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Countering Diffuse Water Pollution: Can Post-Brexit Agriculture Policy Go Against the Flow?

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Abstract

Three years after Brexit, long-term economic, social, and environmental implications for the UK remain uncertain and subject to political debate. In this paper, I draw on a set of contemporaneous discussions during the Brexit negotiations with academic experts in British environmental policy and law to argue, narrowly, that withdrawal from the EU presents a transformative opportunity for the UK to redesign its agriculture policy to better manage diffuse water pollution. First, I introduce long-standing monitoring and enforcement challenges under the EU's Common Agricultural Policy, and their impacts on UK water quality. I then propose a roadmap for regulating the British agriculture sector given its unique characteristics including farm size and stewardship values. I argue that favorable lobbying dynamics after Brexit create an opportune moment for policy reform. Finally, I offer recommendations toward a set of policy tools that center the polluter-pays principle, offer local adaptability, enable farmer participation in stewardship, and align with long-term ecological goals.

Introduction

The United Kingdom's exit from the European Union, finalized on 31 December 2020, was the culmination of a four-year withdrawal process with vast implications for national security, global trade and investment, immigration, and labor. Already, a substantial political economy literature has emerged seeking both to explain the underlying causes of Brexit and consider its implications for the liberal international order.[1] Environmental issues were not a significant factor in the referendum campaign and less attention has been afforded to understanding the impacts of Brexit on the British environment, though speculation runs in both directions. On one hand, Brexit returns "environmental sovereignty" to the UK, giving the government, Parliament, and civil service flexibility to test new policy tools while remaining aligned with the body of European environmental law.[2] On the other, some experts fear environmental priorities could be overlooked altogether as the Conservative government pursues deregulation and new trade deals with Europe and global

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[1] Martill, B., & Staiger, U. (Eds.). "Brexit and Beyond: Rethinking the Futures of Europe," *UCL Press*. (2018)

[2] Hilson, C. "The Impact of Brexit on the Environment: Exploring the Dynamics of a Complex Relationship," *Transnational Environmental Law 7* (1): 89–113. (2018)

partners.[3] The full environmental implications of Brexit are complex and nuanced, so that a full accounting of costs and benefits—and lessons for global environmental governance—may only be revealed over the long-term.

In the most comprehensive study of the "dynamic relationship" between UK and EU environmental policy, Hilson (2018) describes several domains including air quality and fracking in which the UK has been an environmental laggard and the beneficiary of policy integration with the EU. Yet in other domains, such as agriculture and fisheries, EU membership has weakened the UK regulatory process, and in others, such as climate change and biodiversity protection, the effects are varied and multi-directional.[4] Brexit transformed the UK-EU relationship across all domains (including those only now emerging, like governance for solar geoengineering), making it difficult to predict Brexit's net effect on environmental quality. Here I argue only that Brexit provides particular reason for optimism in terms of greening the UK's agriculture sector, specifically by opening a window of opportunity to address long-standing challenges in the regulation of diffuse water pollution from agriculture (DWPA).

This paper is motivated by my own immersion in the policy context as an M.Phil. student in the University of Cambridge Department of Land Economy during the peak of the Brexit negotiations in 2019 and 2020. My analysis is informed in particular by conversations with Ian Hodge, Emeritus Professor of Rural Economy and member of the Economic Advisory Panel for the UK's Department for Environment Food and Rural Affairs (Defra). To develop this project, I also consulted Dr. Ksenia Gerasimova of the Cambridge Centre for Environment, Energy and Natural Resource Governance (my dissertation supervisor at the time, who has published widely on food systems), and I participated in seminars and workshops on related topics with experts from the Department of Land Economy and Faculty of Law, including Professors Shaun Larcom, Jorge Viñuales, Marie-Claire Cordonier Segger, and Markus Gehring. Here I do not undertake original data collection, nor do I perform a systematic literature review. Rather, I rely on first-hand knowledge and discussions with experts to inform a short argumentative review that seeks to explain key dynamics and propose a roadmap for timely policy action.

The paper is organized as follows. Section I defines DWPA, then reviews its causes, the challenges it presents for regulators, and its effects that make it a primary driver of ecological damage in the UK and Europe. Section II contends that by transitioning away from the EU's poorly designed Common Agricultural Policy (CAP), the UK can eliminate perverse incentives for farmers to intensify their practices and address technical and behavioral drivers of DWPA from Britain's relatively large-scale farms. Section III assesses lobbying dynamics in the UK to explain why the restructuring of British agriculture policy after Brexit is likely to succeed in delivering environmental benefits at this juncture. Section IV introduces several potential policy innovations informed by the polluter-pays principle which could

[3] Burns, C., & Carter, N. "Brexit and UK Environmental Policy and Politics," *Revue Française de Civilisation Britannique* XXIII–3. (2018)

[4] Martill & Staiger. "Brexit and Beyond."

soon be developed to address DWPA.

