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ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/cepe21

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To cite this article: Mark Ryan & Anne-Charlotte Hoes (03 Jun 2024): Justice and Sustainability Tensions in Agriculture: Wicked Problems in the Case of Dutch Manure Policy, Ethics, Policy & Environment, DOI: 10.1080/21550085.2024.2360369

To link to this article: https://doi.org/10.1080/21550085.2024.2360369

Published online: 03 Jun 2024.

ETHICS, POLICY & ENVIRONMENT
https://doi.org/10.1080/21550085.2024.2360369

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Justice and Sustainability Tensions in Agriculture: Wicked Problems in the Case of Dutch Manure Policy

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ABSTRACT

In recent years, there has been tension between farmers and the Dutch government regarding sustainability policy (in the efforts to reduce the harm caused by manure surplus) and how implementing this policy affects farmers (in the form of justice concerns). We interviewed Dutch farmers to uncover how they view manure policy. We identified four types of injustices: procedural, contributive, distributive, and intergenerational. We propose that a multi-tiered approach is required to overcome these kinds of 'wicked problems', avoid paralysis from lack of action, and overcome the flaws by overestimating the effectiveness of top-down policy.

ARTICLE HISTORY
Received 14 November 2023
Accepted 22 May 2024

KEYWORDS
Agriculture; farmers; sustainability; justice; wicked problems

1. Introduction

The Netherlands has a high density of livestock and, as a result, high amounts of manure (de Vries et al., 2023; Oenema & Oenema, 2021). Manure has many benefits; it contains many minerals (phosphates, nitrogen, potassium) and can be used as a fertilizer, energy source, or to create bio-based products (WUR, 2021). However, it is not always used effectively, responsibly, or sustainably. Manure may leach phosphate and nitrate into ground and surface water if not processed and disposed of correctly. This process can lead to 'eutrophication and emissions of ammonia and nitrogen oxides, causing soil acidification and reduction of biodiversity' (WUR, 2021). Nitrogen from manure percolates into groundwater; the nutrients also cause eutrophication in freshwater ecosystems, and surrounding natural areas are contaminated with nitrogen deposition from ammonia emissions in the air from manure. This action negatively impacts human health, biodiversity, water quality and climate stability (de Vries et al., 2023). Therefore, improving responsible manure use and disposal is essential to ensure environmental sustainability, promote human health, and help curb the dramatic impacts of climate change.

The Dutch manure surplus is a considerable sustainability challenge for farmers and policymakers in the country, and there is an urgent need to tackle this and provide effective solutions (A.-C. Hoes et al., 2022; PBL, 2017). The Netherlands has been trying to tackle this issue since 1986 (the Fertilisers Act). Farmers have used low-emission

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techniques to reduce ammonia emissions when applying animal manure since the early 1990s. In addition, the European Nitrates Directive (European Union, 1991) states that the amount of nitrate in groundwater must remain below 50 milligrams per liter. Member States should apply a maximum of 170 kilos of nitrogen per hectare from animal manure on the land for the remaining amount of allowed nutrients chemical fertilizers have to be used (Remkes et al., 2020). There is criticism toward this regulation as the production of chemical fertilizers requires large amounts of natural gas and causes an increase in nitrogen worldwide instead of recycling the available nutrients. On the other hand, it is possible to fertilize more precisely with chemical fertilizers because the nutrients are not bound to organic matter, and nitrogen and phosphate can be dosed separately. Animal manure evaporates ammonia, resulting in excessive nitrogen deposition that harms the biodiversity in natural areas.

Even though the production of manure is regulated in the Netherlands through animal and phosphate rights, and there are also strict rules regarding the use, storage, transport and processing of manure (PBL, 2017), the Netherlands does not yet comply everywhere with the prescribed standard of a maximum of 50 mg nitrate per liter of groundwater. It has difficulties with achieving all surface water quality targets.[1] Therefore, the Netherlands must develop a nitrate action program every four years to reach a water quality standard. However, controversy over what constitutes a sustainable manure policy and practice exists (Hoes et al., 2022).

