)
189 CSO (2023) Farm Structure Survey (LINK)
190 Conway et al., (2023) Generational Renewal and Farm Succession: Insights from Ireland, EuroChoices/Wiley. (LINK)
191 Cox, A. (2025). Report raises questions about viability of Irish farming. RTE.Ie. (LINK)

Average age distribution of farmers

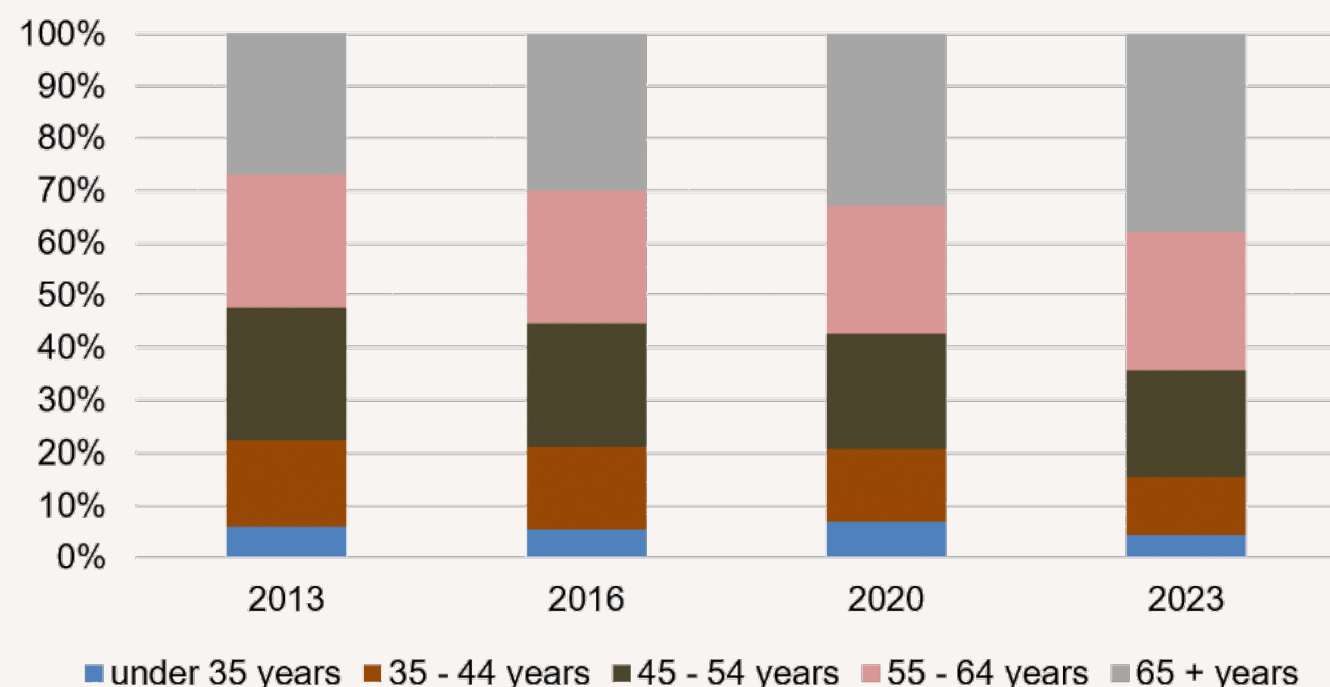


Figure 10, Average age distribution of Irish farmers¹⁹²

Unlike intensive farming systems that require substantial upfront capital and continuous purchasing of inputs, regenerative systems work in symbiosis with nature, providing health to the land through diverse pasture and crops, cover crops, organic inputs, and animal integration. Improved economic resilience through more input-independent systems reduces the exposure to commodity price swings that may otherwise deter or punish new or young farmers. A farm that does not depend on expensive synthetic fertiliser and imported concentrates has a more defensible floor when milk or beef prices fall.

Premium and differentiated markets, whether grass-fed certification, low-input branding or direct sales, offer a margin per unit that the commodity model cannot. With global health concerns growing, these markets are becoming more established, and align with the principles

¹⁹² Data sourced from CSO database ([LINK](#))

of regenerating forms of agriculture, as well as the products they supply. This market availability is reflected in the fact that nearly 90% of new organic entrants are beef or sheep farmers¹⁹³. Dairy farms organic representation is lacking primarily due to a high concentration of industrial operations, and a historical mistrust in organic premiums due to marginal supply that limits processing¹⁹⁴. Surveys consistently show that young entrants to farming are drawn to environmental and ecological purposes¹⁹⁵. Macra na Feirme, Ireland's rural-youth organisation, describes young farmers as "frontline environmentalists" that consider climate action an opportunity to build sustainable, resilient food systems, and reports strong interest in diversification and innovative practices.¹⁹⁶

¹⁹³ Forde, A. (2022). Almost 90% of new organic farming scheme entrants in beef or sheep. Irish Farmers Journal. Farmersjournal. ([LINK](#))
¹⁹⁴ O'Brien, M. (2022b, April 21). Ifac report: What is the outlook for the organic farming sector? Agriland.ie. ([LINK](#))
¹⁹⁵ Farrell et al., (2021). Irish organics, innovation and farm collaboration: A pathway to farm viability and generational renewal. Sustainability, 14(1), 93. ([LINK](#))
¹⁹⁶ Macra na Feirme (2022) „Young farmers are frontline environmentalists“ ([LINK](#))

Evidently, the motivation is there, as is the persistent interest in agriculture. What is lacking is effective, targeted support for new entrants navigating the turbulence of the sector as it is. Doing this would provide the security needed to reinvigorate Irish agriculture, and reverse the decline of a longstanding, crucial sector for the Irish people. Moreover, blended support through both policy and subsidies, as well as preferential loans or asset risk assessments would lower the entry level.



New entry farmers Cathal & Michelle Donnelly farming regeneratively in County Donegal

Systemic Regenerative Solutions for Irish food and farming

Pathways to regeneration

Regeneration is context-specific, particularly for agricultural systems, which are inherently complex. Agricultural land is inextricably tied to its pedoclimatic, economic, social, and cultural context, and its production and holistic performance are reliant on the collective health of these factors. Enabling regeneration requires a farmer's lived understanding of and experience with these factors, ensuring the solutions are the best-fit for their context. Each farmer will decide which, if any, of the tools below best suit their own and their farm's context, given its climate, production type, and socioeconomic capacity. Complex systems do not respond well to dogmatism, and there are no blueprints for the regenerative journey, only the ongoing work of adapting and growing to work with nature.

Irish land's complexity and diversity is sometimes concealed by an apparent uniformity as a green, grass-growing island. Yet, its soils range from free-draining lowland loams to heavy clays and vast tracts of peat, its climate from the wet, mild south-west to the drier east, and its farms from intensive dairy on the best land to extensive drystock and sheep on marginal ground. Layered over this are distinct regional economies, farm structures and cultural traditions of land use. No single prescription could fit them all, which is why the following tools are offered as options to be drawn from and combined, not as a fixed programme to be applied uniformly.

This section details a non-exhaustive list of potential first steps for farmers to take, policymakers to support, and private-sector players to endorse. It is not the aim of this paper to be prescriptive, but to encourage the

exploration of the full range of regenerative practices available. Doing so can aid the creation of a targeted, context-specific pathway to rebuilding resilience at the farm and landscape level. As such, not every benefit and impact of each solution is discussed, but a brief overview of each tool is given, along with the cascading benefits it offers across the risks this paper has examined.

Beneath every one of those tools sits a single foundation. Whatever combination a farm adopts, each works by prioritising the health and biological function of its soil, because that is the base on which all the other benefits rest. A living, structurally sound soil is what allows a farm to cycle nutrients, hold and infiltrate water, resist disease and produce nutrient-dense food, so that reducing bought-in inputs becomes possible rather than costly. Where the soil is degraded, every other intervention underperforms. The tools that follow are therefore best read not as separate fixes for separate problems, but as different entry points into the same living system, each ultimately a means of rebuilding the soil that underpins the resilience of the whole farm.

Diversification of crops, pasture, and production

Grassland

Ireland's pastures are currently characterised by ryegrass monocultures designed to maintain the high-intensity production of animal products. Within this system, negative externalities are overshadowed by perceived economies of scale, export contracts, and volatile margins. Modern livestock operations have been coerced by national and international markets to sacrifice the holistic performance of their farm for an increasingly turbulent commodity market.

However, alternative pasture management can provide higher quality animal production, improved animal and human health, and reduced dependence on external inputs. Multi-species,

diverse swards offer substantial benefits to the ecosystem, on-farm economics, and the health of consumers. Diverse pastures optimise nitrogen use through legumes, which biologically fix atmospheric nitrogen, reducing or eliminating synthetic fertiliser demand and the associated exposure to international-input markets¹⁹⁷. Conclusive evidence supports the benefits of multi-species swards, with UCD work showing multi-species swards reducing nitrogen applications by at least 60%, producing up to 25% more herbage, with cattle reaching slaughter weight five to six weeks earlier¹⁹⁸. Teagasc Moorepark’s dairy trials found diverse and clover-based swards matched ryegrass herbage production (around 13 t DM/ha) on substantially less nitrogen without shortening the grazing season¹⁹⁹. Within a conservative transition period of two years, yields have been shown to improve from 11.5t DM/ha to 14t DM/ha on less than half the synthetic nitrogen applied for ryegrass²⁰⁰.

Higher dry-matter yields also reduce concentrate supplementation, as nitrogen-rich legumes are grazed²⁰¹. Diverse swards match monoculture production at roughly half the nitrogen rate, translating to reduced or eliminated mineral applications, and minimised leaching²⁰². Multiple rooting depths and staggered growth enables diverse pasture to capture nitrogen that ryegrass loses outside its narrow growth window or below its root zone²⁰³, and better animal nitrogen balance means less surplus shed as diffuse pollution. Moreover, legumes eaten aside other plant species provide the plant secondary

compounds and phytochemicals otherwise absent from concentrate. Unlike ryegrass monoculture or concentrate, diverse swards offer a broader mineral and phytochemical profile (polyphenols, flavonoids, carotenoids) that supports balanced antioxidant and glutathione reserves relevant to redox balance and bTB host resilience, while avoiding the high rapidly-degradable-protein, low-fibre profile of fertilised ryegrass that drives rumen ammonia load and oxidative stress²⁰⁴. Varied forage containing forbs like chicory and plantain also carry plant secondary compounds associated with reduced parasite burdens, lowering anthelmintic reliance²⁰⁵.

Rebuilding the internal nutrient richness of an animal also transfers the benefits downstream to consumers. A growing body of literature suggests that dietary diversity in livestock plays a critical role in the health of consumers. A direct link can be drawn between the biological activity of soils, the phytochemical richness of herbivore diets, and the biochemical richness²⁰⁶ of the meat and dairy²⁰⁷. Grass-fed and pasture-diverse systems produce meat and milk with a markedly more favourable omega-3 to omega-6 ratio²⁰⁸ and higher antioxidant²⁰⁹ and trace-element content²¹⁰ than grain-finished equivalents. Trace minerals, primary and secondary metabolites, and plant compounds are transferred from the soil to the plant, and into the animal products that protect against the protein and lipid oxidation linked to inflammation, heart disease, and cancer²¹¹.

Grass-fed livestock on diverse pasture take up essential trace elements such as selenium, zinc, manganese, iodine and cobalt, and their meat and milk carry a more favourable omega-3 to omega-6 ratio than grain-finished equivalents.²¹² The transfer of these crucial nutrients from soil to animals and humans depends on diversity and natural symbiosis. Each plant draws on a distinct nutrient profile, a nutritional ‘bank’ built from the deposits of a functioning, living soil, with deep-rooting species in particular accessing mineral pools that shallow-rooted monocultures cannot reach. Arable farmers can tap these stored nutrients through multi-species cover cropping, making them available to the following cash crop and, in turn, to the consumer’s diet. Where the cover crop is terminated by grazing livestock, it can also support animal health and production.

Arable

Arable systems are still largely dependent on external inputs, prioritising the chemical treatment of structural soil deficiencies over more adapted, resilient cause-remediation. Short crop rotations, repeated fallow periods, and consistent tillage are fundamentally degrading to the productive capacity of the land, again reinforcing the reliance on synthetic inputs to supplement the losses incurred through such practices. By contrast, cover-crops and long rotations can provide a diverse array of cascading benefits ranging from weed²¹³, pest²¹⁴ and disease mitigation, improved water drainage²¹⁵ and retention²¹⁶ resulting from better soil structure and permeability. Cover crops also positively influence nutrient cycling and

reduce leaching²¹⁷ and can provide over-winter forage for livestock. Long crop rotations with a diversity of crops and cover crops additionally aid pest management²¹⁸. Pests and pathogens are typically drawn to specific host plants, and their impact is greater where the plant’s own defences are weakened. Synthetic nitrogen drives fast, soft growth that weakens plant cell walls and can raise disease susceptibility, and it suppresses the soil microbial and mycorrhizal community²¹⁹ that builds aggregates and cycles nutrients²²⁰.

Balanced mineral nutrition helps to reduce this susceptibility²²¹, since a plant’s nutritional status directly modulates its resistance to disease. Simplified rotations expose the same crop to the same pests season after season, whereas diversifying the sequence disrupts pest and pathogen life cycles, and enriches the disease-suppressive microbial community in the soil. Extending and varying the crop cycle, while supporting the plant’s own metabolic and nutritional richness, is therefore a strong route to reducing pest and disease pressure and the reliance on phytosanitary inputs that follows from it.

Vegetable and Horticultural Production

Vegetable and horticultural production offers a further route to rebuilding the resilience and food sovereignty the current model has sidelined. Ireland’s heavy dependence on imported fresh produce leaves the country exposed to supply-chain and price shocks in the very foods most

197 Phelan, P. (2013). Aspects of grazing management to improve productivity and persistence of white clover in Irish grassland (Doctoral dissertation, Waterford Institute of Technology). (LINK)
198 Obasoro et al., (2025). Multispecies swards improve nitrogen use efficiency and reduce nitrogen surplus in agricultural grasslands. Plant and Soil, 1–15. (LINK)
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200 Baker et al., (2023). Annual and seasonal dry matter production, botanical species composition, and nutritive value of multispecies, permanent pasture, and perennial ryegrass swards managed under grazing. Grass and Forage Science, 78(3). (LINK)
201 O'donovan, M., Hennessy, D., & Creighton, P. (2021). Ruminant grassland production systems in Ireland. Irish Journal of Agricultural and Food Research, 59(2), 225–232. (LINK)
202 Thapa, R., Mirsky, S. B., & Tully, K. L. (2018). Cover crops reduce nitrate leaching in agroecosystems: A global meta-analysis. Journal of Environmental Quality, 47(6), 1400–1411. (LINK)
203 Ding et al., (2021). Nitrate leaching losses mitigated with inter-cropping of deep-rooted and shallow-rooted plants. Journal of Soils and Sediments, 21(1), 364–375. (LINK)

204 Ford et al., (2021). Effects of pasture type on metabolism, liver and kidney function, antioxidant status, and plant secondary compounds in plasma of grazing, jersey dairy cattle during mid-lactation. Frontiers in Animal Science, 2, 729423. (LINK)
205 Villalba et al., (2023). Integrating plant secondary metabolites and foraging behavior to enhance animal health in ruminant production systems. (LINK)
206 Van Vliet, S., Provenza, F. D., & Kronberg, S. L. (2021). Health-promoting phytonutrients are higher in grass-fed meat and milk. Frontiers in Sustainable Food Systems, 4, 555426. (LINK)
207 Ahsin et al., (2025). Soil and pasture health underlie improved beef nutrient density determined by untargated metabolomics in Southern US grass finished beef systems. npj Science of Food, 9(1), 151. (LINK)
208 Davis, H., et al. (2020). Nutritional benefits from fatty acids in organic and grass-fed milk. Foods / PLOS ONE (LINK)
209 Daley et al., (2010). A review of fatty acid profiles and antioxidant content in grass-fed and grain-fed beef. Nutrition Journal, 9, 10. (LINK)
210 van Vliet, S., Provenza, F. D., & Kronberg, S. L. (2021). Health-promoting phytonutrients are higher in grass-fed meat and milk. Frontiers in Sustainable Food Systems, 4, 555426. (LINK)
211 Provenza, F. D., Kronberg, S. L., & Gregorini, P. (2019). Is grassfed meat and dairy better for human and environmental health? Frontiers in Nut-

rition, 6, 26. (LINK)
212 Nogoy et al., (2022). Fatty acid composition of grain-and grass-fed beef and their nutritional value and health implication. Korean Journal for Food Science of Animal Resources, 42(1), 18–33. (LINK)
213 Adhikari, L., Mohseni-Moghadam, M., & Missaoui, A. (2018). Allelopathic effects of cereal rye on weed suppression and forage yield in Alfalfa. American Journal of Plant Sciences, 9(4), 685–700. (LINK)
214 Dossey, Z. (2010). Potential of green manure biofumigants and seed exudates in the control of Globodera pallida, the white potato cyst nematode (Doctoral dissertation, Washington State University).(LINK)
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217 Aronsson et al. (2016). The ability of cover crops to reduce nitrogen and phosphorus losses from arable land in southern Scandinavia and Finland. Journal of Soil and Water Conservation, 71(1), 41–55. (LINK)
218 Tripathi et al., (2022). Plant mineral nutrition and disease resistance: A significant linkage for sustainable crop protection. Frontiers in Plant Science, 13, 883970. (LINK)
219 Leff, J. W., et al. (2015). Consistent responses of soil microbial communities to elevated nutrient inputs in grasslands across the globe. PNAS, 112(35), 10967–10972. (LINK)
220 Treseder, K. K. (2008). Nitrogen additions and microbial biomass: A meta-analysis of ecosystem studies. Ecology Letters, 11(10), 1111–1120. (LINK)
221 Weinmann, M., Bradáčová, K., & Nikolić, M. (2023). Relationship between mineral nutrition, plant diseases, and pests. In Marschner's Mineral Nutrition of Plants (pp. 445–476). Elsevier. (LINK)
222 Peralta, A. L., Sun, Y., McDaniel, M. D., & Lennon, J. T. (2018). Crop rotational diversity increases disease suppressive capacity of soil microbiomes. Ecosphere, 9(5), e02235. (LINK)

central to a healthy diet. Reintroducing vegetables and horticulture into the rotation, whether on tillage farms diversifying their output or through new market-garden enterprises, would begin to close that gap while embedding national and nutritional security into the fabric of the sector. The same rotational logic that benefits cereals applies here, as vegetables grown within a diverse rotation help break pest and disease cycles²²³ and draw on the mineral wealth of a biologically active soil²²⁴. Horticulture also connects naturally to the wider farming system through circular nutrient flows. Vegetable production is demanding of organic fertility, and the treated slurry surplus from livestock farms could supply much of that demand. This creates a secondary market, giving livestock operations an outlet that keeps nutrients on productive land rather than polluting watercourses, while supplying the organic inputs a revitalised Irish fruit and vegetable sector would need. Among a functioning ecosystem’s most valuable services is the regulation of the water cycle. Diversification strengthens the land’s capacity to manage water as rotations, cover crops and diverse swards keep living roots in the ground, while also providing different root depths to build soil structure beyond what a monoculture offers. Year-round ground cover reduces the bare-soil periods when nitrate leaches and topsoil erodes²²⁵, cutting diffuse pollution at source. Deeper and more varied rooting opens the soil to greater infiltration, so that heavy rainfall soaks in rather than running off, easing both the flood peaks and the pollution pulses that follow a storm. The same improved structure holds moisture through dry periods, buffering the land against drought. Across the wider land base, a diversified system therefore functions as a form of living water infrastructure, absorbing, filtering and releasing water in a way that a simplified, input-dependent landscape cannot.

