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Infrastructural, performative and feral: Understanding agri-environmental data relations in Aotearoa New Zealand

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Abstract

In agri-environmental decision-making, data are essential to defining problems and informing solutions. Nevertheless, it is important to consider not only how data can be used but also what data *does* in agri-environmental contexts. We argue that the liveliness of data relations can be explored by attending to their infrastructural, performative and feral qualities. Taking digital agriculture and climate change adaptation as examples, we also consider how these interconnected theses could be applied. This critical approach to data relations and their generative effects will help avoid unintended consequences and shape alternative agri-environmental futures.

KEYWORDS

data assemblages, environmental management, more-than-human agency, precision agriculture

1 | INTRODUCTION

In April 2024, the Ministry for the Environment and StatsNZ released *Our Land 2024* (Ministry for the Environment, 2024). This report is the most recent contribution to the cycle of environmental reporting carried out under the aegis of the Environmental Reporting Act (ERA) 2015. In releasing the *Measuring Up* discussion document, which laid the basis for the ERA, the then Minister for the Environment, Dr. Nick Smith, noted both the lack of any legal requirement for independent state of the environment reporting and the existing hodge-podge of measurement practices (Ministry for the Environment, 2011). The result, he complained, was that 'time is wasted debating the data rather than addressing the problem' (Smith, 2011, unpaged). Despite the Minister's aspirations, unruly and absent data have continued to be an issue within the reports produced to meet ERA 2015 requirements. *Our Land 2018*, for instance, observed that significant data gaps existed, and there were equally significant inconsistencies in the data that were being generated, a theme reiterated in *Our Land 2021* and *Our Land 2024* (Ministry for the Environment, 2024; Ministry for the Environment & Stats NZ, 2021, 2018). Furthermore, the Parliamentary Commissioner for the Environment has repeatedly criticised the environmental reporting system as being an essentially passive and opportunistic system 'that has harvested whatever data is there and done the best it can to navigate what's missing' (Parliamentary Commissioner for the Environment, 2019, 2022).

What is evident throughout this series of reports is that, alongside an overt focus on the environment, the adequacy of data is an enduring issue. The framing of the policy-making discussion clearly points to a desired end state where existing and emerging assemblages of indicators, measurement systems and data collection

become 'matters of fact' (Latour, 2004) through which it is possible to verify change and devise responses. Given the urgency of the environmental problems that we confront in Aotearoa New Zealand, and well-documented history of the weaponization of doubt to forestall environmental interventions (Oreskes, 2015; Oreskes & Conway, 2010), it is entirely reasonable to sympathise with efforts to transform data into tools for creating better futures. Along with the authors of the reports cited above, we therefore support the work required in the generation of better data; however, in this paper, we argue that it is also imperative to approach data as a 'matter of concern' (Latour, 2004) by maintaining a critical disposition toward emerging data relations.

Recent attention to Māori data sovereignty highlights the importance of maintaining a critical disposition to data. For example, Kukutai and Cormack (2019) argue that the data practices contained in the Integrated Data Infrastructure (IDI) and census tend to replicate colonial projects to identify, measure and control Indigenous populations, as well as being founded on an extractive logic that sees data as a source of value. Rather than accepting the inevitability of datafication, they advocate for a reimagination of data relations framed around the principles of Māori data sovereignty as developed by Te Mana Raraunga (Kukutai et al., 2023). While we are supportive of this critique, we argue that it is important not only to reimagine the ways in which data are *used* as an intermediary between actors; it is also vital to understand data *as an actor*, exerting agency in, and beyond, particular data practices. In doing so, we align ourselves with recent critical data studies in agricultural (e.g. Klerkx et al., 2019) and environmental (e.g. Nost & Goldstein, 2022) contexts. Furthermore, we acknowledge recent calls in this journal for geographers to explore '[more-than-human] aspects of technology, digital lives and virtual worlds' (Siimes et al., 2023, p. 63). Our aim is to catalyse such research by conceptualising the liveliness of data relations.