In response, the Dutch government organized a fundamental rethink of manure policy in 2018 and at the beginning of 2019, for which a dialogue took place with various parties in society (Ministerie van Landbouw, Natuur en Voedselkwaliteit, 2018b). This fundamental rethink of manure was an essential part of the 'realisation plan' of the Ministerie van Landbouw, Natuur en Voedselkwaliteit (LNV) (the Ministry of Agriculture, Nature and Food Quality in English) vision of 'circular agriculture' that was presented in 2018 that aims to reduce polluting emissions, improve resource efficiency, while also trying to improve the incomes of farmers in the process (LNV (Ministry of Agriculture, Nature and Food Quality of the Netherlands), 2018a; Ministerie van Landbouw, 2019).

In addition, in 2019, the Council of State judged that recently granted permits that allowed nitrogen to be emitted were invalidated as the programmatic approach toward ammonia emissions was considered illegal. As dairy farms are a large contributor to nitrogen emissions (Remkes et al., 2020), there has been a consistent buildup of tension between the Dutch government and farmers (a tension that has also built up in Belgium recently) (EenVandaag, 2022). In 2022, a new cabinet was formed in the Netherlands, and the coalition agreement states that the transition to circular agriculture continues. The Minister for Nature and Nitrogen presented the nitrogen crisis strategy, including buy-out agreements with farmers (Van der Wal-Zeggelink, 2022). These buy-outs involve the government purchasing the farm from the farmer and stopping all farm activities, thereby reducing the total number of farms and livestock in the Netherlands. The letter with the strategy included a map with local Nitrogen goals that showed that more than 70% Nitrogen reduction has to be achieved in several areas.

Dutch farmers who believe current policies are unfair have taken to the streets to demand that their voices be heard, emphasizing that these new policies threaten their livelihood and the very existence of dairy farming in the Netherlands. While the Dutch government aims to meet its sustainability obligations, many feel it is coming at the

expense of farmers. There is an apparent tension between sustainability policy on the one hand and what is considered just and fair for the Dutch dairy farmer on the other hand. The Dutch agricultural sector has been in an uproar over the past few years because of the excessive burden on farmers to reduce their nitrate and phosphate levels and carbon emissions (Reuters, 2024). This anger has led to many protests, violence, highway blocking and even attempted manslaughter (NOS, 2022).

The Dutch manure policy provides a case study of the tension between sustainability policy and justice. It represents how the attempts of national and transnational authorities to implement policy to ensure a transition toward more sustainable habitats, practices, and professions can conflict with the values, ideals, and livelihoods of those expected to implement such policies. This case study represents how even a high-income country with a great deal of experience in sustainability (with water management due to low sea levels and managing very high land concentration and enormous production levels of animal products) faces extreme pressure under current sustainability policy demands. This paper examines the Dutch manure policy as a case study of tensions between sustainability policy and justice. This paper is relevant not only for the Netherlands but also for Europe, as the reduction of nitrogen levels and fertilizer use is an increasing problem and an issue often seen as unfair for farmers implementing such policies.

We evaluate the tensions between Dutch farmers and the Dutch government's manure policy through five interviews with Dutch dairy farmers. This paper provides a sample of justice concerns farmers in the Netherlands feel about the current manure policy. The purpose of the paper is to show how these five farmers view manure policy, and we propose that many of the issues identified in the Dutch manure case can be seen as 'wicked problems', a term referring to matters that create problems or challenges with most types of responses and are tricky to solve. We conclude by proposing that for sustainability policy to be successful while responding to a population's environmental justice needs, and efforts must be made to tackle the issue at multiple levels, with different actors, and throughout varying stages. This multi-tiered approach is required to overcome wicked problems, avoid paralysis from lack of action, and overcome the flaws of overestimating the effectiveness of top-down policy.

2. Justice and the Environment

Environmental justice aims to address injustices resulting from individuals' and certain groups' vulnerability toward harm caused by living in places with higher pollution levels, resource extraction, or land use that they do not benefit from. The concept of environmental justice was first developed in the US. This movement focused on the 'unfair burdens placed on minority groups living in areas of poor environmental quality' (Ryan et al., 2023, p. 18). A key goal of environmental justice advocates is to protect the 'fair treatment and meaningful involvement of all people regardless of race, colour, national origin, or income concerning the development, implementation, and enforcement of environmental laws regulations and policies' (Krämer, 2020, p. 1).

Environmental justice emerged in several conceptual approaches, such as 'just sustainability' and 'just transitions'. For example, Agyeman et al'.s 'just sustainability' approach focuses on 'the need to ensure a better quality of life for all, now and into the future, in a just and equitable manner, whilst living within the limits of supporting ecosystems'

(Agyeman et al., 2003, p. 5). Agyeman et al. state that environmental injustices toward human communities can and should be discussed and tackled in environmental policy (i.e. ensuring social and environmental sustainability together) (Agyeman, 2013; Agyeman et al., 2003).