223 Peralta, A. L., Sun, Y., McDaniel, M. D., & Lennon, J. T. (2018)
224 Mendes, R., et al. (2011). Deciphering the rhizosphere microbiome for disease-suppressive bacteria. *Science*, 332(6033), 1097–1100. ([LINK](#))
225 Thapa, R., Mirsky, S. B., & Tully, K. L. (2018). Cover crops reduce nitrate leaching in agroecosystems: A global meta-analysis. *Journal of Environmental Quality*, 47(6), 1400–1411. ([LINK](#))

Animals as strategic ally

Rotational, mob, holistic, or adaptive multi-paddock (AMP) grazing is a pasture management technique that mimics the natural grazing pattern of livestock. Animals are densely stocked and frequently moved to emulate the predator-prey relationship of grazing animals. Doing so limits selective grazing, in which animals repeatedly return to the most palatable, nitrogen-rich regrowth at the expense of the plant itself. Where a plant is grazed again and again during regrowth, it must draw repeatedly on its root reserves to rebuild leaf, and if it is never allowed to recover, that draw-down starves the root system and eventually kills the plant²²⁶. Placing the animals in a ‘mob’ for a short period to graze each given paddock ensures non-selective grazing, and denies them the chance to repeatedly graze the same plant. Each paddock is then rested long enough for the sward to re-establish before it is grazed again. Rest periods can also help break disease cycles, both for wildlife contact and for immunosuppressive gut parasites²²⁷. The precise grazing time, density and rest period depend entirely on the farm’s context, its climate, soils, and pasture. Yet underpinning all operations is the principle of short, even defoliation followed by adequate recovery²²⁸.

Prioritising non-selective grazing ensures cattle draw the broadest nutrient profile from varied forage, with evidence that animals grazing a wider plant variety require fewer veterinary interventions and show greater overall resilience. Well managed, diverse pasture reduces the risk of parasite burden and the use of pharmaceuticals like de-wormers and antibiotics²²⁹, shown to have

226 Mosier et al., (2021). Adaptive multi-paddock grazing enhances soil carbon and nitrogen stocks and stabilization through mineral association in southeastern U.S. grazing lands. *Journal of Environmental Management*, 288, 112409. ([LINK](#))
227 Humblet, M.-F., Boschioli, M. L., & Saegerman, C. (2009). Classification of worldwide bovine tuberculosis risk factors in cattle: A stratified approach. *Veterinary Research*, 40(5), 50. ([LINK](#))
228 Teague et al., (2011). Grazing management impacts on vegetation, soil biota and soil chemical, physical and hydrological properties in tall grass prairie. *Agriculture, Ecosystems & Environment*, 141(3–4), 310–322. ([LINK](#))
229 Grace et al., (2018). Grazing multispecies swards improves ewe and lamb performance. *Animal*, 13(8), 1721–1729. ([LINK](#))

a negative impact on human²³⁰, animal²³¹, soil²³², and microbial²³³ health. A well-planned rotation across one or multiple groups (dairy, youngstock, finishing) also doubles as a surveillance tool, letting a farmer watch whether exposed animals progress to reactors. Higher stocking density, meanwhile, distributes dung and urine more evenly across the paddock rather than clustering it around favoured resting spots, returning nutrients to the soil where the regrowing sward can use them²³⁴.

Forage production can rise through the compounded effect of sufficient rest, even nutrient return, and the animal impact that tramples ungrazed plants flat, generating a litter layer to protect against erosion. In the Irish context this is particularly pertinent as heavy rainfall on exposed soil can dislodge fine clay particles that then set into a surface crust, or cap, as conditions dry. Surface capping seals the soil against water, limiting microbial activity, forcing rainfall off as runoff, and leaving the profile unable to cycle water to the plants that depend on it²³⁵. A continuous litter cover, maintained by trampling rather than removed by close grazing, is one of the more effective defences against that sealing.

The combined effect of evenly distributed, organic-matter-rich dung, trampled plant litter, and the root exudates and shedding roots of uniformly grazed plants is instrumental in building soil²³⁶. Microbial life fed by that organic matter drives aggregate formation and supports root growth, unlocking nutrients for plant use²³⁷. Grazing also stimulates compensatory regrowth that increases root exudation, moving

230 Checcucci, A., et al. (2020). Exploring the animal waste resistome: The spread of antimicrobial resistance genes through the use of livestock manure. *Frontiers in Microbiology*, 11, 1416. ([LINK](#))
231 Checcucci, A., et al. (2020)
232 Verdú, J. R., et al. (2018). Ivermectin residues disrupt dung beetle diversity, soil properties and ecosystem functioning: An interdisciplinary field study. *Science of the Total Environment*, 618, 219–228. ([LINK](#))
233 Wepking, C., et al. (2021). Application of manure from cattle administered antibiotics has sustained multi-year impacts on soil resistome and microbial community structure. *Soil Biology and Biochemistry*, 155, 108151. ([LINK](#))
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235 Penn State Extension. (2023). Soil crusting: causes and management. ([LINK](#))
236 Teague, R., & Kreuter, U. (2020). Managing grazing to restore soil health, ecosystem function, and ecosystem services. *Frontiers in Sustainable Food Systems*, 4, 534187. ([LINK](#))

237 Mosier et al., (2021)

photosynthetic carbon into the soil²³⁸ at varied rooting depths a monoculture would not achieve²³⁹. As climate pressures intensify and compounding extremes like the 2018 storm-and-drought become more frequent, cultivating this living, evolving water infrastructure offers a low-cost, perennial system that provides cascading benefits conventional grey infrastructure cannot match.

Organic Treatments and Stimulants

Slurry is one of the primary sources of nitrogen leaching on livestock farms. Untreated, much of the nitrogen it contains escapes into the air as ammonia gas, both in the storage tank and after it is spread on the field. Once this nitrogen is lost, it drifts and settles back onto land and water elsewhere as pollution²⁴⁰, and what does not escape as gas is often washed through the soil as nitrate before the grass can use it²⁴¹. The result is a farmer applying slurry to feed the grass, while much of its value is lost to the air and to the nearest river.

Lactic Acid Bacteria

Treating slurry with lactic acid bacteria (LAB) is a simple, low-cost way to hold on to that nitrogen. LAB are the same family of microbes that ferment silage, yoghurt and sauerkraut. In practice, the farmer adds an inoculant, a culture of these bacteria, to the slurry store, often alongside a food source for them such as a sugar or a whey by-product. The bacteria ferment the slurry and turn it slightly acidic. Dropping the acidity shifts the nitrogen from ammonia, the form that escapes as gas, into ammonium, a stable form that stays in the slurry.

238 Sun, Y., et al. (2020). Increased contribution of root exudates to soil carbon input during grassland degradation. *Soil Biology and Biochemistry*, 146, 107817. ([LINK](#))
239 Mosier et al., (2021).
240 Xu, R., et al. (2019). Ammonia volatilization as the major nitrogen loss pathway in dryland agro-ecosystems. *Environmental Pollution*, 258, 113698. ([LINK](#))
241 Ryan et al., (2006). Nitrate leaching from grazed grassland lysimeters: Effects of fertilizer input, field drainage, age of sward and patterns of weather. *Irish Journal of Agricultural and Food Research*. ([LINK](#))

Specific products, dose rates and timings will vary and depend on each farmers' context, but the underlying method remains in the inoculation of the store, letting the bacteria acidify it, and then spread as normal.

Because the nitrogen is then stabilised as ammonium, far less is lost to the air. Trials of biological acidification have reported ammonia-emission reductions of up to 95% under optimised conditions²⁴², with nitrogen retention during storage improved by around 20% relative to untreated slurry²⁴³. Combined with the better infiltration and biological activity of regeneratively managed soils, treated slurry makes its nitrogen plant available, dramatically reducing leaching and associated pollution of waterways.

Alternative Treatments

LAB treatment is one option within a wider toolbox of biological slurry treatments. As with all proposed solutions, the specific pathway a farmer will take is dependent on their own farm circumstances.

Anaerobic digestion breaks slurry down under low-oxygen conditions to produce biogas, generating an on-farm energy source alongside a digestate that is typically more plant-available and lower in volatile solids than raw slurry. Its use has been shown to cut total greenhouse gas emissions from manure management by around 40% relative to untreated storage²⁴⁴. However, digestion raises the slurry's pH and ammoniacal nitrogen content, which several field and storage studies have found can increase ammonia emissions²⁴⁵ relative to untreated slurry unless paired with rapid, low-emission spreading. Biochar offers a complementary fix to

this through its porous structure that slows the release of ammonium. Trials adding biochar to composting and vermicomposting cattle manure have shown reduced nitrogen losses by roughly a quarter to two-thirds depending on the biochar type and rate²⁴⁶, while the biochar itself, once land-applied, contributes lasting carbon²⁴⁷ and cation exchange capacity to the soil. There exist multiple treatments and inoculants to stabilise slurry, and further research is recommended to farmers looking to deepen their understanding of the available options. No single treatment is without trade-offs, and the choice between them, like the wider regenerative approach this paper describes, depends on what each farm is trying to solve.

Increasing the nitrogen use efficiency of slurry means each application replaces more bought-in chemical fertiliser, cutting or eliminating the fertiliser bill directly. Stabilised slurry also becomes an asset rather than a disposal problem, with surplus supporting lower-stocked or tillage farms, providing livestock farms with an extra income stream. Moreover, excess slurry could support organic fertility to a tillage sector looking to reduce its synthetic inputs, enabling Ireland to rebuild a domestic feed-grain base. Facilitating a circular flow of nutrients from livestock to arable land addresses the pollution problem while reinstating input independence. This framework is absent in the current volume-based regulation.

²⁴² Liu et al., (2023). Highly efficient reduction of ammonia emissions from livestock waste by the synergy of novel manure acidification and inhibition of ureolytic bacteria. *Environment International*, 172, 107768. ([LINK](#))

²⁴³ Hăni, C., et al. (2021). Acidification effects on in situ ammonia emissions and cereal yields depending on slurry type and application method. *Agriculture*, 11(11), 1053. ([LINK](#))

²⁴⁴ Aguirre-Villegas et al., (2019). Anaerobic digestion, solid-liquid separation, and drying of dairy manure: Measuring constituents and modeling emission. *Science of the total environment*, 696, 134059. ([LINK](#))

²⁴⁵ Fangueiro, D., Pedersen, J., & Hafner, S. D. (2022). Effectiveness of mechanical separation for reducing ammonia loss from field-applied slurry: Assessment through literature review and model calculations. *Journal of Environmental Management / Science of the Total Environment*. ([LINK](#))

²⁴⁶ Gong et al., (2023). Biochar improves compost humification, maturity and mitigates nitrogen loss during the vermicomposting of cattle manure-maize straw. *Journal of Environmental Management*, 325, 116432. ([LINK](#))

²⁴⁷ Kwapinski et al., (2010). Biochar from biomass and waste. *Waste and Biomass Valorization*, 1(2), 177-189. ([LINK](#))



Photo: Tom Stack

Case-study of an Irish dairy regeneration journey - Thomas Stack

Globally, the fragility of the industrial agriculture model is accelerating. As discussed above, the heavy dependence on imported inputs that underpins industrial systems is no longer a reliable foundation for food production. Regenerative systems, by contrast, tend to show greater yield resilience, particularly in arable, perennial, and mixed systems, where production is diversified and therefore more resilient, the scope for buying additional output through external inputs is limited, and soil health directly determines production. Their advantage lies in rebuilding soil health to maintain strong production on a far lower and more stable cost base.

Livestock systems offer a different picture. An intensive meat or milk operation can, at the extreme, sustain very high stocking rates on non-regional or international inputs, feed, fertiliser and concentrate, pushing the production of a farm beyond its natural boundaries. A regenerative system deliberately distances itself from this approach, stocking closer to what the land can carry on its current and biological fertility, while building its productive capacity over time. It replaces bought-in nitrogen and feed with legumes, diverse swards and grazed grass, and accepts somewhat lower output per hectare as the direct consequence of improving the holistic performance of the farm and building independence.

Taken alone, output per hectare is a misleading measure of a livestock system's performance. It rewards intensity regardless of the negative impact or externalities it generates on the landbase, or elsewhere. A fuller account has to weigh output against the inputs required to produce it, the resilience of the margin when prices swing, and the wider costs, to water, animal health and emissions, that per-hectare yield conceals. Regenerative models perform strongly under this holistic understanding,

even where raw output per hectare is lower. Comparatively, they produce a competitive and stable margin on a fraction of the inputs. Our case study of EARA's Irish farmer member Tom Stack exemplifies this improved holistic performance. We present the data transparently and openly, across several different measures rather than a single headline figure. As discussed earlier, the regenerative transition is unique and context-specific. Tom chose to make drastic changes from one year to the next, while others may move more gradually. Regardless of the pace of a farmer's regeneration, support should be available in charting their own path, on their own terms, united in their diversity by a shared direction of travel.

Tom is a regenerative organic dairy farmer working 59 hectares in Limerick. With 57 hectares of permanent pasture, one of forest, and one of arable land, he is embedding resilience in his land for the long-term benefit of farm economics. Tom began the regenerative transition of his farm in 2018 and gained organic certification in 2020. Specialising in Korean Natural Farming (KNF), Tom facilitates a system that harnesses natural processes (fermentation and the interactions of beneficial fungi, yeasts and bacteria) to support plant growth. By using bacteria, fungi and other microorganisms gathered from his own land, Tom draws on communities that are already adapted to his farm's particular soils and climate. Much as selective breeding shapes a herd over generations, microorganisms inherit and refine the traits that let them thrive in a specific environment. KNF works with this principle of local adaptation through what are known as indigenous microorganisms (IMOs). IMOs are locally gathered communities of fungi and bacteria that have adapted over many years to provide the appropriate nutrient and chemical balance for their particular climate and landscape.

LAND USE	
Total farm area	59 ha
Utilised agricultural area (UAA)	58 ha
of which permanent pasture	57 ha
of which arable / tillage	~1 ha
Forest (excluded from UAA)	1 ha

Sovereignty and Input-Inde

Tom's system typically runs between 93-114 head of cattle, with a stocking density of 1.3-1.5 LSU/ha. Given the structure of the farm, the yearly stocking fluctuates, yet production remains stable at 200,000-220,000L per year, for an average of 3700L/cow. Moreover, since Tom started his transition and began relying solely on the biological productivity of his land, **Tom has increased his stocking rate from 45 to 60 milking cows in just 3 years.** This evolution illustrates how a landscape regains its productive capacity under regenerative management. Irish intensive dairy operations typically produce 5000-6000L/cow at 2 - 3 LSU/ha²⁴⁸, yet these systems rely extensively on purchased inputs and a lack of dietary diversity and quality. Stocking rate is a key determinant of the land's productive and regenerative capacity. Traditionally it was set by available forage, matched so that grazing animals never exceeded the land's ability to regrow. As explored earlier, that link has now been severed through imported feed, as farms can carry far more animals than their own land could sustain. Stocking is therefore dictated less by what the land can grow than by how many cattle can be fitted onto owned or rented ground, maximising „efficiency“ at the expense of landscape health.

That intensity carries a measurable ecological cost, visible even in the land's capacity to hold carbon. Livestock systems stocked at around 1.5 LU/ha have been shown to sequester and

248 Data taken from Eurostat and CSO

store more carbon than those at 2.5 LU/ha²⁴⁹, and a grassland ecosystem model found net greenhouse-gas sink behaviour only below roughly 1.6 LU/ha as systems establish. Roughly 1.4 million hectares of Irish soils are peat, with ~400,000 hectares under agricultural management. Peatlands store an immense amount of carbon, yet agricultural peatlands are draining these stocks by almost 4 million tonnes of CO2 per year²⁵⁰. So, restoring the landscape's capacity to sequester carbon works to mitigate the adverse effects of climate change, but also to regenerate the productive capacity of the land.

It is telling that „efficiency“ can be increased by internationally imported feed. A farm is counted as more efficient by buying inputs produced thousands of kilometres away, deepening its reliance on the productivity of farms elsewhere and on the supply chains that connect them. It is a fragile foundation on which to rest farm economics and national food security. Variable costs account for 50-60% of the average annual costs of production for Irish dairy farms, of which fertiliser, plant protection products, and feed comprise ~40%. Between 2020 and 2025, animal feed alone represented 28% of all variable costs on average. As explored earlier, the escalation of the Russia-Ukraine war in 2022 caused spending on these inputs to rise by 37% as supply and available trade routes were interrupted.