Our argument consists of three connected theses that extend current critical engagements with data. First, we establish that data relations are not constrained to virtual space but inhabit materially embedded places. Second, data relations are performative of reality rather than merely representative of it. Third, despite utility as domesticated indicators, data relations are also wont to feral actions. In the following sections, we expand on each of these three theses in turn by reviewing salient themes in recent critical social science literature. We also consider how they could be applied to agri-environmental contexts by taking digital agriculture and climate change adaptation as examples. We conclude by reflecting on the need for geographers and other critical social scientists to pursue a more expansive engagement with data in agri-environmental contexts.

2 | DATA AS INFRASTRUCTURAL

Contemporary data imaginaries are dominated by visions of the cloud. Weightless, endlessly evolving and opaque, references to the 'cloud' speak to the putative placelessness and restlessness of data and of the unmediated relationship between user and data. The 'cloud' is an abstraction, which enables us to forget about the ephemeral assemblage of political, technological, social and environmental relations that make the experiences of data ubiquity possible (Kitchin, 2014). Yet, as Hu (2016) points out, the 'cloud' as a cultural metaphor and organisational logic is underpinned by the slow, embedded geographies of material objects and the people who tend them. Hence, the 'cloud' and the work of data enabled by it do not exist independently of the particular conditions of the socio-material assemblage of infrastructure.

While geographers have become increasingly concerned with the lived experiences of ubiquitous data and the evolving relations between data and social practices (Kitchin, 2021), less attention has been given to those infrastructural assemblages through which data is produced and does work (Kitchin, 2023). Data cannot exist outside these assemblages, and to grasp the agency of data, we need to understand infrastructures as complex palimpsests comprised of intricate layers of spatio-historical relationships (Pickren, 2018). Consequently, understanding data and its myriad assemblages means examining the complex topologies of servers, data centres and fibre optics cables that comprise the most visible aspects of contemporary communications networks. But this is not enough, as these networks themselves rely on other material networks, such as water and electricity. The material fuzziness of infrastructures is also compounded by their intersection with knowledge and thinking systems through which the world is identified, sorted and governed (Bowker et al., 2019; Edwards, 2019a). It becomes doubly compounded when we think of people as infrastructure as they work to knit together fuzzy, and often ragged, material systems (Simone, 2004).

The location of these material infrastructures is the product of historic governmental and legal processes that carved out corridors for railroads, telegraph cables and fibre optic cables; as well as the capricious cycles of industrial (dis)investment that have seen infrastructural capacity unevenly distributed, utilised and discarded (Easterling, 2014; Starosielski, 2015). The ways in which contemporary data relations exert agency are a product of their contingent pasts; consequently, understanding

data requires following its material genealogies because this can reveal the intricate technopolitics and contingencies that curl around even the most basic data (Akbari, 2020; Edwards, 2019b).

The material infrastructures that make internet access in Aotearoa New Zealand an everyday possibility illustrate these points. The vast majority of global digital data flows through fibre optic cables that connect data centres to users (Chataut, 2024). Aotearoa New Zealand is no different, being linked to data centres in Australia and the United States by three submarine cable networks: the Southern Cross Cable, the Tasman Global Access Cable, and the Hawaiki Cable (Pullar-Strecker, 2021).[1] Within Aotearoa New Zealand, Telstra's Aqualink connects Auckland, Wellington and Christchurch, while Spark's Nelson-Levin cable moves data between the North and South Islands. These cables are connected to a content distribution network for specific applications such as YouTube, which are supported by global cloud platforms such as Amazon Web Services (AWS) and Microsoft Azure. AWS and Microsoft Azure currently supply Aotearoa New Zealand and the South Pacific via data centres in Australia.[2] Both have announced plans to build data centres in Aotearoa New Zealand, although AWS's plans are currently on hold because of stormwater issues (Moss, 2024; Surowiec, 2023).