Similarly, the 'just transition' approach aims to give justice a more prominent role in the discourse about the environment (Newell & Mulvaney, 2013). One of its main focuses is ensuring justice and equity for individuals during the transition to a low-carbon future due to climate change (Heffron, 2021; Newell & Mulvaney, 2013). Just transition approaches often concentrate on certain types of justice in their approaches (e.g. procedural, distributive, contributive, and intergenerational justice) (McCauley & Heffron, 2018; Timmermann, 2020). These four types of justice will be used to frame the injustices the interviewees felt toward sustainability policy in this paper.

Firstly, *procedural justice* refers to what types of procedures and steps one can implement to ensure that justice is realized/injustice is not caused (Timmermann, 2020). It involves establishing rules and process guidelines to improve impacts and avoid adverse outcomes. There is a strong emphasis on law, due process, and administrative court proceedings to ensure justice is realized. It involves a fair and transparent process to ensure that decisions are made fairly and openly.

Second, distributive justice ensures a fair distribution of resources and innovation in proportion to one's needs. Distributive justice 'assumes a distributing agent and some persons who have claims on what is being distributed. Justice here requires that the resources available to the distributor be shared according to some relevant criterion, such as equality, desert, or need' (Miller, 2021). There should be a fair distribution of resources among individuals; if not, then those individuals deserve a form of redistribution so they can get their fair share. Regarding resources, distributive justice is comprehensive and can refer to a fair distribution of taxes, access to amenities, comparative infrastructure between places, distribution of innovation potential, technology transfer, or education. Overall, distributive justice translates as the fair distribution of *burdens* and *benefits* for individuals (Timmermann, 2020).

Third, contributive justice focuses on the participation of marginalized groups so that there is a fair 'contribution' to policies, actions, outcomes, and processes (Timmermann, 2020). Contributive justice ensures an inclusive, transparent, and participatory form of fairness. Fairness occurs when an inclusive environment allows people to participate in decision-making processes and scientific enterprises and offers transparency in these processes (Timmermann, 2020, p. 124).

Fourth, intergenerational justice refers to ensuring that future generations have a fair provision of resources, quality of life, and benefits that we have. It has been a fundamental value within the sustainability movement since the Brundtland Report (Brundtland, 1987). It emphasizes an obligation to act morally toward those in the future (Meyer, 2021). It is challenging because we do not know what interests, values, and needs will arise and how our actions will impact, help, or hinder these requirements (Parfit, 1984). There is also a tension between ensuring a just provision of resources to future generations and being fair to people today (Raz, 1986).

3. Methodology

In the Netherlands, manure pollution is an ongoing issue with a relatively long history of environmental policies and alternative farming practices (Boonstra & Bock, 2009; Frouws, 1994), and we believe that analyzing this as a case study (Yin, 2009, 2015) may offer rich insights into justice concerns among Dutch farmers. The interviews focus on issues on their farm when they try to improve the nutrient cycle and the subsequent pressures of the Dutch manure policy. The starting point of the interviews was to get a broad picture of the farmers' narratives, paying particular attention to what they considered good manure practice and policy, as well as to their motives and identity as Dutch dairy farmers.

The interviews were conducted online in 2021 using Teams (as a result of the COVID-19 restrictions). All interviews were recorded and transcribed. After this, we analyzed the different narratives, identifying fertilization practices and what manure policy issues farmers face. The interviews were analyzed using the thematic analysis approach developed by Braun and Clarke (Braun & Clarke, 2006). This approach establishes a way to identify, examine, and report the main themes that emerge during empirical analysis and organizes and describes that data in a rich and informative way (Braun & Clarke, 2006).

We conducted five interviews with Dutch dairy farmers experimenting with improving the nutrient cycle on their farms. As these dairy farmers are experimenting with ways to reduce manure's adverse environmental side effects, we anticipate that these farmers are a good source of information to gain further understanding of the different justice concerns in agricultural policy. As the sample size of farmers is small, the paper is not intended to provide a robust and comprehensive view of *all* Dutch dairy farmers but simply the first-hand perspectives of five farmers, whose backgrounds vary and provide different contexts for their responses.