I. Regulating Diffuse Pollution

Diffuse pollution, or nonpoint source pollution, describes the human-caused release of pollutants into the environment from widespread land use activities.[5] Agriculture is a major driver of diffuse pollution, particularly from the application of nitrogen-based and other chemical fertilizers and compounds during farming, which creates harmful runoff into the water system.[6] In addition to the threat DWPA poses for aquatic and terrestrial species and the provision of ecosystem services, it is also linked to significant economic losses from diminished commercial and recreational value of water resources, and it represents a substantial risk to public health if drinking water supplies become contaminated.[7] Despite the large and tangible benefits of mitigating DWPA, the problem is made intractable by environmental, behavioral, and temporal dynamics that raise the cost and complexity of monitoring and control programs relative to those for point-source pollution (i.e., from factories, power plants, or sewage treatment facilities).[8] I discuss each set of dynamics in turn.

First, natural variability of rural environments complicates efforts to link diffuse pollution to environmental damage, and vice versa.[9] For instance, in a case study of nitrate runoff from agricultural sources in the UK's Yorkshire Derwent catchment (or watershed, an area of land over which water collects into a single body), Hutchins (2009) finds the effectiveness of mitigation techniques to be variable across space and difficult to estimate precisely. Specifically, impacts of reduced fertilizer application and conversion of arable land to grassland could not be easily predicted or measured due to underlying differences in environmental factors such as soil quality, location of farms relative to water bodies, and the topography of the land.[10] In an inter-regional comparison of catchments in Cumbria, Norfolk, and Hampshire Avon, Owen (2012) reports variability in climate conditions including rainfall and temperature that affect the concentration of pollutants in runoff. These studies demonstrate major challenges for the administration of mitigation efforts in the absence of "efficient spatial targeting of measures."[11]

Second, farmers in different climates have developed specialized farming techniques as well as land and water conservation practices that affect their baseline perceptions of DWPA and

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[5] Kampas, A., Edwards, A. C., & Ferrier, R. C. "Joint Pollution Control at a Catchment Scale: Compliance Costs and Policy Implications," *Journal of Environmental Management 66* (3): 281–91. (2002)

[6] Cleasby et al. "An Exploration of Individual, Social and Material Factors Influencing Water Pollution Mitigation Behaviours within the Farming Community," *Land Use Policy 70*: 16–26. (2018)

[7] Owa, F. D. "Water Pollution: Sources, Effects, Control and Management," Mediterranean Journal of Social Sciences 4 (8): 65–68. (2013)

[8] Hodge, I. "The Governance of the Countryside," *Cambridge University Press*. (2016)

[9] Blandford et al. "Reforming Agricultural Nonpoint Pollution Policy in an Increasingly Budget-Constrained Environment," *Environmental Science & Technology 46* (3): 1316–25. (2012)

[10] Bateman et al. "Cost-Effective Mitigation of Diffuse Pollution: Setting Criteria for River Basin Management at Multiple Locations," *Environmental Management 44* (2): 256–67. (2009)

[11] Bateman et al. "Cost-Effective Mitigation of Diffuse Pollution."

willingness to take up mitigation efforts.[12] For this reason, there are large information asymmetries between farmers, who draw on local expertise and lived experience to take or avoid certain actions that affect DWPA, and regulators, who lack first-hand knowledge of conditions on the ground.[13] Such asymmetries, although not harmful in all cases, generate vulnerabilities to issues of adverse selection and moral hazard. For example, adverse selection would result if regulators lacked information needed to target interventions to DWPA-prone catchments, and instead new programs disproportionately enrolled farmers already embracing sustainable practices. Here, regulators might falsely believe their interventions to be working. Moral hazard would result if new programs, regardless of their location, could not be credibly enforced, allowing noncompliance to become normalized among farmers. For these reasons, tackling DWPA at scale means contending with the high costs of program implementation due to inaccurate or unavailable information at the local level.[14]

Third, the iterative process of detecting and addressing diffuse pollution may only unfold over long time horizons. Braden (1993) notes the interaction of DWPA with point-source (i.e., direct) pollution from urban and industrial activities, making local ambient pollution levels an unreliable indicator of the origins and relative concentrations of contributing sources.[15] Consequently, isolating the effect of DWPA in available water quality data is analytically intensive, and it may take many months for the true extent of DWPA to become known to regulators. Furthermore, Hodge (2016) describes disparate residence times for DWPA in the water system, as well as protracted time lags between "the actions causing pollution and subsequent environmental damage."[16] It follows that time lags are also likely before the effects of DWPA mitigation programs can be observed on the local environment. These factors, taken together, undermine efforts to assess the scope and severity of DWPA in the first instance, evaluate compliance with mitigation programs, and establish social and political acceptance of such programs.