Infrastructures are ontologically unruly but have been described as forms of 'matter that enable the circulation of other matter' (Larkin, 2013, p. 3). A concern with the provenance of the material infrastructures of data cables as outlined above (matter that enable...) should not obscure the obdurate thingness of data itself (... other matter) (Bates et al., 2016). The seductive plasticity and weightlessness of contemporary digital data is a discursive strategy rather than an ontological given. Data has 'dimensionality, weight and texture', which has consequences because it costs energy, time and money to 'simply collect, check, store, move, receive, and access data' (Edwards, 2010, p.84). This cost is 'data friction' and it is ubiquitous in data management infrastructures, regulatory frameworks and epistemological and work practices (Bates, 2018). Read in a particular way, data friction is a relationship to be avoided because of the conflicts, breaks and deformations that occur (Bowker, 2000). Yet, data friction can also be a deliberative strategy to maintain control over data, and a means of forcing otherwise invisible circuits of data to become matters of concern. The result of this complex interplay between data friction and power constituted within data assemblages is that the 'moments and sites of "data friction" are deeply political – they are the result of collective decisions of human actors who experience significantly different levels of empowerment with regard to shaping the overall outcome' (Bates, 2018, pp. 426–427).

Different dimensions of the politics of 'data friction' can be seen in the formulation of ideas of security and data sovereignty and their embedding in governmental data policies in agri-environmental contexts. For example, the New Zealand Farm Data Code of Practice (NZFDCP)[3] has the aim of enabling the movement of data by assuring primary producers of the security of their data. Friction framed in terms of security, therefore, becomes the necessary basis of data flow. The NZFDCP also contains provisions about data sovereignty requiring organisations to disclose to primary producers the legal jurisdiction within which both data and data backups are kept. However, the generative potential of such requirements created by modern cloud computing can be illustrated through John Deere's developing footprint in Aotearoa New Zealand.

Known as an agricultural equipment company, John Deere has pursued its Smart Industrial Operating Model, which includes significant investments aimed at transforming itself into an agricultural data platform (John Deere, 2023). In 2017 this strategy involved the purchase of the Silicon Valley machine learning startup Blue River Technology (Tobe, 2017). As its data services and subscriptions policy makes clear, the development of a data platform potentially involves the movement of farmer and machine data anywhere across the company's global operations. For example, machine data are uploaded via an undersea cable from Aotearoa New Zealand into the cloud, through AWS's infrastructure and accessed through the MyJohnDeere.com platform. From Aotearoa New Zealand, data on the MyJohnDeere.com platform is at various times located via data centres in the United States, Australia and Singapore.

This shifting topology of storage, access and data sovereignty also suggests that data infrastructures need to be understood in terms of temporal as well as spatial relationships (Addie et al., 2024). Rather than regarding infrastructures as fixed networks, a temporal sensitivity suggests a web of relations rooted in material connections that are endlessly reconfigured according to logistics logics that prioritise speed of flow. It is tempting to assume that flow dissolves place, but friction is the inevitable counterpart to flow, and manifests in specific, place-based knots of relations. Topography, bad weather, patchy cell connectivity, and faulty GPS units all might mean that the aspiration of real-time, continuous data flows becomes raggedly stop-start. Elsewhere, cyber-attacks on servers, trawlers snagging fibre optic cables, and heatwaves overloading air conditioning systems might also disrupt data flows. It is important to consider the potential consequences of these frictions and disruptions to on-farm procedures, ranging from everyday activities (such as a sudden inability to operate tractors, apply

nutrients and harvest crops) to long-term decision-making (based on (dis)continuous measurements of inputs and outputs). Place matters, because data, including John Deere's machine data, only exist within knotty, socio-material relations that are lively with friction.