Farmer 1 said that his father started drastically lowering the amounts of fertilizer and external feed in the 1980s (Strootman et al., 2020; Van der Ploeg, 2021). Because the cows are in the pastures most of the year, they have less cow slurry (i.e. liquid manure of combined cow feces and urine). Moreover, because the cows eat less heavily fertilized grass and the protein content of additional concentrates is reduced, the manure contains lower ammonia levels than cows with more proteins in their diet (Reijs, 2007).

Farmer 2 is a farmer who has cows on primarily sandy soil. They started supplying 'planet-proof milk' in 2018, ensuring that their company worked toward sustainability. They dispose of their manure near an arable farmer, and they get back maize for their fodder. They pay for the manure removal and buy the corn. As a result, there are fewer concentrates and a more efficient use of their feed. Their cows get as much fresh grass as possible, with less concentrated use. The farmer also participates in a project to grow more biodiverse grasslands.

Farmer 3 said his cows are kept inside year-round and eat as much dry grass matter as possible from the farm, maize, palm kernel flakes, rapeseed meal, resistant turnip, and wheat yeast concentrate. They produce the maximum amount of milk using farm management data (resulting in 40 liters per cow daily). They have a manure surplus, which they must remove because of the manure regulation, which costs 10 and 14 euros per m^3 between 2015 and 2020. The farmer disagrees about how much manure they should

Table 1. List of farmers.

Farmer	Province in NL	Short Farm Description
1	Friesland (North)	110 cows, 80 ha, nature-inclusive and outdoor grazing strategy
2	Overijssel (South)	100 cows, 46.5 ha, supplying planet-proof milk
3	Overijssel (North)	270 cows, 95 ha, modern stable, milking robots, efficient feed strategy
4	Overijssel (East)	200 cows, 82 ha, a farm with many sensors as it is offered as a research facility
5	Friesland (South)	80 cows, 80 ha, a biodynamic dairy farm.

remove and claims that his cows' manure contains fewer nutrients when he feeds his cows according to policy recommendations.

Farmer 4 invested in sensors so more fundamental research or small-scale studies can be validated practically. She explained that her farm is set up to perform repeated measurements according to a jointly established research protocol and offered to report with statistical analysis. 90% of the grass is a blend with herbals and clover, which works well for them as the blends keep the sandy soil moist during dry summers, nitrogen fixation and more biodiversity. The farmer experiments with *precision* fertilization; she assesses the pastures where the cows graze, and a study with drones that monitor and evaluate the field is being executed.

Farmer 5 explains that their biodynamic[2] dairy farm applies an 'Irish dairy farming system' in which the whole herd gets calves around 1st March, and the feed demand of the cows follows the grass growth. They use strip grazing techniques so the cows can eat fresh grass for as long as possible. Three months a year, the cows stay in the stables. The biodynamic manure that the cows produce is spread above the grounds as fertilizer, for which they have to apply a dispensation yearly. The farmer does not have to pay to remove the surplus of biological manure as it is valued by a biological arable farmer who pays for the transport. An overview of the five farmers can be seen in Table 1.

4. Results

The view of Dutch farmers on sustainability policy, such as the phosphate and nitrate levels, has been documented in other reports (e.g. the Rathenau Instituut Report (Munnichs & de Vriend, 2018) and a WUR report (de Lauwere et al., 2016)). Within these reports and the findings of our interviews, sustainability policies are primarily seen as a good thing. However, the issue is the *kind of policy* being implemented and how it affects farmers' livelihood and control of their farms. There is no disagreement against sustainability policy *per se*, but more so, what is seen as *unjust* policy.

This paper explores tensions between feelings of injustice (by the interviewed farmers) and the Dutch government's sustainability (manure) policies. In the case of the Dutch manure policy, farmers often echo that the actions against them are unfair and unjust. They believe they are being treated poorly and have no justice in discussions with Dutch politicians and representatives. Throughout our interviews, we categorized many justice-related concerns into the four categories of justice: procedural justice, distributive justice, contributive justice, and intergenerational justice.

4.1. Procedural Justice

In the context of Dutch dairy farms, it was apparent that the farmers felt pressured to conform and behave in a particular way about manure. They want to *keep their freedom and control over their farm* and profession, including manure management. The farmers worried they would be unfairly prevented from controlling their farms. Farmer 3 stated that current administration and inspection systems, which identify who has abided by the phosphate and nitrate policies, undermine the control of their land. He also viewed it as undermining trust in farmers to implement these steps, stating that farmers deserved more flexibility concerning regulation.