Given these layered challenges, it comes as little surprise that existing policy efforts have largely failed to rein in DWPA across Europe. Shortcomings under the EU Water Framework Directive are especially profound. Following decades of "piecemeal" EU legislation on nitrates in agriculture, urban wastewater, industrial pollution and other threats to water quality, the Directive, which entered force in late 2000, was a major consolidation of water policy "within a common approach and with common objectives, principles

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[12] Benskin et al. "Monitoring Agricultural Diffuse Pollution through a Dense Monitoring Network in the River Eden Demonstration Test Catchment, Cumbria," *Area* 44 (4): 443–53. (2012)

[13] Horan, R. D., Ribaudo, M. O. "Policy Objectives and Economic Incentives for Controlling Agricultural Sources of Nonpoint Pollution," *Journal of the American Water Resources Association* 35 (5): 1023–35. (1999)

[14] Braden, J. B., Segerson, K. "Information Problems in the Design of Nonpoint Source Pollution Policy," In: "Theory Modeling, and Experience in the Management of Nonpoint-Source Pollution", C. S. Russell and J. F. Shogren (Eds). *Kluwer Academic Publishers*. (1993)

[15] Braden & Segerson. "Information Problems."

[16] Hodge. "The Governance of the Countryside."

and basic measures."[17] [18] Tasking EU member states with the implementation of national laws to ensure "good status" of all water bodies by 2015, the Water Framework Directive set objective and scientifically informed minimum standards for the biological, hydrological, and chemical qualities of compliant surface, estuarine, and ground waters.[19] In addition to preventing regression of existing "good status" waters, states must propose detailed river basin management plans providing a comprehensive assessment of human impacts on water quality in the basin, along with case-specific management techniques required to "fill the gap" necessary for "good status" attainment.[20] While derogations from "good status" may be granted for substantially artificial waters or extenuating circumstances such as cost prohibitive management, the Directive is generally thought to be innovative in its coordination of approaches.[21] In England and Wales, however, just 27% of water bodies were found in "good ecological status" by 2012, with a third of known failures attributable to DWPA.[22] With recent changes to water quality testing methods able to take better account of certain long-lasting pollutants, data released by Defra in 2020 found this figure to have declined to 16%, with 0% of rivers achieving desired chemical levels.[23] Performance lags significantly behind both Water Framework Directive objectives and those of the UK Government's 25 Year Environment Plan, and full attainment is not expected for years to come.[24]

Deficient enforcement of existing mitigation policies is a key cause of lagging performance under the Water Framework Directive. For example, Nitrate Vulnerable Zones under the EU Nitrates Directive have been implemented at scale to limit the quantity and timing of fertilizer applications, with the goal of minimizing runoff. However, designation of such zones has largely failed to prevent eutrophic conditions, where excess nutrients from fertilizers induce algal blooms, which in turn lead to depleted dissolved oxygen levels that threaten aquatic life. Indeed, despite detailed guidance developed for farmers, 69% of English Nitrate Vulnerable Zones exhibited "no significant improvement in surface water nitrate concentrations after fifteen years."[25] This suggests a general disregard for the guidance, made possible

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[17] "Introduction to the EU Water Framework Directive," *European Commission*. (2019). https://environment.ec.europa.eu/topics/water/water-framework-directive_en

[18] Yang, Y. S., Wang, L. "A Review of Modelling Tools for Implementation of the EU Water Framework Directive in Handling Diffuse Water Pollution," *Water Resources Management* 24 (9): 1819–43. (2010)

[19] Bateman et al. "Integrated Assessment of Water Framework Directive Nitrate Reduction Measures," *Agricultural Economics* 41 (2): 123–34. (2010)

[20] Bailey et al. "Towards a More Strategic Approach to Research to Support Catchment-Based Policy Approaches to Mitigate Agricultural Water Pollution: A UK Case-Study," *Environmental Science & Policy* 4–14. (2012)

[21] Blandford et al. "Reforming Agricultural Nonpoint Pollution Policy."

[22] Bailey et al. "Towards a More Strategic Approach to Research."

[23] "Catchment Data," *Department for Environment Food & Rural Affairs*. (2021). https://environment.data.gov.uk/catchment-planning/

[24] Hodge. "The Governance of the Countryside."

[25] Worrall, F., Spencer, E., Burt, T. P. "The Effectiveness of Nitrate Vulnerable Zones for Limiting Surface Water Nitrate Concentrations," *Journal of Hydrology* 370 (1–4): 21–28. (2009)

by systemic failures in enforcement.[26]

II. Britain Un-CAP-ped

The UK has not set its own agriculture policy since 1972; instead, for the last 50 years, it has been subject to the EU's Common Agricultural Policy. The evolution of modern farming in Europe largely parallels the history of the CAP and its various reforms seeking to preserve the competitiveness of the sector over time. For better and worse, EU technocrats have navigated UK farmers through major economic and technological transitions, including mechan-ization and the use of biotechnology. Accordingly, the design of the CAP is instructive for under-standing British agriculture's long and fraught relationship with the natural environment. Now, for the first time in agriculture's modern era, Brexit compels the UK to leave the CAP and consider this relationship afresh.