3 | DATA AS PERFORMATIVE

Having established that data is embedded in material infrastructures, we now turn to consider in more detail the role it plays in agri-environmental contexts. In doing so, we align ourselves with theorisations of performativity and enactment that position the non-human world not simply as a backdrop that constrains or enables human activity in certain ways, but as part of the ongoing performance of realities (e.g. Law, 2019). The performativity of data has gained increasing attention in social research, with studies ranging from the collective bodies of nation states and economic unions (Cakici et al., 2020), through to the individual bodies that are the subject of health practices (Lupton, 2016, 2018). In contrast to common sense assumptions that data simply represent an underlying reality, these studies contend that data is active in the performance of individuals and populations. Methods such as surveys and censuses take a snapshot of particular details about a subset of individuals in a population (Law, 2009). Furthermore, myriad digital technologies and social networking sites continuously collect data on users' physical characteristics, emotional states, location and activities (Lupton, 2018, 2019). This information is then collated, manipulated and interpreted via statistical protocols to foreground particular aspects of a population or individual without the distraction of other details. Furthermore, extrapolation from data sets is used to zoom in and out, such that individual people are enacted through aggregated population data, and vice versa (Cakici et al., 2020). Hence, the 'quantified self' (Lupton, 2016) takes on a life of its own as it performs multiple overlapping (or conflicting) realities of human bodies.

A similar focus on performativity underpins research in agri-environmental settings, where the active role of technologies has been studied in dairy farming (Bear & Holloway, 2019), biosecurity practices (Donaldson & Wood, 2004), wildlife conservation (Stokland, 2015) and environmental sensing (Gabrys, 2016). Nevertheless, the specific role of data in these and other agri-environmental contexts is relatively underexplored and requires closer attention (Ascui et al., 2018). Furthermore, where the need for critical data scholarship in agri-environmental settings is recognised, the focus is commonly on how data is 'constructed and used' (Bronson & Knezevic, 2016, p. 3; also Bronson, 2022), rather than an examination of what data *does*.

In agri-environmental contexts, data plays a central role in visualising and quantifying an otherwise invisible and ephemeral world, and this is performative. Qualities of our environments can now be measured, mapped and compared such that the subjectivity of embodied human experience is increasingly replaced by the objectivity of disembodied data. This leads to new forms and locations of expertise and authority. Whereas it was once necessary to be physically situated in an agri-environmental setting over a long period of time in order to know it, technologies such as GPS and GIS collect large volumes of data over time and at a distance, and predictive models take a central role in agri-environmental decision-making (Vurdubakis & Rajão, 2022). Expertise is often linked to the ability to collect and process data as opposed to tacit knowledge of the agri-environmental context itself (Nost, 2022). Thus, new 'centres of calculation' are emerging (Latour, 1987 p. 232), and data are integral to their performance.

The performativity of data has epistemological consequences: it changes how we know, whose knowledge counts, and what is known about our environments and agricultural practices (Lukacz, 2024; Nost & Goldstein, 2022). It also has ontological consequences: it brings some environments and agricultural practices into being, whilst simultaneously precluding others. Furthermore, these performances are the result of not only what is present in a dataset but also what is absent from it. GIS images, GPS tracking and environmental models render a complex world knowable, ordered and manageable. But these data are inherently partial, and absences in datasets can lead to unforeseen consequences that result in environmental and social harms. This is evident in penguin conservation practices in the Falklands, where gaps in GPS tracking data actively influence ongoing conflict over territory and oil resources, and ultimately reify an extractive regime (Blair, 2022). Similarly, absences in data used to model the UK foot and mouth outbreak led to a controversial culling policy that irreparably damaged rural livelihoods (Law, 2008). Furthermore, by performing environmental qualities as quantifiable and visible, data also performs a universal way of knowing that serves to other non-Western systems of thought and record. Post-colonial and Indigenous scholars have highlighted the role of data in the ongoing practices of colonisation, and, as we have already noted, there are increasing calls for data sovereignty in Aotearoa New Zealand and overseas. But it is not only who controls data that is the issue; the very act of collecting and storing environmental data (as framed by Western epistemologies) performs a reality that can serve to disconnect Indigenous communities from the land (Verran & Christie, 2014).