Tom's farm is largely insulated from this risk. From just one hectare of arable land, Tom produces 12 to 15 tonnes of a grain mix (peas, oats, barley and buckwheat) part of which goes to calf feed, and part of which is used to create his on-farm organic sprays under KNF. When added to fresh, diverse pasture and silage, the animals are kept both happy and healthy, with the benefits extending to the land, the milk, and the farm's economics. Additionally, the cost of this supplementary feed remains within the Irish economy, as any contracting support replaces the cost of international inputs, stimulating local economies and work.

249 Soussana et al., (2004), Carbon cycling and sequestration opportunities in temperate grasslands. Soil Use and Management, 20: 219-230. [\(LINK\)](#)

250 Teagasc (2023) Counting Carbon: Science and Practice [\(LINK\)](#)

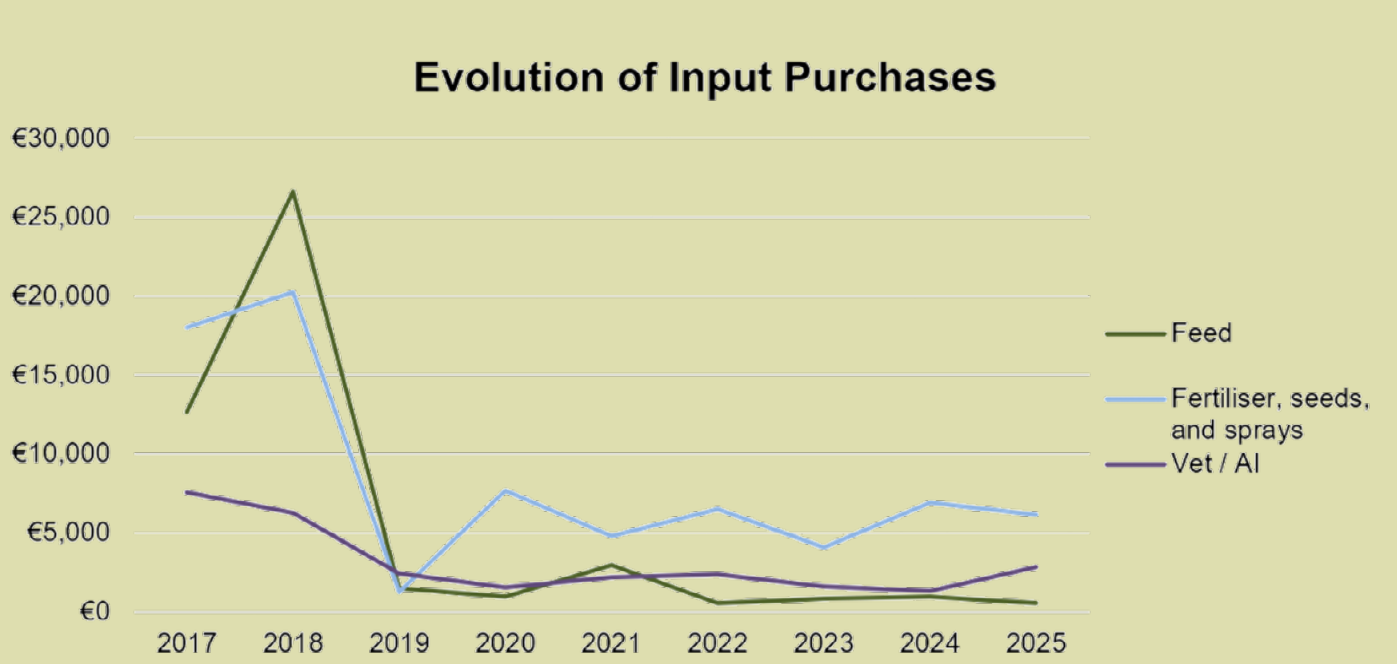
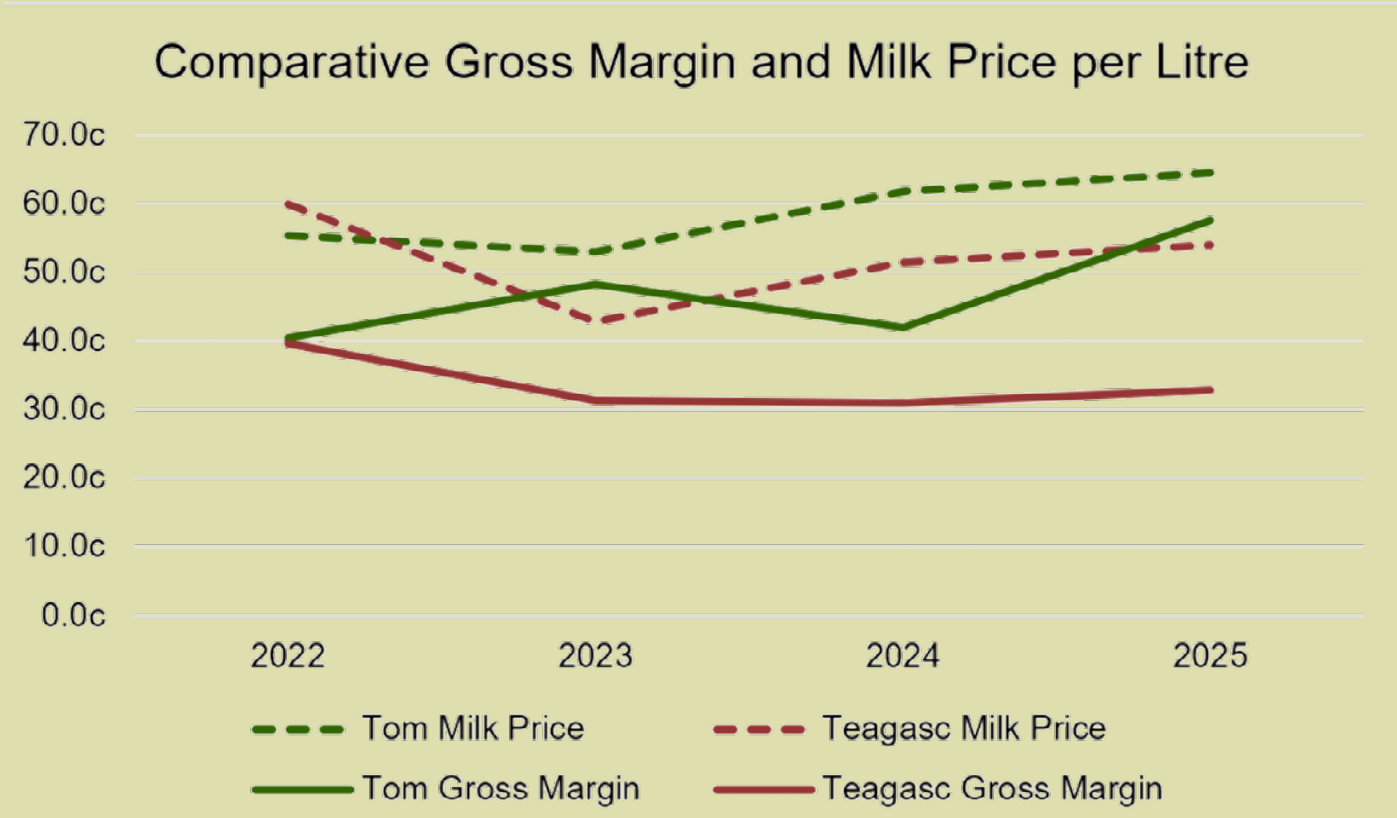


Figure 11, Evolution of Tom's feed, fertiliser, seeds and sprays, and veterinary expenses

Figure 12, Comparison of Tom Stack's and Teagasc average gross margin, and price per litre of milk²⁵¹.

251 Teagasc data sourced from National Farm Surveys [\(LINK\)](#)



Since 2017, just before Tom began his farm's transition, he purchases no supplementary cattle feed purchases, and only purchases a small amount of hay for bedding and turkey feed. Fertiliser, seed and spray purchases have reduced by roughly 67%, and synthetic nitrogen, phosphorus and potassium are no longer used at all. Since 2019, Tom has only applied lime as a soil amendment, which means the farm was immune from the input cost crisis in 2022. 2018 illustrates the reality of mounting climate pressure on conventionally managed farms. As explored earlier, the successive shocks of that year, the winter storms and the summer drought, compounded one another to devastating effect. Between an underperforming pasture and increased demand on animal feed, Tom's spending on supplementary feed doubled, inevitably driving him towards the whole transition of his farm. Maintaining a healthy farm ecosystem is a key mitigating factor to the impacts of drought and flood, as previously explored in the solutions section.

The drought of 2026 highlighted this resilience, moving beyond hypotheses to real conditions. As previously discussed, July 2026 was Ireland's driest on record, with the daily growth of dry matter at half the rate of the 10-year average. For most farms this translates to significantly increased spending on feed to maintain productivity, adding to the already elevated direct costs. Tom's farm was not immune to the drought, yet the landscape's capacity to respond to the drier climate diverged sharply from surrounding operations. While many neighbouring farms began providing supplementary feed to cattle both day and night, Tom's herd remained on pasture, starting supplementary feeding six weeks later, and even then only at night.

Remarkably, every kilogram of supplementary feed was also produced on his own land, protecting him from the 6-7% price hike on rations²⁵². This performance traces back to the hydrological function of diverse, deep rooted swards, rotational grazing, and a thriving soil microbiome stimulated by maintenance sprays

252 Declan O'Brien. (2026). Feed price hike of €20-25/t in the pipeline. Irish Farmers Journal. Farmersjournal. (LINK)

to feed soil microorganisms. Higher soil organic matter, greater microbial activity, and varied rooting depths have built Tom's water storage capacity, giving his pasture access to moisture where other systems run dry.

By integrating diverse pasture, arable land, and optimising the natural processes on the farm through inoculants and on-farm microorganisms, Tom's farm is both productive and free from synthetic inputs and imported concentrate. Liberating the costs usually tied to inputs gives more space to invest in the resilience of the land. Doing this ensures that productivity does not drop and margins do not tighten during periods of climatic or economic pressure. 2023 showcased this resilience with national dairy incomes dropping significantly as Tom's profitability increased.

Animal Health

Herd health and immunity is a central priority on the farm, and the herd has proved notably resilient even as bTB cases have increased within the region²⁵³. At its most recent test in August 2026 it returned zero reactors, despite surrounding operations carrying reactors and rising herd incidence. This again indicates that the hypotheses proposed earlier in this paper should be further explored, investigating an animal population under real exposure pressure that is nonetheless not converting into disease. It is this distinction between infection pressure and host susceptibility that the current test-and-cull framework overlooks.

Several aspects of Tom's farm align with the drivers of disease resilience discussed earlier. Diverse pasture removes the high-starch, low-fibre load associated with systemic inflammation and oxidative stress caused by subacute ruminal acidosis²⁵⁴. In place of monoculture ryegrass pastures, the animals graze diverse, biologically active pastures that supply the carotenoids, polyphenols and other plant secondary

253 Data sourced from CSO on bovine Tuberculosis (LINK)
254 Plaizier et al. (2008).

compounds on which antioxidant defences depend.

KNF systems reinforce this by boosting health from the gut through fermented preparations and microbial inoculants. By applying foliar sprays and organic soil amendments, KNF stimulates the critical transfer of nutrients through fungal hyphae. In addition, direct-fed microbials (DFM) are a key component of KNF, the live bacterial and yeast cultures whose primary studied roles are the modulation of gut immune function²⁵⁵ and the stabilisation of rumen fermentation²⁵⁶. DFMs have been shown to stabilise rumen pH and support fibre-digesting bacteria while enhancing immune function through the microbial diversity²⁵⁷. These microbial-host interactions stimulate host immune responses such as increased white blood cell and lymphocyte counts in young ruminants²⁵⁸ and act against zoonotic and food-borne pathogens. Reviews increasingly position DFM as viable alternatives to antibiotics in livestock production.

Tom does not use routine antibiotic or worming treatment, and has not since 2017, with the exception of one dose in 2025 to treat pneumonia in 3 calves. As a result of these immune-driving synergies of natural processes, Tom's annual veterinary fees were 80% lower in 2024, and 65% lower in 2025²⁵⁹ compared to 2017.

Grazing management complements this approach, and works to the same end. The farm runs a rotational grazing system in which stock graze the pasture non-selectively, taking a wide range of species rather than grazing preferentially. Given a pasture is diverse, this delivers the dietary diversity that underpins immune function, while the rest periods built into the rotation help break transmission cycles,

255 McAllister et al., (2011) Review: The use of direct-fed microbials to mitigate pathogens and enhance production in cattle. Canadian Journal of Animal Science, 91, 193-211. (LINK)
256 Ban, Y. & Guan, L.L. (2021) Implication and challenges of direct-fed microbial supplementation to improve ruminant production and health. Journal of Animal Science and Biotechnology, 12, 109. (LINK)
257 Frontiers in Veterinary Science (2025) Temporal changes in ruminal microbiota composition and diversity in dairy cows supplemented with a lactobacilli-based DFM. 12:1584959. (LINK)
258 Ban, Y. & Guan, L.L. (2021)
259 This year was exceptional given the 3 cases of pneumonia in calves.

including for immunosuppressive gut parasites that continuous set-stocking sustains. Effectively, a management system can itself become a tool of disease prevention rather than a driver of disease.

To complement the herd immunity gained from diverse, nutrient rich pastures, Tom is also anchoring resilience through genetic selection. Rather than the narrow, high-output dairy genetics around which the national herd has concentrated, Tom is building genetic resilience through a herd combination of Friesian, Shorthorn, Ayrshire and Irish Moiled crosses, capturing the effect known as heterosis or hybrid vigour. Heterosis is most pronounced for functional traits related to fertility, disease resistance and productive life in dairy cows, and increases alongside the genetic diversity of the breeds being crossed²⁶⁰. Crossbred cows consistently show greater survival, fertility and health than purebred Holsteins²⁶¹, an advantage attributed to both heterosis and the avoidance of inbreeding depression²⁶². Maintaining strong, locally adapted genetics and crossing across diverse breeds therefore builds immune robustness into the herd itself, complementing the resilience built through diet and management.

Notably, the farm carries a hectare of woodland. Because badgers are a well-established wildlife reservoir for bovine TB in Ireland and Britain, and woodland and field margins raise the likelihood of cattle contact with them, this naturally elevates exposure risk²⁶³. That the herd remains clear despite this heightened exposure pathway demonstrates that the resilience appears to lie in the animals' capacity to resist the establishment of infection.

260 Getahun et al., (2019). Importance of hybrid vigor or heterosis for animal breeding. Biochem Biotechnol Res, 7(1), 1-4. (LINK)
261 Kumar, M., Ratwan, P., & Kumar, A. (2018). Heterosis-genetic basis and utilization for improvement of dairy cattle: A review. Res. Rev. J. Dairy Sci. Technol, 5, 40-50. (LINK)
262 Wakchaure et al., (2015). Importance of heterosis in animals: a review. International Journal of Advanced Engineering Technology and Innovative Science, 1(2), 1-5. (LINK)
263 Khouri et al., (2026). The effect of wildlife host hotspots on bovine tuberculosis (bTB) risk dynamics in a disturbed landscape. Landscape Ecology, 41(3), 51. (LINK)

Treating Water Pollution

Tom's farm sits within a derogation zone, surrounded by intensive farms operating at or near the 220 kg N/ha organic-nitrogen limit. Conversely, when calculated on the Nitrate Directive's own basis²⁶⁴, Tom's organic-nitrogen loading is roughly 105 kg N/ha, comfortably below the standard 170 kg/ha limit and less than half the derogation ceiling. He is, in effect, already farming at the nitrogen loading the regulation is aiming for, without needing a derogation at all. When compared to regional averages, this difference is all the more stark. Counting all nitrogen streams, a typical intensive dairy farm in the surrounding area applies roughly 170–200 kg of synthetic nitrogen per hectare each year²⁶⁵, on top of an organic-nitrogen loading of around 200–220 kg/ha carried by its higher stocking. Combined, that is on the order of 370–420 kg of total nitrogen applied per hectare. Tom's total is his ~105 kg/ha of organic nitrogen, with lime as the only additional input, less than one-third

264 Nitrogen loading for cattle per hectare are based on stocking density (LSU / ha) multiplied by their excretion coefficients.
265 Teagasc (2023) Farm Structure Survey 2023 (2013–2023). [\(LINK\)](#)

of the total nitrogen applied relative to regional averages.

Tom achieves this through several complementary practices rather than any single measure. His fertility is built biologically through a modest foliar application of on-farm microbial preparation (around 600 kg of solid indigenous microorganism mix across the farm, roughly 10–11 kg/ha) that promotes plant nutrient uptake and feeds soil biology rather than forcing growth chemically. His slurry is treated with lactic acid bacteria (LAB) before spreading, which holds nitrogen in the slurry rather than losing it. Through this treatment, Tom's slurry has stabilised to the point at which frogs are swimming in the slurry tank. Ammonium nitrogen comes largely from urine and makes up around half of slurry's nitrogen. However, it is the most susceptible to losses through volatilisation, and biological treatment of this kind has been shown to cut these losses substantially.