The CAP was originally implemented to promote European self-sufficiency for food by increasing production. To achieve this, policymakers designed the policy to maintain domestic commodity prices above world market levels using import taxes. In the UK, the CAP accelerated the diversification of the British manufacturing-based economy while developing stable incomes for farmers. Across Europe, rapid scale-up of farms helped transition the EU to become a net exporter of agricultural products by the early 1980s.[27] Suddenly confronted with excess production, the UK government sought to maintain high domestic prices by buying intervention stock (i.e., acquiring products, storing them, and selling them at a loss on the world market), and using other interventions to avoid a politically damaging reduction of domestic prices.[28] As direct production support for farmers persisted, fraud (i.e., falsely reporting output levels), environmental degradation from intensification (i.e., increasing fertilizer, pesticide, and machinery use per unit land), and overproduction became commonplace.[29] The MacSharry Reforms of the early 2000s reduced the level of production support, but substituted it with direct payments based on arable area and headage payments for each unit of livestock kept by a farm (collectively known as pillar 1 of the CAP), while also introducing rural development programs (known as pillar 2).[30] In recent years, "cross-compliance" measures have been introduced in effort to make pillar 1 payments conditional upon various pro-environmental actions, including protection of watercourses from DWPA. Nevertheless, weak monitoring and poor incentives to undertake substantial, costly mitigation actions have plagued the initiative.[31] Today, the CAP continues to command 36% of EU spending, and significant inefficiencies remain.

While poor design features of the CAP have long

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[26] Hodge. "The Governance of the Countryside."

[27] Hodge. "The Governance of the Countryside."

[28] Hodge. "The Governance of the Countryside."

[29] Roederer-Rynning, C., & Matthews, A. "What Common Agricultural Policy After Brexit?" *Politics and Governance* 7 (3): 40–50. (2019)

[30] Roederer & Matthews. "What Common Agricultural Policy After Brexit?"

[31] Hodge. "The Governance of the Countryside."

been acknowledged by European leaders, efforts to overhaul the policy have been repeatedly mired in complex negotiations due to division among EU member states.[32] Many elements of the CAP are deeply entrenched, even if they are problematic for the environment, and the complexity of the policy has created fears that reform could throw markets into chaos or harm Europe's global competitiveness. Proposed reforms must also overcome stark differences in trade preferences among EU members, a political barrier that has proven insurmountable to date.[33]

Accordingly, Brexit offers a unique opportunity for the UK to dramatically reframe its approach to agriculture without interference. Most promisingly, the landmark UK Agriculture Act of 2020 outlines plans to reform farming subsidies and implement a "public money for public goods" regime designed to enhance environmental quality, with the goal to limit unsustainable production and induce major improvements in local water quality under river basin management plans.[34] Though the new regime remains opaque and subject to the fickle nature of British politics—including pressures from changing leadership under Prime Ministers Boris Johnson, Liz Truss, and Rishi Sunak, and a looming general election before January 2025—there are reasons for optimism. If newly designed instruments are fit for purpose, Brexit may come to be regarded as a turning point in the global effort to combat water pollution from agriculture.

One of the primary reasons for optimism is that Brexit sets the stage for an agriculture policy capable of addressing pollution challenges specific to large-scale farms. Perverse incentives to scale-up production under the CAP have contributed to a Europe-wide trend of "fewer, bigger, more intensive" farms. Between 2005 and 2016, the total number of farms in the EU dropped from 14.5 million to 10.3 million, while total output grew steadily.[35] Consolidation has been especially rapid in the UK, which has long embraced larger farms than other major food producing countries in Europe, such as Italy and Poland.[36] In fact, in 2016, the UK ranked first in the EU in terms of average family farm size, at just under 70 hectares; by contrast, in Romania, known for its tradition of small-scale family farming, over 90% of farms were smaller than 5 hectares.[37] Most EU agriculture sectors look more like Romania's than the UK's, as evidenced by the roughly two-thirds of EU farms that were smaller than 5 hectares in

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[32] Daugbjerg, C., & Swinbank, A. "The Politics of CAP Reform: Trade Negotiations, Institutional Settings and Blame Avoidance," *JCMS: Journal of Common Market Studies* 45 (1): 1-22. (2007)

[33] Daugbjerg & Swinbank. "The Politics of CAP Reform."

[34] De Vito, L., Fairbrother, M., & Russel, D. "Implementing the Water Framework Directive and Tackling Diffuse Pollution from Agriculture: Lessons from England and Scotland," *Water* 12 (1): 244–269. (2020)

[35] Harvey, F. "Fewer, Bigger, more Intensive: EU Vows to Stem Drastic Loss of Small Farms," *The Guardian*. (2021). https://www.theguardian.com/environment/2021/may/24/fewer-bigger-more-intensive-eu-vows-to-stem-drastic-loss-of-small-farms

[36] Neslen, A. "England Flaunts Green Reforms while EU Stays in Hock to Farmers," *Politico*. (2020). https://www.politico.eu/article/england-flaunts-green-reforms-while-eu-stays-in-hock-to-farmers/

[37] "Agriculture Statistics – Family Farming in the EU". Eurostat. (2016). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agriculture_statistics_-_family_farming_in_the_EU#Structural_profile_of_farms_-_analysis_for_the_EU

2016.[38] Because of the structure of pillar 1 payments under the CAP, which compensate farmers *per hectare* of arable land, large UK farming operations are disproportionately favored by the policy. And because cross-compliance efforts have largely failed to deter large farms from reinvesting these payments into increasingly environmentally damaging production methods, the UK environment is disproportionately harmed.