To consider the performativity of data further, we turn to the example of climate change adaptation

planning in Aotearoa New Zealand. The Ministry for the Environment released the first National Adaptation Plan (NAP) in 2022 (Ministry for the Environment, 2022). This plan marked a shift from a dominant focus on climate change mitigation, acknowledging that future communities will also need to live with and adapt to a changing climate and its various socio-cultural, economic and environmental impacts. One of four priorities in the NAP is to '[enable] better risk informed decisions' (ibid. p. 14), which requires 'access to the latest climate projections data' (p. 15). As part of this focus on *access* to data, various tools are being developed to make these data more *accessible* to decision-makers. One significant innovation in this space is the development of digital twins: three-dimensional virtual representations of real physical environments, based on available data of that environment. Digital twins are well established in engineering contexts where they can act as virtual representations of physical objects or systems and therefore be used to inform their design, manufacture and operation (Ferrari & Willcox, 2024). More recently they have been introduced into planning contexts, with cities and regions around the world using digital twins to model current functions[4] and potential developments.[5]

In Aotearoa New Zealand, a digital twin of Wellington City has been developed using publicly available and real-time data, including land contours, weather patterns, and transport flows.[6] Further to its use in day-to-day planning processes, the NAP notes this digital Wellington could be used to model future climate change impacts and adaptation scenarios, thus aiding climate adaptation planning by providing a more tangible vision of potential urban futures (Ministry for the Environment, 2022, p. 44). While the digital twin will incorporate a range of data, it is important to recognise that absences are inevitable and result from the privileging of some perspectives over others. Available data will depend on existing data infrastructures, such as 'GIS maps and city-wide sensors' (ibid.). While there is a stated commitment to include other knowledge, including mātauranga Māori, the infrastructures required to translate this knowledge are likely to be comparatively less durable (Latour, 1990), and the digital twin is likely to provide a partial representation of a complex system (Westerlaken, 2024). Nevertheless, data that are present in and absent from this digital twin will be performative: they will influence decision-making, thereby acting on and changing the 'real world'. Hence, while the intention is to adapt to the impacts of climate change, unintended maladaptations could also result from this digital vision of the future (Barnett & O'Neill, 2010; Nost, 2019).

4 | DATA AS FERAL

In critical data studies, there is growing attention to agri-environmental data assemblages in political and politicised action (Bronson, 2022; Klerkx et al., 2019; Nost & Goldstein, 2022). Nevertheless, in much of this work, data remains a handmaiden to the intentions of human actors and lacks the capacity to initiate, conduct or direct action on its own. It is our contention, however, that data acts in ways similar to other non-human agents that provide not only unexpected and surprising outcomes but also ones that are beyond the control and oversight of humans. Data is somewhat unique in this regard, being a creation of human measuring (a feature that is addressed in our observations on the infrastructures and performativity of data above); but once data has been generated, it can break the bonds of domestication, displaying feral potentialities that have the capacity to disrupt the territorialisation of agri-environmental regulation.

In pursuing this line of argument, we share interests with recent reflections on the exceptionality of humans in the context of the Anthropocene (Blok & Jensen, 2019; Clark & Yusoff, 2017; Yusoff, 2021). Authors have challenged the Anthropocene thesis by arguing that greater attention should be placed on the active role of more-than-human elements in the processes contributing to and facilitating the dominance of humans in the current epoch. Clark and Yusoff (2017, p. 20) focus specifically on earth processes and their 'articulations' with global social life to suggest that Western social thought must better engage with and account for its geological underpinnings. For Blok and Jensen (2019), the Anthropocene debate demands a re-examination of social theory in order to more appropriately acknowledge the agency of non-humans. They propose adopting an Actor-Network Theory-informed approach that takes Isabelle Stenger's imperative to acknowledge Gaian influences on human existence. Similarly, recent work by more-than-human scholars in *Feral Atlas* depicts ferality as simultaneously a condition of the Anthropocene in its increasingly complex more-than-human entanglements and an art of observing these relations and telling their stories (Tsing et al., 2021). While not directly invoking the Anthropocene, our interpretation of the data that participate in agri-environmental assemblages confronts similar considerations about the capacity for non-human actors and processes to determine the context and potentialities of environmental management. It extends these efforts, considering the implications of not only the geological or Gaian but also the human-initiated efforts to territorialise such processes through the collection and analysis of data. Moreover, we consider the agency of data that operates outside its interactions with human sense-making to consider its impact among other non-humans as well.