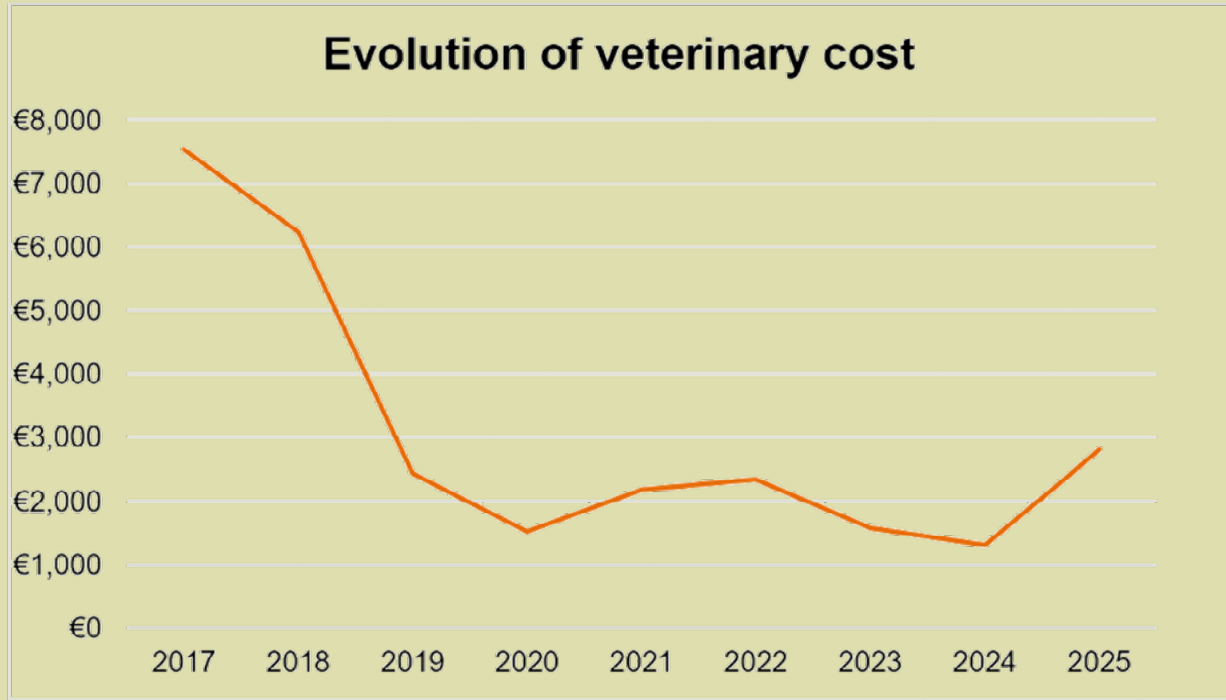


Figure 14, Comparative analysis of Tom's farm's photosynthesis and soil cover against regional averages²⁶⁶

266 Figures calculated through Normalised Differentiated Vegetation Index (NDVI) and Fraction of Photosynthetically Active Radiation ([FPAR](#)) analyses
European Alliance for Regenerative Agriculture | Regenerating Systemic Risk: A Case Study on Ireland

Because cattle are moved to a fresh paddock each day under a rotational system, nitrogen is deposited evenly and in step with the sward's ability to take it up, dramatically reducing losses to leaching. Both practices follow the same logic that underpins KNF, to capture and cycle nutrients on the farm, rather than lose them and buy replacements in.

Despite such a radical reduction in synthetic fertilisers, Tom's pasture performs competitively with surrounding industrial farms. NDVI and soil-cover analyses indicate that the total photosynthetic activity of the grassland feeding his cattle rivals that of neighbouring conventional farms, while also delivering the cascading benefits to plant, animal, human and ecosystem health associated with diverse forage.

The Honest Regenerative Business Case

Hidden costs embedded within the Irish agri-food system are estimated to be ~€20 billion per year (\$23 billion USD)²⁶⁷, with roughly half of this directly attributed to environmental degradation²⁶⁸. Regenerative forms of agriculture can both reduce emissions²⁶⁹ and sequester carbon²⁷⁰, while rejuvenating regional ecosystems²⁷¹ and strengthening social and economic wellbeing²⁷². To recall, Tom's 58 hectares of agricultural land supports between 93 and 112 head of cattle. With a stocking rate of roughly 1.3-1.5 LSU/ha, he sits below the national dairy farm average of around 2.0 and well below the intensity high-input systems push toward.

267 Environmental Protection Agency (EPA). (2024). Ireland's state of the environment report 2024. [\(LINK\)](#)
268 <https://epawebapp.epa.ie/ebooks/soe2024/>
269 Newton et al., (2020). What is regenerative agriculture? A review of scholar and practitioner definitions based on processes and outcomes. *Frontiers in Sustainable Food Systems*, 4, 577723. [\(LINK\)](#)
270 Lundgren et al., (2026). Regenerative agriculture: connecting soil carbon storage, biodiversity, and profit. *Environmental Research: Food Systems*, 3(3), 035020. [\(LINK\)](#)
271 Schreefel et al., (2020). Regenerative agriculture – the soil is the base. *Global Food Security*, 26, 100404. [\(LINK\)](#)
272 Lundgren et al., (2026). Regenerative agriculture: connecting soil carbon storage, biodiversity, and profit

Where production per hectare might be comparatively lower, regeneratively managing the land with a lower stock rate eliminates imported feed, synthetic inputs, and the need for reseeding. So, even though milk production per cow, hectare, and total volume is lower than typical high-input Holstein systems, Tom's system generates demonstrably higher margins per litre.

Tom's input independence holds a significant long-term economic advantage, which matters most for family farms with limited access to capital, yet also secures the resilience of local and national food supply. Nonetheless, intensive operations have as much to gain, even without the same financial instability family farms are subject to. Running on the farm's own biological fertility rather than bought-in inputs lowers both the cost of entry and the exposure to uncontrollable markets beyond the farm gate. This provides a clear advantage through the insulation from global markets. Carrying no purchased feed and no synthetic nitrogen, phosphorus or potassium, Tom has removed the two largest and most volatile lines on his cost sheet. Seen earlier, input spending fell from a climate-induced 2018 peak of over €26,000 on feed and around €20,000 on fertiliser, seeds and sprays to under €1,500 and roughly €4,000 to €6,000 respectively from 2019 onward, a fall of around 96% in feed (with zero purchased feed for his cattle) and two-thirds in fertiliser, now only applying lime.

This lower cost base produces a strong and stable margin. Excluding subsidies, Tom's gross margin per litre ran at 40 to 58 cent across 2022 to 2025, well above the national average of 30 to 39 cent. Tom's margins continue to widen as his organic premium establishes around ten cent per litre, and the land becomes ever more resilient, healthy, and productive. Moreover, Tom's income is not prone to the same volatility as the national figure, with no dependence on purchased inputs, the farm economics remain steady. Beyond economics, the herd has been antibiotic-free since 2017 and returned zero bovine TB reactors at its most recent test despite rising incidence nearby. Moreover, the land is regenerating rather than degrading, and at an organic nitrogen

loading of around 105 kg per hectare Tom sits well below even the standard 170 kg limit while matching regional averages for photosynthesis and soil cover.

However, Tom's total production is lower than the average dairy farm. At roughly 1.3 livestock units per hectare against a national average near 2.0 for dairy farms, and around 3,700 litres per cow against roughly 5,500, his output per hectare is lower by design. His gross margin per hectare of €1,300 to €1,800 therefore sits below the national average even as his margin per litre runs high, and lower total output can mean lower total profit despite the stronger unit margin. To address this, Tom has chosen to vertically integrate the processing of his milk into his farm, rather than opting for higher-productivity genetics in his herd. For Tom, herd immunity is a key priority, sacrificing this for productivity is not an option. So, processing his own cheese, cream, and milk and providing this to his community is a viable value-adding option for his farm. This approach still falls within the broader trajectory of the regenerative journey, as he is searching to continuously improve his lands and animals'

health, as well as his social and economic performance.

This balance depends on price and on the diversified income a mixed system can build alongside milk. What Tom's accounts show is that the trade-off is far more favourable than the commodity model assumes. Competitive, stable margins that benefit both land and animal health represent a strong position by any measure other than raw output per hectare, and for a family farm weighing security against scale, that is the advantage that matters most. It is worth stressing that this assessment captures only the impact at the level of the individual farm. Once the wider mitigation of environmental, climatic, food-security and health risks is accounted for, the value of these regenerative approaches compounds well beyond the farm gate. These are public benefits delivered at private cost, and should be rewarded through performance-based payment-for-ecosystem-services (PES) mechanisms that remunerate the farmer. This is discussed further below in the recommendations section.

Tom vs the national average dairy farm, 2022–2025 (market-based, subsidies excluded)

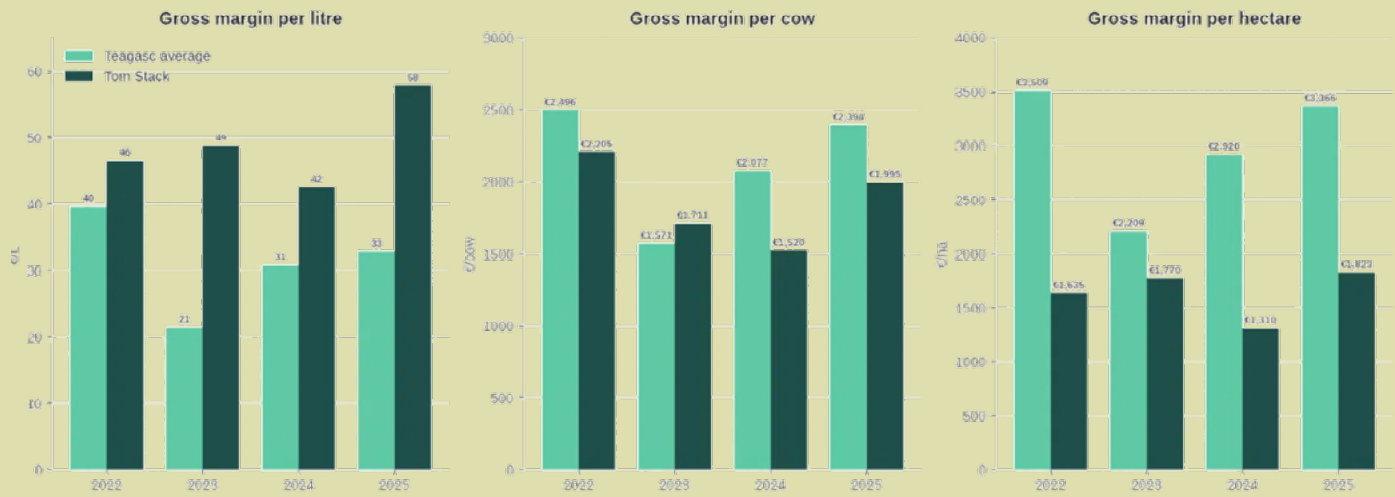


Figure 15, Economic comparison of Tom’s farm against Teagasc averages, gross margin per litre, cow, and hectare



Photo: Tom Stack

Diversity of Regeneration Journeys

Not every transition must look like Tom’s and likely none will look exactly like Tom’s. Every regenerating journey, reducing harmful and off-farm inputs while increasing the capacity of the farm to produce biologically intensive systems through their own generative power, is unique. Moreover, each farmer’s journey is dependent on their immediate priorities. Whether economic, ecological, social, or otherwise, the first steps taken will depend on their context. So, the regenerative journey depends on the economic context as much as the ecological and social. Existing debt, connected investment cycles and necessities for total profit vs margins related to sale opportunities are all critical factors in regeneration. Likewise for the Irish dairy sector, Tom’s example is one of many. One that visualises the direction of travel, on which every farmer needs to make her or his own path.

Felix Riecken

In EARA’s Farmer-led Research Study²⁷³ we showcase the journey of Felix Riecken, a dairy farmer from Holstein. Over the last 8 years, Felix has transitioned from conventional to regenerative organic, and now farms at about 8500l per cow per year. Similar to Tom, he self-produces a share of his animal feed, which accounts for only 9% of their total diet. His cattle are grass-fed, as in the Irish system, and are managed under a similar adaptive multi-paddock grazing system as Tom.

273 EARA (2025) Farmer-led Research on Europe’s Full Productivity The Realities of Producing More and Better with Less - Place-based Innovation for the Good of All [\(LINK\)](#)

Felix Riecken			
Schleswig, Holstien			
Production and Profit	Regional Average	Felix	% Change
Indicator			
Milk per cow	10500L	8500L	-19%
Imported Feed (share of total)	30%	6%	-400%
Input Reductions			
Indicator			
Synthetic Nitrogen	175kg/ha		-100%
Synthetic Phosphorus	61kg/ha		-100%
Synthetic Potassium	146kg/ha		-100%
Pesticides	485g/ha		-100%
Antibiotics	4-6mg/kg	0.6mg/kg	0.35
Photosynthesis	-	-	38%
Soil Cover	-	-	16%
Fuel	165L/ha	97L/ha	-41%

Figure 16, Felix Riecken’s performance against regional averages in Schleswig, Holstein

Henrique Cordeiro

Another example comes from the Azores, an island region of Portugal whose economy leans heavily on dairy. Two large dairy corporations buy from local farmers, so growers have few alternative routes to sell their milk. This leaves many of them with little room to accept lower total yields, particularly where debts must be serviced or other financial commitments met. Even under these constraints, a regenerating journey remains possible.

Henrique Cordeiro is a contract dairy farmer of a multinational dairy company in the Azores island of Portugal. He exemplifies another impressive journey over the last 4 years. He farms 60 hectares of which 25 hectares are grassland and 35 hectares are arable (maize, grass and grain-mixes for silage). With 130 milking cows and 50 heifers, he runs a very intensive system and is impressively managing to increase yields while reducing input dependency and improving ecosystem and animal health.

Like Tom, Henrique’s photosynthetic performance remains comparable to conventional plots and even improves against them despite a 25% reduction in synthetic nitrogen, and a full elimination of synthetic phosphate and potassium. By reducing herbicides and insecticides, and eliminating anti-wormers, the soil microbiology is restored, ensuring a wider buffer in the face of climate events. The culmination of these factors has drastically reduced input costs, with improved net profit per hectare more than doubling compared to before the transition.

Overall, our case studies show that between them, they score an average of 65% less purchased feed, 75% less fertiliser, 88% less plant protection products, and 33% less fuel.

Again, we want to stress that all examples and case studies should give expression to the diversity of journeys and the necessity for each farmer charting their own path within their holistic context understanding. Those are regeneration paths that governments and businesses must support structurally but not prescribe with agronomic practices.

Agro Milhafes			
Azores, Portugal			
Production and Profit	2021	2025	% Change
Indicator			
Milk per cow	-	9900L	13%
Gross Margin	-	-	>100%
Imported Feed	320g/L	260g/L	-19%
Calving Failure	-	-	
Input Reductions			
Indicator			
Synthetic Nitrogen	-	-	-25%
Synthetic Phosphorus	-	-	-100%
Synthetic Potassium	-	-	-100%
Herbicides	-	-	~70%
Insecticides	-	-	0.5
Antibiotics	-	-	0.35
Anti-wormers	-	-	100
Fuel	-	-	-20%

Figure 17, Comparative performance of Agro Milhafes farm, pre-transition to 4-years regenerative.



Regenerating solutions for systemic problems

We structure this final chapter around the four core systemic risks discussed earlier in the paper, reflecting on each through systemic solutions. These are not isolated silos but a blended, context-specific and continuous journey of improvement. Each solution serves both farmers and eaters in Ireland, across quality, resilience, incomes and prices, national and nutritional security, and the generational renewal crisis. Regenerating forms of agriculture do not sacrifice yield for nature, independence for annual profit, or national income for national security. Regenerating forms of agriculture entrust Irish farmers to choose the best paths ahead for their land and communities, producing food while regenerating nature.

Methodological Assumptions

This analysis rests on a set of deliberate assumptions that should be read as the basis for an illustrative estimate rather than a forecast. Most significantly, we model a 100% national uptake of regenerating forms of agriculture over a full six-year horizon, and cost the transition across the entire sector. We do this in the knowledge that whole-sector conversion is not achievable within six years, but because it is the clearest way to communicate the complete cost-effectiveness of the transition against the costs already embedded in the current model. The six-year window itself reflects the judgement of EARA's network of pioneering regenerative farmers, whose direct experience holds that significant, probable steps of a transition are achievable within a conservative four-to-six-year period. Slower pathways will apply to farms carrying young debt built on the industrial model, and that the renationalisation of fresh produce would extend well beyond this timeframe. Accordingly, the produce-import bill is treated separately and only partially recovered, and we

have not modelled the hectares of horticulture this would require, the land reallocated to arable, or the grower base and supply-chain infrastructure such a shift depends on.

The quantitative reductions are estimates rather than measured national outcomes, built by combining our case-study farms' self-reported figures, calculated against each farm's own pre-transition baseline and local context, with supporting evidence from wider literature such as UCD's multispecies-sward trials, the 78-farm EARA cohort, and Teagasc and CSO data. Averaging pioneer-farm performance and applying it to a national baseline necessarily assumes a degree of representativeness that three dairy farms and the EARA network cannot fully guarantee, so figures such as the modelled feed and fertiliser reductions, the derogation-loss offset, and the premium mechanism should be read as reasoned, yet possible approximations bounded by ranges rather than precise predictions. The input baselines drawn from CSO data are taken to represent the full sector across 2020 to 2025, a window that contains the 2022 price shock and its 36% jump in spending, which we treat as representative of ongoing volatility rather than a one-off, on the basis that input dependence is the structural exposure being addressed.

Several further assumptions underpin the economic comparison and should be held in view. We assume that a portion of existing public expenditure across the bovine TB, CAP and water budgets is redirectable toward the transition, which crosses departmental and legal boundaries that this paper does not attempt to resolve. The prevention benefits credited in the bTB and water cases are treated as probable rather than proven, consistent with our recommendation that the soil, plant and animal health links be established through dedicated on-farm study before they are relied upon in policy. Finally, the Munich and Vittel precedents are assumed to transfer to the Irish context, and the per-hectare payment ranges to be adequate to buy the transition, with the understanding that both would require calibration to local soil, climate and farm structure. Taken

together, however, the convergence of our farmer-led data and the external literature points consistently in one direction, that regenerating systems can match the productivity of the model they replace while achieving it on a structurally lower and more resilient cost base.

For this reason, the findings and arguments laid out in this paper should be treated as an inoculation of the broader movement already underway in Ireland rather than a finished blueprint. Many organisations, initiatives and networks are already working toward the regeneration of Irish agriculture, and the value of this work lies in strengthening and connecting that effort, not in directing it from above. Any further work on the ground, whether pilots, research or policy design, should therefore be carried out in close collaboration with those existing actors, with the farmers who carry the risk and knowledge of the transition, and with the decision-makers and enablers across the public and private sectors who shape the conditions in which it can succeed.

National security

Recent price volatility in global markets has destabilised the agricultural sector worldwide. For highly input-dependent countries like Ireland, the resulting rise in farmgate operating costs has compressed margins and eroded resilience. Integrating regenerative forms of agriculture offers a way to build independence and embed resilience in the sector at comparatively low cost relative to the current economic model.