As a result, the dominant form of agriculture in the UK has come to look more like "US-style megafarms" than the iconic small-scale family farms for which Europe is known.[39] For instance, the number of requests for "intensive need permits" for large livestock facilities with over 1,000 animals (meeting the US Department of Agriculture's definition of a "concentrated animal feeding operation") has grown exponentially in the UK in recent years.[40] [41]

With operations of this scale, the nature of water quality monitoring problems shifts. For instance, because industrial agriculture relies heavily on mechanization, human oversight is minimal, making episodes of pollution difficult to detect in a timely manner.[42] Further, the concentration of animal activity at large farms compounds the severity of typical threats to water quality, such as eutrophication, while introducing new ones such as novel pathogens and multi-drug resistant bacteria from the regular application of antibiotics to livestock.[43] Because monitoring and enforcement of environmental standards relies largely on "self-reporting and physical, resource-intensive, infrequent inspections," rule-breaking operations can easily exploit regulators' lack of capacity.[44] Indeed, just a few non-compliant megafarms could inflict lasting damage to aquatic ecosystems at the catchment level if regulators fail to detect elevated water pollution levels in a timely manner.

The UK's model of large-scale agriculture also has implications for how farmers perceive regulatory efforts. In surveys of UK farmers, Inman (2018) finds widespread skepticism among farmers of the causal link between their fertilizer use and DWPA, indicating both deficient scientific understanding, and a general lack of internalization of social responsibility for water quality.[45] For example, despite a long-running "system of catchment-sensitive farming" in the UK aimed at

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[38] "Agriculture Statistics – Family Farming in the EU," *Eurostat*. (2016). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agriculture_statistics_-_family_farming_in_the_EU#Structural_profile_of_farms_-_analysis_for_the_EU

[39] Child et al. "UK has Nearly 800 Livestock Mega Farms, Investigation Reveals," *The Guardian*. (2017). https://www.theguardian.com/environment/2017/jul/17/uk-has-nearly-800-livestock-mega-farms-investigation-reveals

[40] Clemans et al. "Antibiotic Resistance, Gene Transfer, and Water Quality Patterns Observed in Waterways Near CAFO Farms and Wastewater Treatment Facilities," *Water, Air, & Soil Pollution* 217 (1): 473–489. (2011)

[41] Child et al. "UK has Nearly 800 Livestock Mega Farms."

[42] Hodge. "The Governance of the Countryside."

[43] Clemans et al. "Antibiotic Resistance, Gene Transfer, and Water Quality Patterns."

[44] Anderson et al. "Enhancing Environmental Enforcement with Near Real-Time Monitoring: Likelihood-Based Detection of Structural Expansion of Intensive Livestock Farms," *International Journal of Applied Earth Observation and Geoinformation* 103: 102463. (2021)

[45] Cleasby et al. "An Exploration of Individual, Social and Material Factors."

facilitating training and awareness of DWPA, promoting nutrient management, and providing funding for mitigation actions, a vast majority of farmers have failed to embrace voluntary mitigation measures.[46] This evidence complements previous research from the US demonstrating that small-scale farmers have stronger environmental stewardship values, and are more receptive to conservation programs than farmers who practice industrial agriculture.[47] Among UK farmers, Inman (2018) highlights a pervasive belief that environmental damage is an unavoidable consequence of production,[48] while Hodge (2016) documents UK farmers' willingness to over-apply fertilizers and pesticides to bolster productivity.[49]

Ultimately, this literature lends weight to the argument that Brexit enables the UK to divorce itself from CAP payments that are especially damaging given the unique characteristics of the British agriculture sector. Notably, in 2021, 80% of CAP direct payments flowed to just 20% of (large-scale) farms, where the UK is overrepresented.[50] Thus, restructuring of British agriculture policy ought to enable decision-makers to account for the relatively localized issue of megafarms. For this reason, post-Brexit approaches may inform policy discourses in other countries coping with environmental externalities from large-scale farming, such as the US, Australia, or Canada.

III. Overcoming the Farm Lobby

Even before Britain joined the European Economic Community in the early 1970s, the EU's farm lobby staunchly opposed pro-environmental CAP reforms. It has taken this position ever since. The lobby is led by two powerful interest groups, which merged in the 1960s: the Comité des Organisations Professionnelles Agricole (COPA) and the Comité Général de la Coopération Agricole de l'Union Européenne (COGECA). Over time, COPA-COGECA's influence in Brussels has profoundly shaped EU policy on trade, food safety, animal welfare, and the environment. By releasing UK policymakers from the powerful grip of COPA-COGECA, Brexit enables environmental advocates to "attack" at an opportune moment when Britain's *domestic* farm lobby is divided and acquiescent, a classic strategy of timing.[51] In the decades prior to Brexit, COPA-COGECA came to enjoy unrivaled access to the official decision-making channels of the European Commission. For instance, the European Commission's Civil Dialogue Groups, designed to facilitate transparent information exchange and with business and civil society stakeholders on policy-relevant matters including agriculture, have functioned in practice to advance the farm lobby's agenda. As of February 2021, COPA and COGECA representatives occupied about half of the seats within the dialogue group most relevant to

[46] Cleasby et al. "An Exploration of Individual, Social and Material Factors."