Our conception of the agency of data aligns with broader literatures on vital materialities (Bennett, 2010; Vannini & Vannini, 2020) and non-human agency (Braun, 2008; Braun & Whatmore, 2010). Bennett's (2010) elaboration of a political ecology situated in Deleuze and Guattari's conceptualisation of assemblage underlies our interest in non-human entities. Of particular relevance to agri-environmental governance – in which the focus is often on determining and altering the actions and responsibilities of humans – we draw on Bennett's provocation to recognise that responsibility can lie outside the specific actions of an individual or group of humans, being instead the product of interactions with the assembled non-humans. Bennett's thesis similarly informs Lupton's (2019), p. 6) depiction of data as 'lively', which captures 'the vitality of human-data assemblages', and stresses that this can continue in the absence of human actors. Similarly, our position encourages a shift from perspectives that focus exclusively on data as a human creation (that is, as a domesticated entity) to consider the untamed and wild actions of data in its relations with human and other non-human entities.

The ferality of data allows serious attention to its capacity to alter the character of that which is measured and, subsequently, the manner in which humans engage and participate with the non-human environment. Feral data can initiate 'lines of flight' that extend from one assemblage to another in mutual processes of becoming (Thornton, 2020). As a result, our attention is drawn to the potentialities of data to both organise (i.e., territorialise) and disrupt (de-territorialise) our environments in ways that escape predetermined outcomes and human intentions. The influence of data thus transcends the purpose of defining a quality or measuring an outcome, becoming an inherent and essential feature of the agri-environmental system. What that system is (and not only what we understand it to be), is substantially altered by the agency of the data in the assemblage.

The growing application of artificial intelligence (AI) in agri-environmental contexts provides an apt example of these feral potentialities of data. By analysing large volumes of data at speed, AI can generate novel outputs without human input, ranging from creative artworks to academic writing, and consequently has the capacity to transform the workforce and associated notions of expertise in numerous industries (Dwivedi et al., 2023). This includes environmental decision-making, where applications such as chatbots and image generators can be used to formulate potential solutions to complex environmental problems. Such applications are evident in our example of digital agriculture discussed earlier: John Deere's work on farm equipment datafication feeds directly into its machine learning and AI strategy, and its aspirations for ubiquitous precision-based agriculture. Indeed, in a sign of the company's shifting strategy, it employs more software engineers than mechanical engineers (Patel, 2021). John Deere's Chief Technology Officer Jahmy Hindman explains that these changes are driven by the following vision of the future:

> It's this idea of enabling each individual plant in production agriculture to be tended to by a master gardener. The master gardener is in this case probably some AI that is enabling a farmer to know exactly what that particular plant needs, when it needs it, and then our equipment provides them the capability of executing on that plan that master gardener has created for that plant on an extremely large scale. (Patel, 2021, p. 2).

Hence, the agri-environment can shift from an ecology of communities to one of demanding individuals, each drawing equal attention to 'needs' for nutrients, water and pest protection. John Deere's AI development is not isolated. Reviews by Akkem et al. (2023, 2024) highlight the range of experimentation (and commercial development) taking place with AI in agriculture. However, the seemingly neutral objectivity of datafied agricultural systems has been questioned. Ditzler and Driessen (2022) point out that models of smart agriculture almost universally entrench a monocultural approach that leaves no space for alternatives such as agroecology. Visser et al. (2021) warn of the danger of 'precision traps' that stem from the opacity of the operation in devices such as algorithms, and where an unquestioning acceptance of the accuracy of algorithmic outputs generates unexpected risks. Indeed, John Deere's, 2023 Annual Report identified program bias in decision-making algorithms 'could impair the adoption and acceptance of autonomous machine solutions' (John Deere, 2023, p. 17). Furthermore, concern over introducing unexpected behaviours in its agricultural equipment has been cited as a factor in the company's longstanding opposition to the 'right to repair' by farmers inter alia (Shaw, 2023). This suggests that within the techno-optimism that accompanies AI development, there is a lurking fear that the opacity and deterministic ontologies of AI will result in feral outputs and actions.