Between 2020 and 2025, Ireland's expenditure on imported fertilisers, feedstuffs, fuel, plant-protection products and fresh produce reached €30 billion. Spending on agricultural inputs in 2022 alone was 36% higher than the year before, driven by the escalation of the Russia-Ukraine war, and over the last five years fertiliser, feed and plant-protection products have accounted for 40% of Irish farmers' total direct costs. The case studies in the previous section demonstrate the potential for Irish farms to detach from the input-dependent model and gain more resilience from international input markets. While each farm's or co-operative's path is context-specific and cannot be generalised, EARA's network of

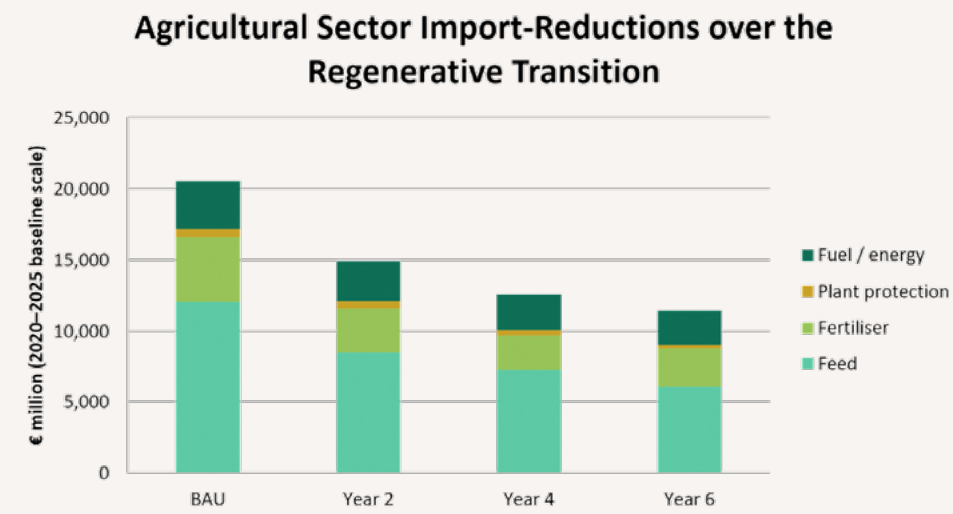


Figure 19, Feed, fertiliser, plant protection, and fuel import reductions under a whole-sector 6-year regenerative transition. Baseline taken as the total spending of the six-year period between 2020-2025.

pioneering farmers holds that significant steps of the transition to regenerative agriculture are achievable within a conservative period of four to six years.

This analysis estimates the reduction in critical input spending achievable under a national transition to regenerating forms of agriculture, drawing on our three farm case studies and the wider EARA Farmer-led Study database²⁷⁴. Each dairy case was chosen to demonstrate the diversity of viable systems rather than to promote a single model. Tom's small-scale, bio-intensive organic farm, Henrique's more intensive, high-stocked system in the Azores, and Felix's larger-scale organic operation together demonstrate some of the diversity of choices and pathways that exist for transitioning farms. EARA's arable and beef-cattle cases found within the Farmer-Led Study extend the range further, each prioritising a different journey. Our central finding is that meaningful input reductions do not depend on their universal and immediate elimination, but can also be achieved via a context-specific process to continuous reduction and independence.

Estimated reductions are given against a baseline drawn from CSO data on the cumulative national input spending for the entire agricultural sector between 2020 and 2025. The farm-level reductions are self-reported by each farm and calculated against its own pre-transition levels and local contexts, then averaged and applied to the national baseline. Given the gradual nature of a transition, the figure presents the saving at successive stages rather than as a single endpoint, showing how avoided costs deepen as the sectoral transition progresses. The year two, four, and six columns therefore represent the cumulative reduction available at each stage, so that an early-stage transition yields a proportionate saving while a full six-year transition delivers the largest.

Combined national spending on feed, fertiliser, plant protection, fuel and energy reached **€20.5**

²⁷⁴ EARA (2025) Farmer-led Research on Europe's Full Productivity The Realities of Producing More and Better with Less - Place-based Innovation for the Good of All ([LINK](#))

billion for the period between 2020–2025. Further, **€9.6 billion was spent on imported fresh produce**, reinforcing the need for renationalised production of fruits and vegetables. Applying the average performance improvements observed across the case studies and the EARA cohort, we model a six-year transition in which input dependence falls conservatively, but progressively.

Established regenerative systems after 6-years would achieve a reduction of roughly €9.1 billion during the period 2020-2025. That is, a 44% reduction relative to business-as-usual.

Reductions are front-loaded in feed and fertiliser purchases, where substitution by biological and agronomic means is fastest. Assuming that fruit and vegetable production is partly renationalised, there is potential to further reduce this bill and minimise spending on fresh produce for crops that are most suited to Ireland's climate.

Imported feed can be substantially reduced through grassland restoration, using diverse, productive pasture to displace bought-in concentrate, while arable paddocks or farms fill any remaining gap, as shown on both Tom's and Henrique's arable plots. UCD research on multispecies swards recorded up to 25% more herbage on at least 60% less nitrogen, and Tom's own accounts show purchased feed falling by around 96% after his transition, with only a portion of feed given for turkey production. A sector-wide feed reduction of roughly a quarter within two years, rising toward a half by year six, sits well within what these results imply, allowing for the fact that not every farm moves as far or as fast as a single pioneer.

Across the case studies, output volume fell by an average of 13%, yet gross margins still improved because input costs dropped faster than revenue, reflecting the same underlying mechanism consistent across the wider EARA data in which reduced input dependence compresses the cost

of production and loosens the link between farm income and input-price volatility. EARA's Farmer-Led Study mapped this holistic performance across 78 farms in 14 European countries and found fertiliser volume down 61% on average, plant protection products down by 75% on average, all for only a 2% yield disparity and a 20% improved gross margin.

Optionality is central to this framework. Henrique's farm shows that a higher-input, higher-output system can cut input dependence on fertiliser (-25%) and antibiotic use (-35%) while increasing production (+13%). Regeneration does not require farmers to scale back immediately, but ensures the process of continuous improvement. Each farm can position itself along a spectrum according to its land, market and appetite for change, rather than converging on one prescribed model.

Specific Case: Irish Dairy

This sector-specific model sits beneath the national input reductions above, chiefly those in feed, fertiliser, plant protection and fuel. The approach taken for this specific case is offered as an alternative route for the dairy sector, as a key export-driven and volatile industry within the broader umbrella of Irish agriculture. The figures are not precise farm-level predictions, but they are accurate enough to support a credible large-scale economic model of what a dairy transition would mean for incomes. We focus

on these four categories of direct costs, as they are the costs most influenced by regenerative land management. Others, such as veterinary spending, are harder to model with confidence, since many farms will not breed directly for herd resilience or keep bulls, and savings tied to reduced bovine TB will only become visible as funding is unblocked to study farms like Tom's.

We begin from the last five years of national data, 2021 to 2025, taking total milk volume and total milk value. Each year's figure sits between the ICMSA base price index²⁷⁵ and the Teagasc National Farm Survey ²⁷⁶averages. Dividing the total value by volume gives an average farmgate price of 47.46c per litre over the 5 years. We then isolate feed, fertiliser, plant protection, and fuel costs, which Teagasc data indicates account for 55 to 60% of total direct costs. So, we take total direct costs per litre, apply a 60% share, and multiply by output volume. Averaged across the five years this produces a baseline of 8,661 million litres, €4,113 million of output and €1,083 million of input spend.

The volatility across those years is itself part of the argument. The farmgate price swung from 38.7c per litre in 2021 to 56.8c in 2022, then fell back to 41.5c in 2023, movements driven by global markets rather than anything on Irish farms, and the clearest illustration of the exposure the transition is designed to reduce.

²⁷⁵ ICMSA Milk Price Index ([LINK](#))
²⁷⁶ Teagasc National Farm Surveys ([LINK](#))

Historical Data + 5-year Average Irish Dairy Sector				
Year	Milk price (c/L)	Milk output (ML)	Total output (€M)	Input spend (€M)
2021	38.7	8,758.3	3,386.6	788.3
2022	56.8	8,824.7	5,013.4	1,074.9
2023	41.5	8,458.4	3,507.2	1,086.1
2024	49.5	8,428.4	4,172.7	1,046.8
2025	50.8	8,835.2	4,488.5	1,123.8
5-yr avg	47.5	8,661.0	4,113.7	1082.9

Figure 20, Historical data (2021 to 2025) on Ireland's average milk price and volume, dairy farm economic output, and spending on feed, fertiliser, fuel, and plant protection.

From this baseline we model five years of transition, treating year five as the midpoint of a four-to-six-year window. Production follows an initial j-curve before levelling at the farmer-average reduction of 13%. Alongside this we apply a progressive regenerative premium on the 47.46c base, beginning at 2c per litre and stabilising at 6c per litre from year three, deliberately conservative against the 12 to 30c per litre premiums organic milk can command

in Ireland, ranking second highest in the EU²⁷⁷. Input spending falls progressively to a 44% cut by year five, following the broader sector reduction percentages above.

Comparing the five-year historical average with the five-year transition average, regenerative dairy farmers would receive an average premium

²⁷⁷ [\(LINK\)](#) Agriland (2026) Ireland has the second highest organic milk price

Transition Model Irish Dairy Sector				
Stage	Milk price + premium (c/L)	Milk output (ML)	Output incl. premium (€M)	Input spend (€M)
Baseline	47.5	8,758.3	4,113.0	1,082.9
Year 1	49.5	8,232.8	4,075.2	934.4
Year 2	50.5	8,118.7	4,099.9	785.8
Year 3	52	7,612.6	3,958.6	725.1
Year 4	53.5	7,585.6	4,058.3	664.3
Year 5	53.5	7,686.6	4,112.3	604.0
5-yr transition avg	52.3	7,847.3	4,060.9	745

Figure 21, Future 5-year model of the dairy sector, with a progressive milk premium for regenerative dairies, against reduced input spending.

of around 10% more per litre, produce an average of 10.4% less volume, and see a gross output change of just -0.40%, around €16 million across the sector, while cutting the direct costs of feed, fertiliser, plant protection and fuel by an average of 31.2%, or €337 million a year. Moreover, the total cost of the proposed premium structure begins at €150 per hectare, steadily increasing for a 5-year average of €300 per hectare, or €325 million per year.

The model also reveals a point the headline figures understate. Because output value holds almost flat while input spend falls steeply, the margin left after these four inputs widens year on year. Measured as total output minus the modelled input bill, that **margin rises from €3,030 million at baseline to €3,503 million by year five, an improvement of €473 million or roughly 16%**, assuming all other direct costs remain steady.

This input saving converts almost entirely into retained margin.

The modelled fall in output leans on the choices of our case studies, which are below average due to genetic selection for resilience and diversity. A sector applying these changes less aggressively would see a smaller volume reduction. Diversification also opens revenue the core model does not capture. Farms moving into specialised grass-fed regenerative beef can access premiums of 10 to 20% in established markets, and both the Irish and wider EU markets are shifting toward nutrient-dense, environmentally sound products. Positioning Ireland as a pioneer in regenerative production would build an export market led by quality rather than volume, while securing the long-term value of its farmland and communities.

Relative Differences, Transition against Baseline Averages				
Stage	Milk price	Milk volume	Output (€)	Input total reduction
Year 1	4.2%	-6.0%	-0.9%	-14%
Year 2	6.1%	-7.8%	-0.3%	-27%
Year 3	8.9%	-14.1%	-3.8%	-33%
Year 4	11.5%	-15.4%	-1.4%	-39%
Year 5	11.2%	-14.1%	0.0%	-44%
5-yr avg	10.1%	-10.4%	-0.4%	-31%

Figure 22, Comparative performance of typical dairy production (based on historical averages), against the modeled transition. Relative differences and 5-year average of milk price, volume, total economic output, and input reduction.

Underpinning all of this is the need for performance-based incentives, so that farmers are rewarded justly for the improvements they deliver and progression is driven by continuous improvement rather than a one-off change. MRV (monitoring, reporting and verification) systems already exist that can map the regenerative performance of a piece of land, using metrics similar to those operationalised in EARA’s own research²⁷⁸, making it possible to tie reward directly to measurable outcomes. These mechanisms are explored later in the paper and outlined in the concluding appeal.

This model can equally be applied to other forms of production, though with less precision than the dairy case allows. Dairy is the best-documented system in Ireland, with milk recorded in litres and in value through co-op statements, the A+B-C payment structure and the CSO and Teagasc surveys, which makes the price, volume and input figures used here comparatively reliable. Beef, sheep and other livestock enterprises are far more thinly recorded. Output is measured in kilograms of liveweight or carcass across animals finished at different ages, weights and grades, direct costs are harder to separate cleanly, and there is no equivalent of the per-litre price series that anchors the dairy model, so any equivalent projection would carry wider error bars. Similarly, the share of organic farms has grown much faster

²⁷⁸ EARA (2025) Farmer-led Research on Europe’s Full Productivity The Realities of Producing More and Better with Less - Place-based Innovation for the Good of All [\(LINK\)](#)

in other livestock categories, with only 0.4% of dairy farms under organic management. At the same time, organic producers – particularly sheep producers – decide to sell their products on conventional markets, as the primary financial incentive comes from subsidised payments. Calculating the different premiums between livestock groups is therefore more difficult, though further research should be a priority for public institutions.

However, the logic of this analysis holds across all livestock categories. Reduced input dependence lowers the cost base, loosens the link between farm income and volatile input markets, and allows a quality-led premium to offset a modest fall in volume. If anything, the case is stronger for these systems, because milk markets have shown some of the sharpest price swings in recent years, as the 2021 to 2023 farmgate movements set out above make clear, and a lower, more stable cost base offers the most protection precisely where revenue is least predictable. Closing the data gap through better recording of output, costs and prices across non-dairy livestock would allow the same model to be built out with the same confidence, and is a priority for extending this analysis.

Export Resilience

Over 90 percent of Irish beef and dairy output is destined for exports²⁷⁹, yet the system producing it depends heavily on imported feed, fertiliser, plant protection and fuel. That dependence ties national food production to global commodity and energy markets and the geopolitical events that move them, leaving the food supply exposed to price spikes and supply disruptions the country cannot control.

Regenerating systems reduce this exposure by cutting imported feed, synthetic fertiliser and plant protection, lowering the share of production resting on volatile inputs, keeping output and supply steadier through external shocks. The strategic aim is to match total stocking rate to the genuine, continuously regenerating carrying capacity of the land rather than propping stocking above it with imported inputs, so that production rests on domestic resources. Ireland’s climate, rainfall and land base give it a natural advantage in pasture based production, which already dominates the sector. That advantage is currently treated as a licence to intensify a reductionist system chasing commodity volume grown from imported inputs. The regenerative proposition reinstates Irish land, animals and people at the centre and separates Irish farming from the volatile input driven model imposed on it.

For livestock this means replacing part of the supplementary feed given to milking cows or finishing cattle with self produced cereals, with the crop or mixture chosen to suit soil type and climate. No kill cropping offers a route to that arable capacity without converting permanent pasture to tillage. Cereals are sown directly into living pasture, suppressing the sward so it recovers afterwards while the soil is never left bare, so a farm grows its own grain on top of its existing grassland base rather than trading one land use for the other. Where this is not possible, prioritising nationally produced grains raises protection against global market crises. A range of practitioner and technical resources is

279 Minister Heydon publishes annual review and outlook. (2025b). Gov.ie. (LINK)

available for developing these techniques in an Irish context. Tillage farms remain largely dependent on synthetic inputs in Ireland, with fertilisers alone accounting for 40% of direct costs²⁸⁰. In 2025, fertiliser spending averaged €19,401 per farm, while plant protection cost €11,936. Reducing these inputs would have a lasting impact on economic, ecosystem and social health, while supporting animal production and feed independence. Integrating cover crops during typically fallow periods rebuilds soil health, leading to increased nutrient retention, and consequently lowered soil nitrate pollution through leaching and reduced synthetic inputs.

Moreover, this can be done at comparatively low cost. Reallocating expenses from synthetic inputs towards mixed species cover crop seeding is a viable way of embedding resilience in Irish arable land. Seed costs in 2025 averaged just under €9000, less than 30% of the total spending on fertilisers and plant protection products. In addition, ensuring maximum soil cover and living roots in the soil through no- or reduced-tillage will save diesel costs and rebuild soil structure and fertility for drought and flood resilience, and reduced nitrogen leaching.

Specific Case: Irish Horticulture

Ireland’s fresh produce market represents a substantial, largely untapped opportunity for both existing and future farmers. In 2025, Irish horticulture contributed 5% (€644 million including €220 million in potatoes) to the agriculture sector’s total output, from less than 0.4% of the total UAA. Horticultural exports are estimated at just over €240 million for 2024 and 2025, with mushrooms holding a large majority of the total value. Though, this is set against the backdrop of over €1 billion worth of fresh produce was imported from countries with markedly lower production costs, making it difficult for national production to compete²⁸¹. The dynamics of this trade deficit threatens national production, and

280 The Farmers Journal (2026) Fertiliser is 40% of Direct Costs on Tillage Farms (LINK)
281 Teagasc (2026) Horticulture Road Map 2030 (LINK)

nutritional security.

The retail fruit and vegetable market in Ireland is worth over €1.5 billion annually, yet, Ireland imports around 83% of its fresh produce. Organically produced vegetables and fruits show the same pattern as roughly 70% of organic fruit and vegetables sold in Ireland are imported. Notably, organic Irish fruit and vegetables are sold uniquely within the Irish market, indicating that domestic demand for Irish-grown organic produce currently outstrips domestic supply²⁸².

Teagasc’s horticulture road map already outlines the potential for tillage farms to explore rotationally producing fresh produce that can be grown in Ireland’s climate. However, there is ample opportunity for livestock farms or new entrants to diversify or specialise in horticulture.