The farmers feared that their rights to use manure or give nutrients and carbon to their pastures and fields would be further restricted. For example, farmer 4 was critical of the new manure policy plans, that was a result fundamental rethink of manure policy, that includes the removal of all manure from dairy farms that are not land-based. The government defines land-based dairy farms as a farm that has sufficient land to place all the manure legally. A dairy farmer can manage the land themselves or have a long-term partnership with a nearby arable farmer (Schouten, 2021). Removing all manure is a normal way of working for Dutch *poultry* and *pig* farmers, who generally do not have land. However, dairy farmers usually have land on which they can place their manure: 'If you have 0% land, that [removing all manure] makes sense, but there is land here at the farm, then you are not going to drive all that manure away first [to be processed in a mineral factory] and then only bring nutrients back that do not have carbon in it.[3] [. . .] I miss the point of that [. . .], and I will not send any trucks to burn diesel to take the manure already here to some factory and then send that same truck back here to use it on my land'.[4]

The farmer refers to the fact that farmers can only apply a limited amount of nitrogen and phosphate to the land, and the remainder must be exported. Because of this, many businesses offer solutions to farmers to respond to these policy restraints. For example, the company Bio-NP offers to use the 'minerals and nutrients which are present in the manure in an optimal way. The manure is converted into energy, fertilizer and high-quality struvite granules. The residual product can be applied on your own land for fertilization' (Bio-NP, 2024).

Secondly, the farmers were also worried about the sometimes *unfair procedures* that classify farmers as fraudsters if they do not strictly follow the Dutch manure policy. The term manure fraud is used for different situations: from the dumping of manure to incorrectly registration of farm land. Minister Schouten stated that fraud must be addressed and stopped for the manure policy to be effective (Schouten, 2018). Farmer 4 thinks that better procedures and distinctions should be in place to identify when people deliberately dump manure and those who try to do the right thing but make a genuine mistake filling out forms: 'A judge will rule differently for someone who accidentally leaves something in his shopping cart or someone who defrauds hundreds of supermarket branches through phishing (farmer 4)'.

Due to the current system of fines, this nuance is not transparent. It has been an issue since (at least) 2016 concerning the manure policy, with many agricultural entrepreneurs stating that there should be a differentiation between intentional and unintentional fraud, e.g. from accidentally filling out forms incorrectly (de Lauwere et al., 2016). In

addition to this, farmers reported that it was often difficult to fill out their exact situation because of the specific questions and black-or-white sections in the forms. Furthermore, the view is that intentional fraud will increase if further restrictions are implemented and regulation becomes tighter (de Lauwere et al., 2016).

Thirdly, the farmers stated that the policy required by the Dutch government would cause them to perform actions that they believe are harmful to the grasslands. Since the 1990s, dairy farmers have been encouraged to inject slurry manure into the ground to reduce ammonia evaporation. However, since changes in EU regulation in 2020, dairy farmers are prohibited from both 1) applying for dispensation to apply manure above ground and 2) applying for a derogation to use more cow manure instead of chemical fertilizers to re-balance the nutrients in the ground.[5] This regulation is controversial as a group of dairy farmers fear the consequences for the soil ecology of their grasslands. Farmer 1 agrees with the general notion that injecting manure reduces ammonia emissions but claims that the Dutch agricultural university has shown that how he manages his farm causes fewer ammonia emissions than assumed (Sonneveld et al., 2009). Farmer 1 notes that policymakers do not consider other types of measured data, and these reports end up on the shelf and are never used. Farmer 4 also questions the impact of manure injection: 'Don't we underestimate the role of soil biology in ensuring low emissions and making good use of our minerals?'.

As a result of this policy, farmer 1 decided not to apply for dispensation to apply manure above ground. Because of this, he has to hire a contractor with the machinery to inject the manure instead of doing it themselves, which costs him €10,000 every year. The contractor has heavier machinery, which the farmer believes is harmful to soil ecology. Farmer 1 worries about the effects on soil biodiversity and the possible harm of injecting manure. 'Our impression is that if you have more soil life, you create healthy soil, producing better crops (such as grass and herbs). And you probably have fewer illnesses, but I still have to prove that'. Farmer 4 also noted that injections dry out the soil (because the soil is open) in addition to harming soil life.