[47] Buttel, F. H., & Gillespie, G. W. Jr. "Preferences for Crop Production Practices Among Conventional and Alternative Farmers," *American Journal of Alternative Agriculture* 3: 11–17. (1988)

[48] Cleasby et al. "An Exploration of Individual, Social and Material Factors."

[49] Hodge. "The Governance of the Countryside."

[50] Harvey. "Fewer, Bigger, more Intensive."

[51] Ling Yean Yng et al. "Military Principles of Chinese Origin to Improve Competitiveness," *Organization, Technology & Management in Construction: An International Journal* 1 (1): 3–9. (2009)

agriculture, and the group's meeting times were decided according to COPA's schedule.[52] Across thirteen total dialogue groups, eight were chaired by a COPA or COGECA affiliate.

In 2019, a *New York Times* investigation found that the EU farm lobby wields exceptional power in Brussels, despite that farming is no longer a dominant component of European GDP, explaining:

> *"Agricultural lobbyists, among the most influential in Europe, have exclusive, closed-door access to government leaders. […] As long as there has been farm money, COPA-COGECA, Europe's largest organization for farmers, has swayed where it goes. European leaders have historically treated the group not as mere recipients of government money, but as partners in policymaking."*[53]

Among other potential conflicts of interests, reporting revealed that prior to meetings of European farm ministers, the President of the European Council, "as a matter of tradition," grants a private meeting to COPA-COGECA. Similar access has been denied to environmental groups.[54]

Historically, COPA-COGECA have pushed to maintain unconditional pillar 1 payments, primarily advocating for policies that benefit large farms.[55] The lobby's agricultural "research projects" inform position papers which advocate for "simplification" of regulations, oppose efforts to reduce pesticide and fertilizer use, and refute the health risks of farming intensification.[56] For instance, on DWPA in particular, the lobby warns against "overambitious targets" which are "not properly reflecting reality or community perceptions about the quality of water," and condemns efforts to "valorise water" as an ecosystem service.[57]

Because COPA-COGECA has virtually monopolized the farming industry's political clout in Brussels, there has been little reason for the UK's own farm lobby to engage deeply on matters of the CAP. Though some British pro-agribusiness NGOs have emerged in the wake of Brexit, they form a relatively unorganized network without a substantial track record. Beyond their inexperience, British farming interest groups face reduced capacity to oppose post-Brexit environmental policy for three additional reasons:

1. Brexit negotiations were unexpectedly long and complicated, creating significant economic uncertainty. It is now a matter of urgency for British

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[52] Herman, E. "Behind the CAP Reform –The Rooted Lobbying of COPA-COGECA," *Eyes on Europe*. (2021). https://www.eyes-on-europe.eu/behind-the-cap-reform-the-rooted-lobbying-of-copa-cogeca/

[53] Apuzzo, M., & Gebrekidan, S. "Who Keeps Europe's Farm Billions Flowing? Often, Those Who Benefit," *The New York Times*. (2019). https://www.nytimes.com/2019/12/11/world/europe/eu-farm-subsidy-lobbying.html

[54] Apuzzo & Gebrekidan. "Who Keeps Europe's Farm Billions Flowing?"

[55] Zdanovskis, K., & Pilvere, I. "Engagement of Agricultural Nongovernmental Organisations in Making the Common Agricultural Policy," *Economic Science for Rural Development* 38: 239–249. (2015)

[56] "European Farming," *COPA-COGECA*. (2022). https://www.google.com/url?q=https://copa-cogeca.eu/europeanfarming%23b193&sa=D&source=docs&ust=1715184453563630&usg=AOvVaw09xW18zEvznWg6-nmC1Bms

[57] "Position Paper: Fitness-Check of the Water Framework Directive," *COPA-COGECA* EN (17) 3758: 5. (2018)

farmers to ensure new favorable trade deals are negotiated to open foreign markets to British agricultural products.[58] The turbulent political climate has prevented even well-established farmers' advocacy groups, such as the National Farmers' Union of England and Wales from mobilizing forcefully against (relatively less imminent) environmental issues, allowing the pro-environmental vision of the 2020 Agriculture Bill to pass without much contestation.[59]

2. Heightened social consciousness around the environment, driven especially by the COP26 UN climate talks, which were hosted in Glasgow in 2021, has meant that British politics is now unprecedentedly united on topics such as climate change and sustainability.[60] Having enacted a landmark 25 Year Environment Plan in 2018, both Conservative and Labour leaders are keen to take credit for its implementation. As climate change continues to gain in salience, it is likely that this shift in political attitudes will be enduring.