Existing, heavily capitalised operations may carry significant outstanding debt on tractors, a milking parlour or slatted housing, and have strong reasons to reduce existing input costs rather than pivot into an unrelated enterprise. Vegetable and market-garden production, by contrast, requires a different capital profile with modest land area, no requirement for expensive infrastructure, and a faster route to market through direct sales. Farmers’ markets and produce box schemes are already well-established in Ireland, with much of Ireland’s existing vegetable produce already reaching consumers through these sales channels. For a new entrant without large inherited debt, horticulture offers a lower-capital, faster-return route into Irish farming that does not compete directly with the transition challenges facing existing livestock farms, while directly addressing the food sovereignty and nutritional security gap this paper identifies.

Agroforestry offers a complementary route for existing livestock farms to diversify without displacing their core enterprise. Reintroducing fruit trees, intercropped with fodder and shelter species such as black locust and willow, allows a farm to generate an additional product (fruit) while the fodder trees themselves deliver multiple

282 Agriland (2024) Why boosting consumer demand for organics is important (LINK)

animal health benefits. Black locust foliage carries protein levels comparable to alfalfa²⁸³, and willow’s condensed tannins are associated with improved rumen protein use²⁸⁴, anti-parasitic effects²⁸⁵, and reduced inflammation²⁸⁶, alongside a mineral profile particularly rich in zinc and magnesium. Unlike a standalone vegetable enterprise, this integrates directly into the existing grazing system rather than requiring a separate land-use conversion, making it a lower-friction diversification option for farms not yet ready to take on a new enterprise entirely.

Our set of case studies show that eliminating or reducing the costs of fertiliser and feed liberates a portion of the direct costs, making them available to invest in the resilience of the farm, planting fodder and productive trees, or dedicating sections to arable production. This can simultaneously protect against global market shocks, and provide a secondary source of income for the farm.

Animal and Human Health

Ireland’s bTB eradication programme has cost the state over €600 million since 2020²⁸⁷. During this period, annual exchequer expenditure climbed steeply, rising by roughly 35% in 2024 alone, reaching over €100 million, and is set to reach €157 million under the 2026 budget. Despite this, rates of herd incidence and reactors-per-1,000 tests continue to climb. Building resilience within the herd, through dietary diversity, improved pasture management, reduced stress, and the genetic selection of hardier cattle, shows real potential to reduce the likelihood that an exposed animal develops disease.

Tom’s case study points to a potential link

283 LENGYEL-KÓNYA et al., (2024). Investigation of the usability of black locust (Robinia pseudoacacia L.) cultivars for feed purpose in Hungary. (LINK)
284 Thompson et al., (2025). Unlocking the potential of willow condensed tannins: effects on rumen fermentation, microbiome, and metabolome for sustainable ruminant nutrition. Animal Microbiome, 7(1), 81. (LINK)
285 Mupeyo et al., (2011). Effects of feeding willow (Salix spp.) upon death of established parasites and parasite fecundity. Animal Feed Science and Technology, 164(1-2), 8-20. (LINK)
286 Phillips et al., (2022). Effects of oral white willow bark (Salix alba) and intravenous flunixin meglumine on prostaglandin E2 in healthy dairy calves. JDS communications, 3(1), 49-54. (LINK)
287 Data sourced from Oireachtas (LINK)

between dietary diversity, adaptive multi-paddock grazing, and stronger immune function, and therefore potential to mitigate exposure becoming infection. Host resilience is a decisive factor in whether an exposed animal breaks down. Yet year after year, the exchequer spends reactively, attempting to remediate a system that is structurally failing. The bulk of the eradication budget is effective at its stated task of containing the spread and impact of a disease already present in the herd, and that function remains necessary. Redirecting even a small share of the annual eradication budget toward host-resilience research and toward the farms already demonstrating strong outcomes would cost little against the programme’s overall spend, yet it opens a path to reducing the underlying incidence rather than perpetually managing it, turning a recurring cost into a long-term saving for both the exchequer and the farmer. Dedicated research currently accounts for only a small share of the total programme²⁸⁸, and of that, only a handful of projects examine host resilience at all.

The recommendation of this paper is therefore to break the cycle of reactive measures that leave the underlying drivers of disease untouched. Increasing the research budget and allocating dedicated funds toward the farms that are demonstrably managing the problem well should become a priority. Studying the health of their animals and linking antioxidant and glutathione status to the capacity of exposed animals to contain infection could begin to establish causality, or at least strong correlation, between farm-level management and disease resistance.

Tom’s farm is a natural starting point. The herd has been antibiotic-free since 2017, with animals treated only as needed rather than through the routine, preventative use that characterises many intensive systems, and at its most recent test in August 2026 it returned zero reactors despite sitting among farms carrying reactors and rising incidence. A herd in this condition, clear under real exposure pressure, is precisely where the relationship between management, immune function, and disease resistance could be studied

288 Oireachtas ([LINK](#))

to greatest effect. Integrating agroforestry for supplementary fodder, as discussed above, offers a further, complementary means of supporting that resilience.

Water

The Irish state and its water utility have made clear their position on the water-quality crisis the derogation exists to address. The resources to support the transition already sit within the water sector itself, but have potential to extend beyond their current focal points. Uisce Éireann’s Strategic Funding Plan 2025–2029 proposes a total funding requirement of €16.9 billion, comprising €10.3 billion in capital investment and €6.6 billion in operational expenditure²⁸⁹. Much of this budget goes to managing the consequences of catchment pollution, and while these costs cannot be cleanly disaggregated by source, agriculture is the single largest contributor to the nitrate and phosphorus pressures degrading Irish waters²⁹⁰. Logically, controlling the source of these pressures is straightforward. A fraction of the capital directed at treating and managing polluted water, redirected upstream to help farmers lower their nutrient loading through regenerative management, would address the pollution at its origin rather than at the treatment works.

This logic of paying to prevent pollution rather than treating it is already embedded in European water policy, and source control is the principle underpinning the Nitrates Directive itself. The difficulty lies within industrial farming systems being structurally incapable of meeting the reduction targets that policy demands. Stocking rates often exceed the land’s capacity due to an overreliance on external feed, and nitrogen applications surpass what the sward can capture. Moreover, much of their slurry nitrogen is lost to volatilisation and they are forced to compensate by layering synthetic fertiliser on top due to it being far less regulated. Overall, leaching and volatilisation of nitrogen occurs at rates a lower-

289 Uisce Éireann (2025) Annual Report 2025 ([LINK](#))
290 EPA (2024)

input regenerative system does not approach. Current regulation is setting a target the system’s own design does not permit it to reach.

However, functioning models exist in Europe, and two of Europe’s most-cited water-protection schemes have run for decades, doing so because prevention proved cheaper than treatment.

Since 1992, Munich’s water utility, Stadtwerke München (SWM), has paid farmers in the Mangfall valley to convert to and maintain organic production in its drinking-water catchment. Over 185 farms covering ~4,600 hectares now operate to standards that prohibit synthetic fertiliser and pesticides and cap stocking at roughly two cows per hectare²⁹¹. This area is now one of the largest organically farmed areas in Germany. The scheme began at 500 Deutschmarks per hectare per year and has since been calibrated by field location, with the payment reported at up to €280 per hectare per year²⁹². SWM’s rationale centred on paying farmers to prevent contamination as a more cost-effective solution than the construction and maintenance of treatment infrastructure.

The derogation should be treated not as a technical exception to the Nitrates Directive but as a test of whether agricultural policy can reconcile production, farmer livelihoods and environmental limits. Its repeated renewal shows the danger of separating income support from the ecological conditions on which that income depends, and future policy should move from authorising additional nitrogen as a production entitlement toward supporting farmers to cut nutrient losses, rebuild soil function and deliver measurable water-quality gains.

In context, the derogation never rewarded good practice but permitted heavier stocking to increase production, largely for export, with land-management change rarely extending beyond compliance measures such as clover integration, manure-spreading direction and grass measuring.

291 SWM. (2026). Ökologischer Landbau zum Schutz des Münchner Trinkwassers. Stadtwerke München. ([LINK](#))
292 Deprés, C., Grolleau, G., & Mzoughi, N. (2008). Contracting for environmental property rights: The case of Vittel. *Economica* ([LINK](#))

In place since 2007 and extended six times, each renewal carried an unmet commitment to improve water quality. Over roughly the same period the national dairy herd grew by about 50% to 1.6 million cows by 2020²⁹³ and fertiliser imports rose by about 35%²⁹⁴. Within the derogation cohort, applicant cattle numbers rose from 1.8 to almost 2 million in a single year between 2022 and 2023²⁹⁵, and these remain the most intensive farms in the country, stocked 40 to 50 kg N/ha above their neighbours. For eighteen years the derogation compounded the intensification unleashed by milk-quota removal, permitting more cows, more nitrogen and further consolidation on a condition of water-quality improvement. It illustrates the limits of conditional flexibility when the condition is judged by administrative compliance rather than verified outcomes.

Farmers now facing its loss are understandably resistant, since from the ground it looks like a promotion handed out and then taken back. It represents a turbulent balance between environmental and economic priorities, with pressure to intensify from above and a policy and market structure that rewarded export volume and tolerated the environmental cost.

Funding the transition to regenerative farming systems constitutes a structural shift in how pollution is addressed. Regenerative farms do not just absorb the loss of the derogation, but are inherently less exposed to the loss to begin with. The derogation perpetuated the industrial system, providing more space for high-input, high-output farms to establish themselves. In the case of Tom’s farm, lower stocking rates and reduced volume is offset by lower input costs and increased milk quality. However, funding should be directed to exploring how established regenerative farms improve the nutrient uptake of regenerative swards against conventional pasture. This would shape how the derogation is phased out, and whether reduced stocking is required for regenerative farms with highly productive land.

293 Data sourced from CSO database ([LINK](#))
294 Data sourced from CSO database on imports ([LINK](#))
295 Irish Examiner (2023) Farmers apply for nitrates derogation. ([LINK](#))

Ireland is well positioned to replicate Munich Water Utility’s model as a direct, low-cost solution to the broad degradation of natural waterways. Payments in the range of €200 to €280 per hectare per year, are a generous estimate within the scale of the transition this paper proposes, yet well below the cost of the alternatives. Moreover, these payments fall within a similar bracket of the rates provided for the Organic Farming Scheme in Ireland, which could likely be leveraged to support landscape-level interventions. **These figures also closely reflect the total average cost per hectare of the dairy premiums outlined in the specific dairy case.**

Given the extent of derogation zones and the opportunity costs associated with their removal, it is crucial to act swiftly and decisively. Roughly 7,000 derogation farms exist, averaging ~65 hectares. Employing farmland as living water infrastructure could then effectively be achieved at €13,000 to €18,000 per farm per year, or a national cost in the region of €90 to €130 million per year if extended to the entire cohort. Set against the €300 million in annual income and revenue exposure²⁹⁶ attributed to losing the derogation, and against the multi-billion-euro operational cost of managing polluted water, supporting the transition to regenerating forms of agriculture is a low-cost solution that offers cascading benefits to watersheds, farmers, and the wider population.

Yet, the economic losses associated with the derogation loss are conditional on farms retaining their industrial or intensive economic model. If, in the worst case scenario, stocking rates decrease by 15% for derogation farms, it does not necessarily infer a 39% reduction in family income as cited by Teagasc²⁹⁷. Regenerative farms like Tom’s run cattle at nearly 30% lower stocking rate, with cattle breeds that produce roughly 40% less per cow. Yet, there is an average of only 43% lower gross margin per hectare, slightly lower than the projection.

²⁹⁶ Teagasc (2025) Teagasc publish reports to inform Nitrates Action Programme and Derogation ([LINK](#))

²⁹⁷ Teagasc (2025) Teagasc publish reports to inform Nitrates Action Programme and Derogation ([LINK](#))

Therefore, a 15%-20% reduction in a genetically high-yielding herd does not necessarily decrease the economics of the farm, but can increase the holistic performance of it.

Each farm’s climatic, economic, social, and productive context will have an explicit impact on the speed and scale of a possible transition. For many industrial farms, their fixed costs will be relative to their current mode of production, typically intensive, high-input high-production models. For example, a farmer who has just taken a loan for new winter housing or a milking parlour sized around their current herd, will find that a 15% cut extends the repayment period, since the debt is now serviced from less production. This example can be extended to any young debt built on the industrial model, tractors, land, etc. For these farms, the transition will be slower, building resilience more conservatively as margins improve and buffers widen. Conversely, farms with relatively ‘old’ debt have more freedom in the pace at which the transition can be made.

Generational Renewal

Of the four systemic risks, generational renewal is the hardest to address directly. The transition this paper describes takes four to six years to establish, and a large share of the farmers who would begin it are already near or past retirement age, with an average farm-holder age of 59.4 years and nearly 38% aged 65 or over. Many will not themselves complete a transition on that timescale. However, this overlap between farmers nearing the end of their careers and a transition that takes years to establish is itself an opportunity. For an existing farmer with no succession plan, the regenerative journey can become a route to finding one. If a farmer decides to begin the transition while also looking to pass on their farm, a new entrant can join to share the responsibility and workload of doing so, learning the land directly from the person who knows it best. Blended public-private funding can subsidise the cost of the farm, enabling the handover while the ecological, financial and social regeneration continues. What can be done now is to lower the barriers for those who would enter

and to make entry worth the commitment.

Where this is not possible, new entrants can be drawn in through targeted training and structured knowledge exchange that pairs them with the pioneering farmers already managing these systems. This transfers the holistic, context-specific experience rather than being lost as farmers leave the land. This can be reinforced financially through grants and preferential loans designed specifically for those entering regenerative systems, lowering the capital barrier that a lower-input model already reduces, and recognising that a biologically resilient farm is a lower credit risk once established. Land-access partnerships, share-farming arrangements and cooperative routes to machinery further reduce the upfront cost that can deter younger entrants. Directing these support frameworks at regenerative entry specifically creates a low-capital, lower-risk route into farming visible where one currently appears closed.

The deeper point, however, is that generational renewal cannot be solved on its own, because it is downstream of the other three risks. A lack of grants or funding is not the sole reason that young people avoid farming, rather it is because incomes swing across a threefold range with no floor, regulation tightens unpredictably, land is often passed on in poorer biological condition than it was received, and the work carries a mental-health burden heavier than almost any other occupation. Each of these is a symptom of the same fragile model this paper addresses. Resolving the other three risks is therefore the most powerful thing that can be done for renewal itself. Collectively enabling a resilient and profitable agricultural sector that regenerates the land it passes on is key to its future.

Preliminary Economic and Ecologic Summary

The following section conservatively estimates the needed investment associated with a nation-wide transition to regenerating forms of agriculture. It posits the regenerative transition as a cost-effective solution within a larger resilience strategy to minimise exposure to the systemic risks outlined above. Despite the inherent constraints in any national initiative, we assume the 100% uptake of regenerating forms of agriculture to communicate the true cost-effectiveness of the solution against projected and historical costs embedded in the current agricultural sector. Again, understanding the multitude of individual, local, and regional contexts in which each transition would take place, it is our recommendation that all potential pilots or initiatives be co-created with individuals or organisations working on the ground. Once the public support framework is established, these programmes can act as components of a larger movement driving the social, economic, and ecological regeneration of Irish agriculture. With this in mind, the findings and recommendations discussed in the following sections are positioned to ‘inoculate’ various initiatives and collaborations, not to dictate a rigid or established process.

Economically, the case for supporting the regenerative transition of Irish agriculture rests on a straightforward comparison. The cost of funding this transition at the national scale sits against the accumulating bill of inaction, wherein imported input costs continue to rise and destabilise, derogation loss exposure, an escalating disease-management budget, and the mounting expense of managing water pollution. Our conservative analysis demonstrates that the scales tip in favour of the transition.

Our analysis accounts for the entire agricultural sector’s cost of transition, despite this being wholly impossible within 6-years. We do this to highlight the cost-effectiveness of embedding resilience in the landscape against the business-as-usual approach currently degrading it.

Figure 23 sets out the minimum enabling finance required to support the regenerative transition, structured around coupled per-hectare payments for grassland, arable, and horticultural land, and a per-farm consultancy allowance. The ranges provided are deliberate, and reflect the range of starting points for each farm. Some areas carry higher transition costs owing to climate, soil type and other local constraints. As we explored in the dairy case, alternative approaches exist that still fall within the brackets outlined in this sector-wide approach. Engagement depth will also vary, with some farms adopting multiple regenerative

practices at once while others begin more slowly or prioritise a single change first. The ranges capture that spread rather than assuming a uniform path. Supporting every Irish farm through a 6-year transition, at a rate of €100 to €300 per hectare of grassland, and €150 to €500 per hectare of arable land, together with a €1000 annual advisory allowance per farm, **prices the transition at €3.7 to €9.5 billion over 6 years.**

The arable and horticultural category covers grains as well as fruit and vegetables, reflecting the scope for land to move between uses. Land can be reallocated from grassland into arable, and a share of arable can be turned to vegetable production within the existing rotation, so the payment applies across the full range of cropping that a transitioning farm might take on. The Munich and Vittel precedents show that the ongoing maintenance of an established lower-input system continuously adapts to sustain itself and flourish on a structurally reduced cost base. Within this system, the performance of the land is not conditional to the funding itself. Funds are not given in perpetuity, but rather as a means to buy the transition itself, while the benefits are delivered in perpetuity.

Taken together, these estimates approach the transition from three complementary angles. The national input analysis captures the total reduction in critical input spending available across the whole sector, the enabling finance above projects the public budget needed to incentivise that transition nationally, and the dairy model previously discussed details how both play out within a single intensive system. The enabling finance operates through per-hectare payments and a per-farm consultancy allowance, support that is land-based and therefore sits most naturally with the public sector. The dairy model, by contrast, introduced a milk-price uplift for regenerative production, a progressive premium that rises with the degree of regeneration, mirroring the logic of existing environmental payments for dairy cooperatives.

This approach is monetisable in the market by the dairies themselves or shared with procuring

retailers, which makes it the more natural instrument for private-sector action. Both rest on the same conservative productivity assumption, a slight j-curve in output levelling at a modest overall reduction in milk volume driven chiefly by lower imported feed, derived from the averaged relative development of the three intensive dairy case studies. As Henrique proves, ecological improvement and the reversal of degradation does not necessarily come at the expense of productivity in the first five years, but can even be done alongside an increase in it.