Manure injection is needed to reduce ammonia evaporation, so it is better to apply manure during certain weather conditions, such as when there is little wind and rain. The farmer can use this flexible planning, but this is not the case for a hired contractor who delivers a service for many farmers. While manure injections have many proposed benefits, there are also increasing concerns about this method's lack of long-term testing. There have been some recent studies claiming that manure injections may create antibiotic resistance hotspots in soils (Hilaire et al., 2022), alter the spatial distribution of soil nitrate, mineralizable carbon, and microbial biomass (Bierer et al., 2021; Hilfiker et al., 2024), and increase N2O and CO2 emissions and soil ammonium and nitrate (Dittmer et al., 2020).

4.2. Distributive Justice

The farmers noted there was an *unfair economic burden* for implementing the changes required to meet the Dutch manure policy. For example, farmer 3 stated that the high costs for manure removal and contractors were burdensome. The price for removal has risen significantly over the last 10 years due to the stricter manure policy. In addition, dairy

farmers already had to reduce their herd size less than 10 years ago to comply with European emission agreements (Remkes et al., 2020).

The farmers noted that the yearly administration of manure, which every dairy farmer is obliged to execute, is rather complex to understand, so many need assistance from a specialized accountant. They face an unfair distribution of burdens compared with other farmers. Farmer 4 said that she did the manure accounting herself in the past, but once, she accidentally made a mistake and was threatened with a hefty fine, which turned out to be unfounded. They have hired a specialized account since then. She has a master's degree and thought: 'It has been made so complicated that a scientifically trained farmer does not even understand it immediately'. In the past, feed advisors were able to help. However, the liability is economically so significant that they stopped: 'The liability, the fines [and paying back the financial advantage that they supposedly made], and the consequences of a mistake, can become twice the yearly income of a dairy family farm. You simply do not have that'. According to this farmer, the Netherlands Enterprise Agency [RVO] tells farmers it is better to hire an accountant. Farmers can do the manure administration themselves, but they must stay informed of all the rules, which can change yearly. The administrative burden is also equal among dairy farmers despite some farming systems (e.g. biodynamic) posing no risk of creating large amounts of manure surplus. Farmer 5 is unfairly burdened by administrative accounting for only a tiny amount of biodynamic manure.

Secondly, the farmers felt an *unfair advantage* given to organic farms through land distribution and subsidies (farmer 3). Instead of supporting one group over the other, farmer 3 believed that each group should support and strengthen one another (also discussed by farmers in de Lauwere et al., 2016). There is pressure on farmer 3 to extensify his farm, and he is willing to do this, but he does not have access to the resources to make this transition. In addition, the farmers stated that the government usually does not compensate those who have *already* been taking proactive and innovative steps *before* support policies were implemented. Farmer 5 explains that with the new Common Agricultural Policy (CAP), there is renewed attention to greening and subsidies. 'But we have already done it, of course. Is there anything of reward or appreciation for us?'.

Moreover, for dairy farmers that experiment with low-tech, nature-inclusive, low-input and land-based farms (i.e. branded as hay milk or biodynamic farming), it is challenging to get innovation subsidies as currently, most funds go to high-tech solutions. Low-tech solutions are not deemed innovative enough to gain public funding (farmer 5). In addition, little expertise is available about such farming systems in a Dutch context.

4.3. Contributive Justice

Farmer 5 noted that the nutrient cycle assessment tool, which they need to fill out yearly to deliver milk to the factory, is designed for more conventional farmers and does not offer the ability to report their farm accurately. They feel excluded and sometimes stumble upon things that are impossible to put in, although they exist. For example, they cannot report their outdoor deep litter housing system (this involves repeatedly putting straw or sawdust in indoor booths for animals to defecate on, with new layers of litter being added by the farmer) (Van Dooren et al., 2016). 'Fortunately, we only have to

fill it in once a year [. . .] We do not benefit much from it ourselves, and we do not steer our farm management based on the assessment that the nutrient cycle tool provides' (farmer 5).

Secondly, the farmers claimed that LNV often *does not include many viewpoints and scientific findings* to tackle fertilizer policy inclusively and fairly. For example, farmer 2 pointed out that officials at LNV determine manure policy, and they often lack the knowledge to balance climate targets and fertilizer policy accurately instead of more concretely including farmers who work with fertilizers and the land daily. Farmer 3 also indicated frustration with his inability to contribute to policy change and how it does not correspond to daily practice. According to the farmers, topics such as agroecology, soil biodiversity and soil life/biology are insufficiently recognized in the current manure policy, which focuses more on the chemical cycle of nutrients. These types of farmers and their viewpoints are excluded from the debate. Farmer 1 stated that it was unfair that the intensive farming group dominates discussions around Dutch manure policy rather than including a more diverse perspective and range of farmers.