3. Somewhat paradoxically, a significant majority of British farmers voted for Brexit, despite receiving a disproportionate share of CAP payments. May et al. (2021) attribute this to a combination of forces, including negative perceptions toward the EU and the belief that leaving the EU would "make agricultural policy less restrictive" and increase the profitability of the sector, though it is unclear whether such beliefs are well founded.[61] Regardless of farmers' motivations, the vote may constrain the ability of the UK farm lobby to oppose alternatives to the CAP that directly emerge from Brexit, including various environmental reforms.

In combination, these factors point to Brexit as opening a significant window of opportunity for policy entrepreneurship to address DWPA at a time of weak and fragmented resistance. By disentangling itself from the influence of COPA-COGECA, the UK is positioned to set a promising example to other governments facing policy gridlock due to powerful interests. Of course, reform will take time, especially as the UK economy emerges from the uncertainty of the Covid-19 pandemic and confronts pressures from inflation and the war in Ukraine. Environmental issues must also compete for space on the agenda in Westminster at a time when immigration, housing affordability, and a struggling national healthcare system are front-of-mind for many Britons. Still, in time, the story of British agriculture policy may prove especially relevant for the future of global climate action, which has long been diluted in ambition by industrial interests.[62]

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[58] Harvey, F. "'Completely contradictory': NFU Leader Attacks UK Farming Policy". *The Guardian*. (2022). https://www.theguardian.com/environment/2022/feb/22/completely-contradictory-nfu-leader-attacks-uks-farming-policy

[59] "Written Evidence Submitted by the National Farmers Union to the Agriculture Bill Public Bill Committee," *National Farmers Union*. (2020).

[60] Burns & Carter. "Brexit and UK Environmental Policy and Politics."

[61] May, D., Arancibia, S., & Manning, L. "Understanding UK Farmers' Brexit Voting Decision: A Behavioural Approach," *Journal of Rural Studies* 81: 281–293. (2021)

[62] Kolk, A., & Pinkse, J. "Multinationals' Political Activities on Climate Change," *Business & Society* 46 (2): 201–228. (2007)

IV. Going Against the Flow

Looking ahead, a range of new interventions are needed to accelerate water quality improvements in the UK in line with Water Framework Directive standards, and possible reforms are now receiving attention from local and national decision-makers. (Although Brexit formally released the UK from the Directive, it has been transposed into English law. Defra may ultimately diverge from specific aspects of the Directive, but attaining good ecological status of water bodies remains a key component of the government's Environment Plan.)

Among the most promising policies to consider at this juncture are those capturing the polluter-pays principle, which has featured only superficially in the EU agricultural sector to date, in part because of strong resistance from the farm lobby.[63] Polluter-pays instruments, such as water quality trading, fertilizer (and other input) taxes, and land use permitting, are an attractive way to correct market failures from DWPA because, by requiring polluters to bear the costs of externalities, they reinforce the concept of social entitlement to clean water.[64] At the same time, these instruments have the potential to treat farmers as valuable coalition members in environmental stewardship, rather than adversaries, and may enjoy greater political feasibility over command-and-control alternatives.

Water quality trading, like emissions trading, reallocates the right to pollute among farmers, achieving socially efficient levels of DWPA reduction, as mitigation is conducted by farms able to change practices at lowest cost. Such schemes are not without their own administrative burdens; like DWPA monitoring, water quality trading requires prior knowledge of baseline environmental conditions, and there are trans-action costs incurred in the trading process. Still, water quality trading affords farmers flexibility to combat DWPA in innovative ways and has achieved results outside the UK. Evidence from New Zealand documents a five-year 20% reduction in nitrate emissions from regulated farms under the Lake Taupo watershed's binding trading program.[65] And in the United States, a "partially capped" trading system has been effective in securing profitable DWPA mitigation as regulated point-source facilities buy pollution reductions from farmers, who might then convert arable land to riparian buffers.[66]

Pesticide and fertilizer taxes, meanwhile, can simultaneously encourage farmers to reduce their reliance on harmful compounds and generate significant tax revenues. The reinvestment of revenues in capacity-building and education programs for farmers could, in theory, drive a virtuous cycle of pollution reduction over time. Norway has implemented a pesticide tax since the 1990s, which has successfully changed public attitudes about the impact of pesticides on

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[63] Hodge. "The Governance of the Countryside."