Now, considering the money already flowing through the system over the six years preceding 2025, the benefit of a fixed-term funding scheme that gradually yet continuously reduces recurring costs is made clear. **Farmers spent over €20 billion on imported feed, fertiliser, fuel, and plant-protection products**, a recurring bill paid outward to international markets and rising with every price shock. **The state spent close to €450 million on the bovine TB eradication programme across the same period**, with an additional €157 million approved for 2026, **totalling over €600 million, all while herd incidence climbs.** Public money also flowed through the Common Agricultural Policy, with around €9.8 billion committed to Irish farming over the current programme in direct payments and agri-environment schemes.

A portion of it is intended to secure the very environmental outcomes the current production model continues to erode. Finally, Uisce Éireann has set out a capital plan of €10.3 billion by 2029. While the majority share of this budget is not directed at agricultural pollution, it would be worth exploring trials on farms to see how best to leverage part of this funds to building living, continuously improving infrastructure over grey water infrastructure. Together, these funds represent billions of euros annually dedicated to holding a declining system in place.

Set against the €3.7 to €9.5 billion, not necessarily additional but partly repurposed, investment needed for the regenerative transition, the true cost effectiveness of this solution is clear.

Minimum enabling financing for the Regenerative Transition			
Component	Value (EUR)	Calculation	Annual Total (€M)
Grassland	€100-€300/ha	4,255,050 ha	€425M - €1276M
Arable / Horticultural	€150-€500/ha	365,046 ha	€54M - €182M
Consultancy	€1000 per farm	133,174 farms	€133M
Subtotal - €612M - €1591M			
Total 6-year - €3.67B - €9.5B			

Figure 23, Minimum enabling financing for the national transition to regenerative agriculture, by production type, annual total, and cumulative total.

A conservative reduction in imported inputs alone, modelled from established regenerative farms, is projected to be able to save roughly €9.1 billion over six years on just 4 key inputs. Further savings will accrue alongside added ecological and productive value as these systems continue to improve, stabilising the sector against the compounding risks it currently faces.

Dairy farms attach the headline fear that any reduction in dairy productivity is a collapse in sector income, however, a worked scenario shows why that fear is overstated. Roughly 7,000 farms in Ireland hold a derogation, and these are the most intensively stocked and input-dependent holdings in the country, applying around 173 kg of synthetic nitrogen per hectare and relying heavily on purchased concentrate. Teagasc modelling estimates that losing the derogation would force these farms to destock by around 200,000 dairy cows. That is roughly 14% of the derogation cohort's own herd, and about 13% of the national dairy herd of some 1.55 million cows. Aggregated across the cohort, the estimated income loss is on the order of €300 million a year. That figure assumes the affected farms continue to operate on their current high-input cost base, and this is where the offset lies. These same farms are exposed precisely because they carry the highest input bills in the country. A shift toward legume-based fertility, diverse swards and partially restoring grain production on livestock systems could reduce their combined input spending by an estimated €140 million to €245 million a year, drawn from the synthetic nitrogen and imported feed they would no longer need, even further if herd size is reduced. Set against the €300 million income loss, input savings alone absorb roughly half to four-fifths of the national impact. What remains could be closed by a premium for regenerative grass-fed produce and by the diversified income a mixed system supports.

The scale of any income effect is ultimately governed by choices the farmer controls, principally breeding and stocking, rather than by the transition itself. Ireland's dairy herd is around 95% Holstein-Friesian, bred under the Economic Breeding Index for moderate, pasture-based

yields of roughly 5,000 to 5,500 litres per cow. A farm reducing its reliance on imported inputs does not forfeit that genetic productivity, simply the cost of achieving it. Relocalising production of grains, as Tom does, offers a viable solution to become self-sufficient and immune to global market shocks.

Beyond this conservative estimate, further economic benefit can be added where prevention replaces treatment, in the bTB budget, and in the multi-billion-euro cost of treating polluted water, both of which a lower-input, better-managed landscape reduces at source. We recommend that part of the bTB research and development funds be allocated to studying farms like Tom's, where reactor levels are non-existent, despite encroaching pressure from surrounding farms. The link between soil, plant, and animal health should likewise be further explored with on-farm studies before it is implemented as a solution. Studies should focus on regenerative systems as a mitigating factor of disease susceptibility and contraction. Financially, the business case is evident, with high accessibility and enormous potential, the transition can return several times its cost through continued savings on imported inputs, reduced water treatment costs, potential animal and human health costs, and the mitigation of environmental damage costs.

Another substantial cost rests on the balance of Ireland's agricultural system. Ireland is projected to fall well short of its legally binding 2030 climate targets, cutting emissions by only around 23 to 25%²⁹⁸ against a 42 to 51% requirement, likely needing to purchase €8 to €26 billion worth of international compliance credits²⁹⁹. The current agricultural system is the single largest source of national emissions at over a third of the total³⁰⁰.

298 Environmental Protection Agency. (2026). Ireland to significantly exceed 2030 climate limits. ([LINK](#))

299 Irish Fiscal Advisory Council, & Climate Change Advisory Council. (2025). A colossal missed opportunity: Ireland's climate action and the potential costs of missing targets. ([LINK](#))

300 Environmental Protection Agency. (n.d.). Greenhouse gas emissi-

Regenerative management offers a solution already widely recognised through carbon reductions and carbon sequestration, primarily in arable systems. Where current accounting lacks is in livestock systems, with carbon accounting typically based on highly intensive systems. New research is showing that regeneratively managed soils actively sequester carbon³⁰¹, shifting farmland from a net source toward a net sink and offering a credible domestic route to offset residual emissions.

To avoid the offsetting cost required by falling short of these commitments, updated, Irish-specific life-cycle analyses of regenerative livestock farms that assess their full emissions profile are required. Recently, feed additives like Bovaer³⁰² have been prioritised as a means to reduce the methane-emissions of livestock despite rising concerns over animal health and wellbeing. Countries like Denmark have now made using methane-reducing feed additives mandatory, with 1400 of 2000 farmers using Bovaer as of 2025³⁰³. Aside from the impact on animal welfare, additives like Bovaer act only to sustain an inherently polluting system, in which cattle are kept from diverse pastures, often fed with high energy crops or grains. Regeneratively managed ruminants fed by diverse pasture on healthy soils have access to a unique methane-oxidising bacteria called methanotrophs³⁰⁴, that form the largest biological sink for atmospheric methane, making feed additives unnecessary. Conversely, their activity is suppressed by compaction, heavy stocking and high nitrogen³⁰⁵. Reports of animal health problems from Bovaer users further argue against this pathway.

In summary, ecological regeneration underpins these economic benefits, and its true market price is largely immeasurable. The current system offloads costs that appear in degraded water, depleted soil, lost biodiversity, released carbon and diminished public health. A transition to regenerative management begins to reverse these losses rather than deepen them, restoring water quality, rebuilding soil carbon and structure, improving resilience to drought and flood, and moving farmland toward a net carbon sink. These are the same outcomes that public policy already spends heavily trying to achieve.

The Irish people are already bearing these costs, in the form of rising input bills, escalating disease costs, and agri-environment payments that chase outcomes the current system continues to undermine. The money is being spent to manage the symptoms of the model rather than to change it. What it lacks is a coherent mechanism to direct a fraction of that spending toward the transition that would deliver those outcomes at source. **A time-bound investment of €3.7 to 9.5 billion is set against tens of billions already committed to managing the status quo, import savings of around €9.1 billion for only 4 key inputs, and countless ecological benefits.** This paper envisions a redirection of money the sector is already spending, toward a system that would stop generating the problems in the first place.

The following section will detail potential approaches for both the private and public sectors to support this transition at scale.

ons by sector. ([LINK](#))
301 Teague et al., (2016). The role of ruminants in reducing agriculture's carbon footprint in North America. Journal of soil and water conservation, 71(2), 156-164. ([LINK](#))
302 Dms firmenich - Bovaer supplement ([LINK](#))
303 Prior, M. (2025). Bovaer: Methane-cutting cow feed trials on Arla dairy farms end. BBC. ([LINK](#))
304 Täumer, J., et al. (2025). Methane sink function of grassland soil microbiomes: negative effects of intensive management persist three years after land-use extensification ([LINK](#))
305 Zhao, J., et al. (2020). Impact of grazing on shaping abundance and composition of active methanotrophs and methane oxidation activity in a grassland soil. Biology and Fertility of Soils, 56, 1081-1095. ([LINK](#))



Key recommendations

Private Sector

Private actors shape the prices, contracts, standards and investment conditions that farmers face every day. Dairy and meat processors, cooperatives, retailers, banks and insurers all determine whether regeneration is commercially realistic or remains a niche practice carried by individual farmers at their own risk. Their first responsibility is to recognise that volume is no longer the variable within their control.

Irish processors cannot govern global commodity prices, fertiliser markets or geopolitical shocks, but they can shape the resilience of the supply base their businesses depend on. Investing in lower-input, biologically resilient farms reduces exposure to input-price shocks, supply interruptions, regulatory tightening, disease costs and declining farmer participation. Multiple pathways exist to provide this support, and collaborative action between different actors is the most reliable way to build a resilient agri-food system.

The Ask and the Benefit of the Regenerative Transition, by Stakeholder		
STAKEHOLDER	THE ASK	THE BENEFIT
Banks	• Preferential rates and longer terms for low-input, resilient farms • Favourable finance for new entrants and local processing	• Lower, more stable costs and reduced default risk • A steadier, de-risked agricultural lending portfolio
Insurers & Reinsurers	• Price verified soil and water function into premiums • Underwrite yield or margin across the 4–6 year transition	• Fewer, less severe climate, disease and yield claims • Lower long-term exposure as resilience builds
Cooperatives, Offtakers & Processors	• Multi-year contracts and premiums rewarding regeneration • Reward reduced inputs and better soil, water and animal health	• A secure, resilient supply base • A high-value, quality-led market position
Retailers	• Forward contracts for Irish cereals, pulses, vegetables and fruit • Back local processing and diversified produce	• A differentiated, provenance-led domestic supply • Less exposure to import and price shocks
The Irish Public	• Choose Irish-grown regenerative and local produce • Back box schemes, markets and community investment	• Healthier, provenance-led food on the plate • Shorter chains and a stronger local economy

Figure 24, Overview of the ‘ask’ to enable the regenerative transition, and the ‘benefits’ of doing so.

Banks

Banks have a critical role in enabling the transition of Irish agriculture, both for established farmers and potential new entrants. Agricultural lending is typically considered risky due to tight or volatile margins caused by high input-dependence, changing climates, and unstable market conditions. As such, farmers commonly borrow on worse terms than their European counterparts, paying 3% higher on their interest rates³⁰⁶, combining for a pooled agricultural debt of over €3 billion and climbing³⁰⁷. Modern agricultural systems are fragile by design, and their default risk reflects the climatic, economic, and geopolitical threats they are exposed to. A farm regenerating its biological fertility carries lower and more stable costs, a more defensible margin when prices fall, and therefore a reduced default risk. Banks have the chance to price this in, offering preferential rates and longer terms to farms with reduced input dependence and stronger soil and water management. Doing so can improve the stability of a bank’s agricultural lending portfolio, while lowering the cost of entry for young farmers and the vertical or horizontal integration of established farmers.

Insurance

Insurers and reinsurers carry the compounding cost of climate volatility, diseases, and yield loss, all of which a lower-input, biologically resilient system reduces. As drought and flood events are normalised, the farms with a larger buffer are those with living, water-holding soils and diversified production. Insurers can simultaneously reward and incentivise this resilience by pricing verified soil and water function into premiums, reducing claims frequency and severity over time. Underwriting a farm’s yield or margin over a 4-6 year period is the clearest instrument to enable this transition, relieving the farmer themselves from carrying the full risk of change. This framework is not to

306 Leyden, M. (2025). Irish farmers paying a “crippling” 3% more than European counterparts on farm loans & financing - ICMSA. [icmsa. \(LINK\)](#)
307 Agriland. (2026). Primary agriculture sector over €3 billion in debt - minister. [\(LINK\)](#)

stand on insurers’ shoulders alone, but through place-based transition consortia that bring together all stakeholders that benefit from a healthier, more resilient agricultural sector. Our approach is discussed further in the concluding appeal. Landscape fragility has developed over generations. It is not reasonable to place the cost of decades of degradation on one farm. As the system stabilises and resilience grows, this support can shift toward standard performance-based premiums.

Cooperatives, Offtakers, and Processors

Processors and cooperatives are uniquely positioned to enable the regenerative transition. While they cannot control global commodity prices, they do shape the brands, prices and contracts that make the transition viable, and can equally control the resilience of the supply chain they depend on. Shifting to regeneratively managed dairy and beef production can increase the ecological quality of Ireland’s farms into a reputable, high-value market position, building on the ‘grass-fed’ differentiator. New Zealand’s largest red-meat exporter, Silver Fern Farms, illustrates the direction of travel. Having sold grass-fed products for decades, it launched a Net Carbon Zero by Nature line of 100% grass-fed Angus beef into premium US retail, independently certified and built on measuring carbon sequestered on its own farms, positioning it toward a climate-positive and regenerative goal for 2030. Comparable regenerative-branded lines now sell through retailers such as Whole Foods. Doing so requires multi-year transition contracts and premiums that reward performance, particularly the reduction of inputs, and increased soil and water functions, as well as animal health. The Irish dairy sector’s own strategy, committing to emissions cuts against a 2018 baseline and around €35 million a year in sustainable farm-level investment³⁰⁸, shows a first direction of travel. Directed toward whole-farm resilience rather than efficiency accounting, and

308 <https://www.ibec.ie/connect-and-learn/media/2026/07/03/dairy-industry-unveils-new-strategy>

shared fairly with the farmers who deliver it, those commitments should be built out to finance the transition rather than merely measure carbon-efficiency.

The dairy-specific case set out earlier models one concrete form this could take, a progressive per-litre premium for regenerative milk that rises with the degree of regeneration, offsetting the modest volume reduction of the transition while rewarding the farmer for the ecological quality of their production that can be capitalized on with consumers and higher quality market segments. Crucially, processors and cooperatives need not carry this alone. Because the benefits of regeneration extend well beyond the supply chain, to water quality, climate resilience and public health, the premium can be collectively funded across the stakeholder groups that share in those gains, an arrangement developed in full through the transition consortia framework outlined in the concluding appeal.

Processors and cooperatives can also help diversify Irish production. Ireland remains highly successful as an exporter of dairy, beef and other food products, but this export strength coexists with substantial dependence on imported fresh produce and feed inputs. Ireland's horticultural sector shows enormous potential, having generated €644 million in agricultural output in 2025 from less than 0.4% of utilised agricultural area, while Ireland imported more than €1 billion of horticultural food products³⁰⁹. Incentivising diversification could reinvigorate the sector, particularly if paired with support from lenders to establish local and regional processing facilities.

The Irish Public

Ireland's general population can close the loop by shortening the distance between farm and plate. Direct sales, produce box schemes, farmers' markets, and community-supported agriculture would return price-setting power to the farmer, keeping value within the local economy. This is already happening broadly across the island,

³⁰⁹ Teagasc. (2026b). Horticulture road map 2030. Teagasc | Agriculture and Food Development Authority. ([LINK](#))

with much of Ireland's organic vegetable output distributed through local communities. Demand for provenance-led, grass-fed and organic produce is growing on health and sustainability grounds, and every purchase of Irish-grown regenerative produce over an imported equivalent strengthens the domestic grower base. The potential for community investment models are currently underused, allowing citizens to fund diversified or transitioning production, reaping the benefits associated with regenerative land management. Support to reduce food miles via the Short Supply Chains funding recognises the value of this approach for farmers and communities. Integration of learning from this project into existing community funding programmes such as LEADER, could maximise opportunities for communities to deliver regenerative projects which improve public health, build local resilience and support rural economies.

Collaborative action holds true potential for the transformation of Irish agriculture. Banks can offer preferential loans that let individuals or groups of farmers invest in machinery, and extend the same favourable rates to local and regional processing ventures that provide diversified crops a route to market. At the same time, they build stability and resilience in their agricultural lending portfolios. Processors and retailers can anchor that diversification with forward contracts for locally-adapted Irish cereals, pulses, vegetables, fruits and herbs. Further support can be allocated to storage, freezing, washing, grading, and milling capacity that facilitates the movement of production to national shelves. Insurers can underwrite the yield reductions that block first years of the transition, and cooperatives can help cover the early premiums for their transitioning suppliers, turning a private cost into a shared investment. Each actor lowers the risk carried by the others, while the farmer remains central, obtaining the security necessary for change. Coordination at the local, regional, and national levels enables private capital to finance a resilient agricultural sector.

Public Sector

Policy creates the enabling conditions for the agrifood system to maintain the status quo or shift in one direction or another, playing a key role in the decisions taken by all other stakeholder groups from farmers to food processors and retailers to consumers. The Irish public sector currently spends substantial sums responding to the consequences of the current agricultural model but there are a number of opportunities where investing in preventative measures can have an outsized impact on Irish society from health to rural development, generational renewal in the farming sector to enhanced ecosystem services.

Shifting from reaction to preparedness through investment in resilience

In 2026, the Department of Agriculture, Food and the Marine has a budget of approximately €2.3 billion³¹⁰. This includes €157 million for bovine tuberculosis eradication and €280 million for ACRES, which supports more than 53,000 farmers³¹¹ across biodiversity, climate and water-quality actions. There are several other allocations directly relevant to the transition proposed in this paper. The Organic Farming Scheme budget is €58.6 million to support roughly 5,500 farmers, having grown 221% since 2021, while €88 million is allocated to the Targeted Agricultural Modernisation Scheme (TAMS) for on-farm investment and generational renewal, and €8.25 million funds the Knowledge Transfer Scheme. A further €50 million is directed to the tillage sector through the Protein Aid Scheme, the Straw Incorporation Measure and the Tillage Support Scheme.

The State is therefore already paying both to manage the consequences of systemic vulnerability and to support changes in farm management. However, this patchwork of

³¹⁰ Government of Ireland. (2025b). Statement by minister chambers on budget 2026. Gov.ie. ([LINK](#))

³¹¹ Government of Ireland. (2025c). Your guide to Budget 2026. Gov. ie. ([LINK](#))

programmes are not designed to solve the underlying causes that underpin the structural vulnerabilities embedded in the system.