4.4. Intergenerational Justice

Intergenerational justice often has tension with *intra*generational justice, namely, justice for individuals and groups in the present generation. These people may view policies and changes as harmful to their business, detrimental to their livelihood, or simply too cumbersome, which is one of the main problems in the debate around the Dutch manure policy. There is a concern that unsustainable practices will harm biodiversity and resources for future generations. The methane emitted from cow manure contributes to global greenhouse gas emissions, which we need to reduce drastically to ensure a habitable planet.

Firstly, the farmers reflected on the *past actions of farmers and how they affected their current situation*. Farmer 1 explained that the farmers who lived in this area in the 1960s did not want a land consolidation, which means that his farmland is still part of a bocage landscape with wood lanes and small parcels of pastures (Strootman et al., 2020). His father was one of the first directors of the Vereniging voor Agrarisch Natuur en Landschapsbeheer Achtkarspelen (Vanla.nl), an organization of farmers that maintain the natural landscape and gets ecosystem services compensation for this work. Farmer 5 also discussed how her parents started transforming the family farm into a biodynamic and how she has benefitted from these past activities. Farmer 4 said that in her father's time, they would put as much manure on the fields as the crops would tolerate (farmer 4).

Previous generations of farmers created a nutrient accumulation in the soil and water, resulting in stricter regulation for the current generation. Farmers 2 and 3 also discussed how the effects of previous generations of farmers affect the choices available to present generations who inherit those farms. The current generation of farmers is confronted with a surplus of nutrients in the groundwater and surrounding nature, making adding additional nutrients environmentally risky. However, it is also recognized that crops need nutrients if they are extracted from the land to be farmed for longer.

Secondly, farmers also reflected on the future of farming and future generations of farmers (farmer 5). Sustainability regulation will make it harder for them to farm. Farmer 2 indicated that the future looks quite challenging, with uncertainty around farming in the Netherlands.

Table 2. Justice issues identified in our interviews.

Type of Justice	Issues Identified
Procedural Justice	1. Pressure to conform to sustainability policy while keeping their freedom and control over their farm
	2. Labelling of fraud for unknowingly filling in forms incorrectly
	3. The current manure policy also causes harm to the soil ecology
Distributive Justice	4. Economic burden to farmers to adopt policies
	5. Advantage is given to biological farms
	6. Advantage is given to high-tech innovations
Contributive Justice	6. An intensive farming group dominates manure policy
	7. LNV excludes alternative viewpoints and scientific findings to tackle fertiliser policy
Intergenerational Justice	8. Past generations have caused problems with the soil and water quality
	9. Sustainability policy will make it difficult for future farmers and the industry because of the unfair burden placed upon them
	10. The government is not doing enough to protect the future of farming

He noted that five years ago, there were a lot of easy options for better sustainability practices, but now it is much more difficult. For example, a farmer wants to reduce methane emissions, but the feed they need costs more and increases ammonia emissions.

Farmer 2 also expressed concern about the industry's future in the face of climate change: 'And the climate challenge. How do we meet everything and still keep the business going?' (farmer 2). He expanded by asking: the methane released from cows will cost a lot of money, but who will pay for it? If the government or the consumer does not, this burden will be left to the farmer (farmer 2). According to farmer 2, we are now entering unknown territory, and there is uncertainty about integrating different sustainability objectives when they clash. Sometimes, policymakers discuss manure policy and, at other times, climate change goals, but there is minimal discussion on how farmers should balance the two.

Thirdly, there were many indications of what should be done to protect Dutch farming. For example, the sector should defend itself, and the government should create awareness and assist farmers rather than only implement coercive measures (farmer 2). Some farmers are pressured to conform to restrictions and feel they cannot continue in the industry (farmer 3). For example, farmer 3 stated that he has thought about farming abroad because of Dutch policies but has stayed farming in the Netherlands because his family and friends are here, and he has a lot of passion for farming.

The ten justice issues concerning manure policy can be seen in Table 2.