[64] Choi, I. "Global Climate Change and the Use of Economic Approaches: The Ideal Design Features of Domestic Greenhouse Gas Emissions Trading with an Analysis of the European Union's CO2 Emissions Trading Directive and the Climate Stewardship Act," *Natural Resources Journal* 45: 865–952. (2005)

[65] Bissonnette et al. "Water Quality Trading Schemes as a Form of State Intervention: Two Case Studies of State-Market Hybridization from Canada and New Zealand," *Ecosystem Services* 36 (April): 100890. (2019)

[66] Bissonnette et al. "Water Quality Trading Schemes."

environment and human health, while France aims to halve pesticide use between 2015 and 2025 under its fertilizer tax.[67] While ex-post evaluation of program effectiveness remains limited, successful deployment of such policies in Europe could guide UK decision-makers in overcoming common challenges of tax design, such as long-run inelastic demand for farm inputs, concern about harmful substitutions, and difficulty adjusting the tax level across space.[68]

The difficulty of spatially tailoring interventions like taxes can be overcome with more granular interventions like a pollution trading system using land use permits, which could be deployed at the catchment level. Under such a system, an ecological assessment would be undertaken to determine allowable nitrogen levels in each catchment. Findings would inform the total number of individual leaching permits available to farmers, with initial permit allocations within catchments determined according to farm size. Each season, a farmer would need to hold an appropriate number of permits, accounting for the fact that certain types of crops leach more nitrogen than others and would thus require more permits. Over time, permits will be acquired by inefficient farmers, while efficient farms will abate their fertilizer use. However, transaction costs will result from the need to monitor land uses and permit holding, and there is little incentive for farmers to use fertilizer efficiently once permits are held (other than price paid for fertilizer).

The fraught track record of agriculture policy reform in the UK and ingrained resistance over decades underline the barriers to achieving lasting behavior change from farmers deeply skeptical of government. Moreover, international experience suggests that when it comes to market-based incentives, there are no one-size-fits-all solutions. Rather, a mix of mechanisms, working in coordination, is likely to bring the greatest benefit to post-Brexit Britain. Decision-makers ought to seize upon the current window of opportunity to test a range of polluter-pays interventions, keeping in mind the following guiding principles:

- Local flexibility in choice of mitigation methods is crucial for achieving buy-in. Farmers are local experts and must be given leeway to control pollution creatively and on their own terms. UK farmers have lost trust in heavy-handed EU control of the agriculture sector, and new interventions ought to fulfill the spirit of Brexit by granting farmers agency to shape the programs that affect them.

- Farmers require access to reliable information to participate faithfully in pollution reduction programs. Expectations of participating farms must be communicated in clear and measurable terms and adapted to the local farming context. It is unreasonable to expect farmers to accept significant administrative burdens as a condition of their participation, or to adopt pollution control measures beyond those necessary to capture incentives.

- Interventions should be prioritized

[67] Böcker et al. "Revisiting Pesticide Taxation Schemes," *Ecological Economics* 134 (April): 263–66. (2017)

[68] Hodge. "The Governance of the Countryside."

according to their scalability. In addition to maximizing short-term pollution reductions and accelerating attainment of Water Framework Directive goals, scalable interventions also capture the benefits that arise from collective learning among large groups of farmers. As a result, the agriculture industry may be pushed in innovative and entrepreneurial directions with respect to environmental protection.

- The UK government should not be tempted by offering short term, limited incentives to realize superficial progress (i.e., ahead of local elections). Instead, farmers must be deterred from reverting to intensive practices after cessation of pro-environmental programs. By following through on investments that demonstrate long-term commitment to tackling DWPA, the government can facilitate the creation of durable coalitions of farmers willing to pursue deintensification as an economically viable strategy over the long-term.

While Brexit provides the key impetus for policy entrepreneurship on DWPA, significant educational investments are also needed to create a "water-literate society" in which farmers feel encouraged and supported within stewardship networks.[69] Respect for local institutions will be essential to empower farmers to regard DWPA mitigation as worthwhile and non-adversarial. Overall, policy instruments must be sensitive to the characteristics of DWPA, integrating best-available scientific data with transparent planning to minimize and overcome transaction costs inherent in the regulation of diffuse pollution.[70] Efforts to this end ought to be guided broadly by Sustainable Development Goal 6, with particular attention to target 6.B which calls for strengthening "the participation of local communities in improving water and sanitation management" through stakeholder engagement.

Further research spanning disciplines of environmental science, economics, politics, and law is urgently needed to ensure that opportunities to green the UK agriculture sector outlined here are not forfeited due to inaction or fear of the unknown. For instance, studies must now be undertaken to confirm forecasted impacts of new instruments on farm incomes, market competitiveness, and national food security. Policy analysis is needed to investigate the likely distributional effects of new interventions on farms of different size and location, with an eye toward equity and justice. Comparative case studies, meanwhile, ought to identify early successes and shortcomings from policy roll-out at the local (i.e., catchment) level to overcome technical barriers, build institutional capacity, and inform decisions about upscaling. Finally, longitudinal studies must be initiated to assess long-term changes in key water quality, biodiversity, and public health metrics. With research and policy agendas aligned to counter DWPA, Britain *can* "go against the flow," redefining its relationship with both agriculture and the environment for a new era.

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[69] Boardman et al. "Making Water Policy Work in the United Kingdom: A Case Study of Practical Approaches to Strengthening Complex, Multi-Tiered Systems of Water Governance," *Environmental Science & Policy* 71 (May): 41–55. (2017)

[70] Boardman et al. "Making Water Policy Work in the United Kingdom."