The development of digital twins in climate change adaptation can also be interpreted through the lens of ferality. While our earlier example of Wellington's digital twin is intended to exist alongside its physical double, the Pacific island nation of Tuvalu is developing a digital twin to replace its land territory and land-based functions of nationhood if it is completely inundated by rising seas:

> how will Tuvalu continue to function as a nation with no land? Here, the solution is to rapidly adopt innovative digital tools and platforms, and build a digital nation. This would involve creating a digital government administrative system that could, in the very worst-case scenario, allow Tuvalu to shift its government operations to another location and continue to fully function as a sovereign state. It also looks toward national efforts to preserve and digitise historical documents; records of cultural practices; and other important texts, images, or multimedia that should be protected in the face of climate-induced disasters. (Kofe, 2021).

Hence, by creating a 'digital nation', Tuvalu aims to retain its sovereignty and Exclusive Economic Zone and allow Tuvaluans to maintain their identities and ancestral connections (Niehoff, 2023). There is a sense that a digital Tuvalu will 'continue to be lively' once the land it refers to is gone (Lupton, 2019, p.6), thus enabling the ongoing development of its citizens and economy. As a climate change adaptation strategy, this more-than-human entanglement of people and data may therefore create new spaces for survival in the ruined landscapes of the Anthropocene (Tsing et al., 2021). Nevertheless, questions remain over the inevitability of Tuvalu's inundation by rising seas (Farbotko et al., 2023), and the role of such apocalyptic scenarios in determining, and colonising, island futures (Stratford et al., 2023). As such, this digital adaptation strategy may preclude others that are aimed at preserving Tuvalu's physical presence, and the creation of a digital twin will itself have feral (de)territorialising effects.

5 | CONCLUSION

In this paper, we have argued that it is important to maintain a critical disposition to data and consider not only how data can be used but also what data *does* in agri-environmental contexts. Calls for more and better data in environmental reporting, as exemplified by *Our Land 2024* (Ministry for the Environment, 2024), will not necessarily lead to better environmental outcomes if the active role of data is not simultaneously explored. Hence, rather than focusing solely on how to plug gaps and smooth inconsistencies in these data, we urge geographers to also attend to the liveliness of agri-environmental data, considering what worlds are made, and foreclosed, through data relations, and how these relations could be done differently.

While there is a burgeoning critical literature on the role of data in agri-environmental contexts, data is predominantly cast as an intermediary that translates the will of powerful human agents. In public discourse, however, there is growing attention to the unpredictable and possibly uncontrollable effects of novel data-driven technologies. Although we are not promoting a dystopian vision of the future or seeking to invalidate agri-environmental data projects as a whole (Latour, 2004), we nevertheless agree there is a need to recognise the agency of data in more-than-human terms. We have argued that scholars can attend to the liveliness of data relations through their infrastructural, performative and feral qualities. These are not intended as discrete lenses through which to view data; indeed, as our examples of precision agriculture and climate change adaptation demonstrate, they should be approached as interconnected and overlapping sensibilities to what data can do.

An understanding of data relations and their generative effects provides possibilities for intervention. In the case of climate change adaptation, we could prevent maladaptive outcomes; in the case of precision agriculture, we could avoid locking in path dependencies. Thinking more broadly, tracing the infrastructures that silently shape data provides the possibility to reroute and remake data that better serves the future. By recognising data as performative and feral, we can consider new affordances and (re)politicise problems that have been muted by the extractive, exploitative data relationships associated with surveillance capitalism and generative AI. While data relations will inevitably shape our agri-environmental futures and we cannot hope to control all possible outcomes, it is nevertheless possible for us to play a role in shaping these futures too.

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