Creating demand that enhances local food security and sovereignty

National initiatives and policy commitments to support local food growing should be reflected in local and national procurement decisions around food and nutrition e.g. school meals, catering in hospitals, local authorities and other public institutions. Local authorities, schools and hospitals should be encouraged and supported by the government to prioritise sustainability, short supply chains and local food producers in their procurement and planning decisions. Inclusion of smaller, local producers within public procurement should be enabled locally via engagement programmes additional information which supports that match farmers with supply opportunities. Empowering those potentially unfamiliar with the local procurement process and law who may have been excluded in the past can go a long way to strengthen short supply chains. The outcome of such an approach would assist Ireland to transition away from depending on traditional exposure to the current risks reliance on agriculture imports creates and move (and the associated risks) towards more secure local food economies which build resilience and community wealth.

Generational renewal as the metric for success

Successfully transitioning the agricultural sector into one that provides economic and ecological resilience centred on farmer livelihoods requires enabling conditions that make farming attractive to the next generations. When farming is attractive enough for young people to move quickly into the sector, that is the measurement of success. Ensuring generational renewal also requires a systemic support programme over time rather than just a once-off installation grant. Public programmes should make it easier for young farmers and new entrants to access land,

training, advisory support and low-cost finance. A lower-input regenerative farm can reduce the capital and operating barriers associated with intensive infrastructure and purchased inputs, but this potential will remain limited unless public policy supports succession, partnerships, cooperative access to equipment, processing and other short supply chain infrastructure, and viable routes into farming. The 2026 TAMS structure already includes higher grant rates for young farmers, women farmers and organic farmers, as well as support for low-emission slurry-spreading equipment, solar investment and nutrient storage³¹². Future schemes should extend this logic toward whole-system resilience and diversification, including horticulture, mixed farming, agroforestry and local processing.

Rebuilding resilience in dairy through strengthening herd health in the face of bTB

Taking bovine TB as an example, Ireland's response remains centred on surveillance, testing, removal of reactors, wildlife measures and compensation. These tools remain necessary to contain an endemic disease, but the continuing rise in herd incidence and public expenditure shows the limits of a predominantly reactive model. The 2026 Bovine TB Action Plan introduces further measures, including a new on-farm badger biosecurity scheme with €6 million in funding and additional diagnostic requirements for some larger breeding herds³¹³. These measures may reduce exposure and improve detection, but a more complete programme should also investigate the farm-level conditions that influence host resilience: stocking pressure, nutritional diversity, stress, herd genetics, pasture management and the wider biological condition of the farm³¹⁴.

³¹² Department of Agriculture, Food and the Marine. (2025). Minister Heydon announces opening of application process for replacement of roofs in the targeted agricultural modernisation scheme. Government of Ireland. Gov.ie. ([LINK](#))

³¹³ Department of Agriculture, Food and the Marine. (2026). Minister Heydon announces important update on bovine TB action plan. Government of Ireland. Gov.ie. ([LINK](#))

³¹⁴ Department of Agriculture, Food and the Marine. (2026a). Minister Heydon announces important changes to the bovine TB (bTB) programme now in effect. Government of Ireland. Gov.ie. ([LINK](#))

We recommend designing a bTB herd immunity pilot programme that builds upon the experience at Summerhill Organic Dairy Farm, demonstrating through practice and underlined through scientific research how to strengthen the country's dairy herd health. It is to complement them. Pilot farms in different parts of the country would combine lower stocking pressure, diverse forage, rotational grazing, reduced reliance on purchased feed and strong animal-health outcomes, be studied systematically with properly designed research and transition programmes supported by trained advisors.

For the current bTB eradication programme, we propose the incorporation of additional measures relating to mineral and antioxidant status, dietary diversity and phytochemical richness, ration composition and inflammatory load, stocking density, stress, and contact, and genetic resilience. Integrating regenerating grazing on ecologically diverse pastures into livestock systems can positively influence the overall health and wellbeing of livestock, potentially leading to lowered susceptibility and transmission. Public funding should support longitudinal, independent research comparing management systems and identifying which interventions reduce disease susceptibility, improve animal welfare and strengthen farm viability. Where results are demonstrated, those practices should be integrated into future support and advisory systems.

Effective policy requires a whole-farm and catchment-level approach

Ineffective water cycles on-farm are intrinsically linked to ineffective mineral cycles, which becomes nutrient runoff and water pollution. Yet when water management policies and nutrient management policies are disconnected, they further reinforce these broken cycles and the negative outcomes compound. What one farm does impacts the farm next to it and the water users in the entire catchment. Which is why water provides an important case for shifting from reactive spending to prevention.

Ireland's Sixth Nitrates Action Programme runs from 2026 to 2028 and includes tighter controls, together with an expanded Agricultural Sustainability Support and Advisory Programme, and the continuation of the Farming for Water European Innovation Partnership³¹⁵. The Farming for Water approach is particularly relevant because it supports targeted measures in catchments affected by agricultural losses of nitrogen, phosphorus, sediment and, where relevant, pesticides³¹⁶.

The continuation of the nitrates derogation creates a clear policy test. Ireland has secured the derogation for a further three years until 2028, but access to this relief remains conditional on stricter requirements and demonstrable improvements in water quality. The derogation should not be treated simply as additional allowance. It should be used as a transition window in which public support helps farms reduce nutrient losses, improve nitrogen-use efficiency, rebuild soil function and transition high-input monoculture grassland systems to high quality, biodiverse, low-input grassland systems³¹⁷. These proposed environmental measures also have direct correlation with reduced input costs which should lead to improved on-farm competitiveness and enhanced resilience as well. In particular, the State should prioritise support in sensitive catchments and link payments to verified outcomes rather than relying only on stocking limits and compliance inspections.

Already early and important changes can be made for 2027 under the existing ACRES programme under the 2023-2027 CAP Strategic Plan while simultaneously ensuring a more holistic whole-farm and catchment-level approach to water and nutrient management is embedded in the National and Regional Partnership Plans (NRPPs) for the post-2027 CAP currently under

³¹⁵ Government of Ireland. (2025). Sixth nitrates action programme (2026 – 2028) published. ([LINK](#))

³¹⁶ Department of Housing, Local Government and Heritage. (2025). Launch of public consultation on significant water management issues for the fourth cycle water action plan 2028 - 2033. Government of Ireland. Gov. ie. ([LINK](#))

³¹⁷ Department of Agriculture, Food and the Marine. (2026c). Online system opens for 2026 nitrates derogation applications and dairy band confirmation. Government of Ireland. Gov.ie. ([LINK](#))

development. Farmers should be supported to combine measures that work together, like diverse swards, multi-species cover, lower synthetic-input use, rotational grazing, nutrient planning, improved slurry management, hedgerow and habitat restoration, and locally appropriate water-retention measures. The objective should be to reward a coherent change in the entire farm system, not merely the presence of isolated features or rewarding individual practices. With the upcoming 30% cuts to the CAP post-2027, policymakers have the opportunity to integrate these all-farm measures through ACRES now to kickstart this transition sooner rather than just waiting for the next CAP period where resources will be even more constrained.

The post-2027 CAP negotiations are particularly important in this respect. During Ireland's Council Presidency, the future CAP is being negotiated against the competing pressures of food security, farm incomes, competitiveness, simplification, environmental sustainability and generational renewal while Member States seek as much flexibility as possible³¹⁸. Ireland's stated position is that the CAP must remain common, predictable and fair, while becoming more workable for farmers and public administrations. **Simplification should not mean reducing ambition. It should mean replacing overlapping and burdensome requirements with clear, practical support for outcomes that farmers can understand and deliver.**

The future CAP should therefore provide a dedicated pathway for farms transitioning toward lower-input, more resilient and diversified systems. The proposed transition payment in Article 10 must be ringfenced and mandatory for Member States to include, tied to clear outcomes for that transition. The transition payment must include not just targeted investment support but also independent advisory services together with knowledge transfer and education. Together with additional access to finance, and outcome-based rewards for improvements in soil health, water quality, biodiversity and farm resilience, farmers

³¹⁸ Department of Agriculture, Food and the Marine. (2026a). Irish Presidency Priorities for Agriculture & Fisheries. Government of Ireland. Gov. ie. ([LINK](#))

will receive not just payment for ecosystem services but also strong signals to embark on their transition journeys. Policy design should remain flexible enough to reflect Ireland’s different soil types, farm sizes, livestock systems and regional conditions. It should also ensure that farmers are paid for the public value they create, rather than being expected to absorb the full cost of a transition whose benefits accrue to the wider society.

Public investment should extend beyond just the Department of Agriculture. Water utilities, local authorities, and catchment partnerships all have a role to play. The State and Uisce Éireann already face substantial costs to maintain and improve water infrastructure. Redirecting a proportion of this spending upstream, through properly designed payments for prevention, could help farmers reduce the nutrient and sediment loads entering water bodies in the first place. The Farming for Water EIP provides an existing institutional basis for this approach³¹⁹.

The need for an unified MRV

Performance or outcome-based metrics are a deciding factor in whether these pathways, bTB research, water payments, CAP reform, and new-entrant support are effective. Such a framework rewards farmers for measurable improvement rather than for compliance with prescribed actions.

Remotely sensed	Reported / retrieved	In-situ testing
Photosynthesis Soil Cover	Inputs purchased Relative year-on-year output in stocked or sold yields	Soil Organic Carbon (SOC% and bulk density measurement)

Figure 25, EESC opinion on monitoring, reporting, and verification of regenerative agriculture³²⁰

319 Government of Ireland. (2025b). Minister Browne announces four-fold increase in investment in water quality initiatives in 2026. Gov.ie. [\(LINK\)](#)

320 The European Economic and Social Committee (EESC) (2025) Opinion on Regenerative Agriculture [\(LINK\)](#)

This is the key that turns public spending from a cost of managing decline into an investment in regeneration, since it pays for outcomes the whole of society benefits from. Healthier soils, cleaner air and water, more resilient farms and rural communities are a collective necessity rather than individual options.

Such an outcome-based scheme can be implemented using existing funds, and because the benefits cut across departments and sectors, it can be achieved by pooling a fraction of the resources dedicated to the bTB programme, CAP and agri-environment schemes, water infrastructure budgets and public health into one place. Verifying these outcomes can be done through harmonised monitoring, reporting, and verification (MRV) systems already operationalised. Robust MRV systems can map a farm’s regenerative performance over time, with the EESC Opinion on Regenerative Agriculture already providing the foundations for such a model. The opinion provides recommendations for MRV systems, already operationalised in practice through EARA’s own farmer-led Study³²¹. A shared, pre-competitive MRV backbone would allow every actor, public or private, to reward the same verified outcomes without duplicating cost, and it is this architecture that the concluding appeal develops in full.

The role of the public sector’s role as enabler of a regenerative agrifood system

The public sector’s role is therefore not to prescribe one model of Irish farming but to recognise and enable the resilience regenerative farming brings to people and communities across Ireland. Policy to govern such work must create the conditions (via integrated funding and regulation) in which farmers can choose systems that are economically viable, biologically resilient and aligned with the public interest. The value and diversity regenerative agriculture brings

321 EARA (2025) Farmer-led Research on Europe’s Full Productivity The Realities of Producing More and Better with Less - Place-based Innovation for the Good of All [\(LINK\)](#)

must also be translated into a range of public sector settings. Engaging with local political representatives and officials working on policy and procurement across the public sector touch points beyond just agriculture (schools, hospitals, community programmes) about the nutritional, ecological and health value of food produced using regenerative systems is a good starting point. This requires a shift from paying primarily for production capacity or a crisis response toward investing in the living infrastructure that makes food production possible and recognising the value of these outputs to farmers and communities across a range of policy indicators. Healthy soils, functioning water cycles, resilient animals, diverse farms, improved biodiversity, healthy citizens and thriving rural communities and local food economies should be a leading principle in future agricultural policy and be fully integrated across relevant environmental, health, education, food security and community development policy.



Concluding Appeal to Irish Farmers and Eaters

Ireland's core agricultural challenges, import dependency, animal, human, and ecosystem health, water pollution, and generational decline, can not be treated as isolated problems. They are different symptoms of a fragile production model built on external inputs, high stocking pressure, biological simplification and narrow commodity margins. Each is currently managed independently, with interventions that treat the symptom while reinforcing the cause, and the costs compound year on year. The bovine TB programme will absorb over €157 million in 2026 despite rising rates. Losing the nitrates derogation is estimated to expose the sector to income losses of €300 million a year. Fertiliser and feed shocks restructured farm finances across the island in 2022 and 2023, and the geopolitical conditions that caused them have not gone away. Fewer than one in twenty farmers is now under 35, having halved in just one generation.

Regenerating forms of agriculture offer a different system in which one coherent set of changes targets the cause of these symptoms. It is this approach where its central policy value lies. Shifting land management produces multiple, measurable outcomes across food security, animal, plant, and human health, water quality, economic resilience and generational renewal. The tools required are available now, and continue to develop through ongoing farmer innovation. A growing evidence base supports their use, some of it grounded in Irish research institutions, much of it already practised by Irish farmers and supported in nascent form within existing schemes. A range of others, however, need targeted research to validate their full impact on ecosystem health.

None of this rests on ideology. It rests on a straightforward comparison between the cost of the transition and the far greater cost of the trajectory Ireland is already on. The evidence

assembled in this paper, from national datasets to our three case study farms, conclude that the real expense is inaction.

1) Co-Create Programmes with Practitioners and Leading Agronomists, and Anchor Them in a Compelling Narrative for the Next Generation.

Policy and financial mechanisms must be designed in direct partnership with pioneering farmers to ensure they are practical, context-specific and trusted. Regenerating forms of agriculture must be positioned not merely as a technical shift, but as a forward-looking narrative of hope, resilience and generational renewal. By framing soil health as a public good and regeneration as a pathway to secure livelihoods, this movement can attract and empower the next generation of land stewards, helping to address the generational renewal crisis facing Irish farming and securing the long-term viability of Irish agriculture.

2) Mobilise Cross-Sectoral Finance to De-Risk the Farmer Transition.

Operational risk is the largest barrier to the regenerative transition. We propose performance-based, per-hectare incentives as a solution to empower farmer decision-making while providing comprehensive agronomic support. In addition, public-private Transition Insurance Consortia are a key tool to unite parties who stand to benefit from agricultural regeneration. The framework brings together banks, insurers, water utilities, supply-chain offtakers, carbon and health-sector actors, public bodies, and the farmers

themselves to collectively underwrite operational risk during the critical four-to-six-year transition. Place-based Transition Consortia translate this reallocation of risk into a concrete structure through a collective, multi-stakeholder risk-sharing agreement that finances the transition within a defined landscape. Rather than a fund or a subsidy scheme, it is a structured, context-specific coordination mechanism, governed and supported by the farmers themselves and underpinned by independent monitoring, reporting and verification. Financing follows a stacked model in which the early years of transition, when operational risk is highest, are fully covered by the benefiting parties, before farmers progressively contribute as margins improve and the system matures, leaving them with little or no financial exposure during the critical four-to-six-year window. The result is an equitable distribution of a cost that is societal in origin, designed so that the farmer is no longer asked to carry, in isolation, the risk of correcting a system they did not create. This model distributes risk and secures long-term benefits, giving farmers the financial stability, incentives and agronomic support to innovate. As systems mature, farmer compensation can transition to performance-based payments from CAP, national, regional and private programmes, all verified through a unified MRV system.

3) Adopt a Unified, Context-Specific, Outcome-Based Monitoring Framework.

To monitor progress, accelerate impact and reduce administrative burden, transition programmes must implement a pre-competitive, harmonised Measurement, Reporting and Verification (MRV) system. Building on the consensus established in the 2025 EESC Opinion³²² on Regenerative Agriculture, this framework should track core, measurable outcomes such as Soil Organic Carbon, Bulk Density and Soil Cover, drawing on integrated

³²² The European Economic and Social Committee (EESC) (2025) Opinion on Regenerative Agriculture ([LINK](#))

data from soil tests, satellite mapping and farm records. A shared MRV backbone minimises duplication, lowers costs and unlocks future access to carbon and premium markets. Successful, lasting transition must be co-created on the ground, in direct partnership with local farmers and experienced regenerative agronomists who understand the specific soils, grasslands, crops and conditions of the Irish landscape.

EARA and its growing practitioner Irish and international network can provide the technical expertise, farmer trust and regional knowledge required to turn this analysis into action. Nature exists as a balance of constraints and opportunities. Effective responses require working in alignment with natural systems, enabling systemic regeneration and addressing the risks generated by current land-use patterns.

This study was written with EARA's pioneering Irish farmer members, and it returns to the wider farmer community in Ireland. With it, we aim to create collective action of the Irish people to address and fix the risks laid out in this paper. If your own fields tell a different story, that story belongs in the next version of it. Regeneration is not a set of prescriptive practices but a direction of travel, with every farm taking its own route. Farmers should not walk it alone. With the findings of this report, we ask advisors, researchers, processors, lenders, policymakers and the communities they serve to co-steward the conditions in which regeneration becomes the obvious choice rather than the brave one. The evidence is clear, the economics are compelling, and the knowledge and expertise can be leveraged. What is now required is the cross-sectoral commitment to act, understanding that every year of delay squeezes the financial capacity of Irish farmers, the ecological performance of the land they steward, and the long-term security of the companies, institutions, and people that rely on them.



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About the European Alliance for Regenerative Agriculture

The European Alliance for Regenerative Agriculture is the independent, farmer-led coordination, advocacy and collective action organisation of the movement of regenerative agriculture at the European level. EARA is striving to enable the transformation of our agrifood ecosystems through accountable ecological, economic and social regeneration.

More information can be found on our website at www.eara.farm

Photos are all showing EARA Member Farms.

EARA is independently funded through mission-aligned, politically independent philanthropic partners and maintains no corporate or industry ties, ensuring our work remains farmer-led and free from commercial interests. We never accept funding that could have an influence on EARA's strategy or decision-making. All our funders decisively support EARA's farmer-led decision-making.