5. Discussion and Conclusion

The tension between sustainability policy and the injustices felt by Dutch dairy farmers could be classified as a *wicked problem* with no easy or straightforward answers (Hisschemöller & Hoppe, 2018; Poeck et al., 2017). Wicked problems are surrounded by uncertainties, low consensus on the required and available knowledge, and far from agreements on norms and values at stake (Poeck et al., 2017). Wicked problems involve many stakeholders with conflicting ideas about the problem precisely and diverse ideas regarding effective solutions. Two common responses to wicked problems by policymakers are paralysis and overestimation (Termeer & Dewulf, 2019) (see Box 1 for a definition of wicked problems).

Box 1. Wicked problems.

The term 'wicked problems' originated from a 1973 Rittel and Webber article summarizing ten attributes of social and scientific or technical problems. A wicked problem is commonly understood to be an issue that is complex or impossible to solve. The reason for this difficulty can vary from incomplete, contradictory, or misleading requirements. The solution is not evident; there is typically no single solution, and even when a solution is found, it may not be desirable for all or even resolve the problem entirely. Wicked refers to resistance and disagreement about the resolution, and even if a resolution is found, it does not necessarily mean the problem will stop. A wicked problem is also usually tied up with many other wicked problems, and trying to solve one or even aspects of one often creates or exacerbates the issue. Wicked problems may lead to policymakers becoming paralyzed about what decision to take or an overestimation that specific policies will quickly solve the tensions and issues raised by the wicked problem.

As was shown in the previous sections, there are many tensions between sustainability policy on the one hand (e.g. the Dutch manure policy) and feelings of injustice toward those required to abide by these policies (e.g. Dutch dairy farmers). In the agricultural domain, there are increasing tensions between farmers and policymakers in Europe. The EU is mandated to reduce carbon emissions, reduce biodiversity loss, and implement better sustainability measures for the future of Europe and the planet. However, farmers do not have a problem with sustainability policy per se; they have a problem with sustainability policy that they believe to be overly strict and complicated, blaming them for the mistakes of other farmers in the past or very costly burden on farmers (i.e. justice issues 4, 8, and 9 from Table 2).

One example of this *wickedness* is the difference in views between Dutch farmers and the government on the best approaches. Farmers did not see the government's measures, such as underground manure injections, as practical and ecologically sound (i.e. an overestimation of policy) (i.e. justice issue 7 from Table 2). This issue was also addressed in the 2018 Rathenau report, where the participants from the livestock sector stated that policy measures (that prescribe how livestock farmers use their manure to reduce ammonia emissions) do not correspond to management in which healthy soil is central (i.e. justice issue 3 from Table 2). For that reason, several farmers are against the compulsory injection of manure into the soil. They say manufacturing injection 'contaminates' the soil (Munnichs & de Vriend, 2018, p. 18).[6]

Unfortunately, the same perspective was illustrated in our interviews. Some of the sentiments during the interviews were that Dutch and EU policy is based on incomplete data, does not account for alternatives, and that the resulting measures are expensive to implement (i.e. justice issue 7 from Table 2). Farmers were highly skeptical about the scientific merit and integrity of the studies that underpin Dutch manure policy. Many interviewees emphasized an 'us versus them' dichotomy, which prevailed in similar studies with Dutch farmers (de Lauwere et al., 2016). The interviewed farmers felt that their views were not considered, and they were forced to follow guidelines outlined by policymakers, even though they disagreed with them (i.e. an infringement on their freedom and control of their farm, as seen in justice issue 1 from Table 2). Farmers often claimed their approaches were more environmentally sound or sounder than the government's (interviewee 2). Therefore, the intricacies and uncertainties within different scientific findings make providing only one policy solution challenging (i.e. justice issue 7 from Table 2).

An additional (but related) problem with different approaches to sustainability is that it is not easy to offer a single categorical 'best approach' in complex situations involving many other types of ecosystems and with uncertain outcomes. For example, while one practice may be beneficial for reducing methane emissions, it may not be so good at lowering nitrate emissions (i.e. making it confusing and difficult for farmers to implement sustainability policy effectively – see justice issue 9 from Table 2). This issue was also addressed in the de Lauwere et al. (2016) report, with respondents stating that there are so many different sustainability policies that it is often challenging to balance them all and know which ones are the best to take (de Lauwere et al., 2016). This lack of consensus can confuse, delay, and paralyze discussions and resolutions.

Another wicked problem revolves around the feeling that one is not being listened to or included in policy dialogs (i.e. justice issue 6 from Table 2). The interviewed farmers felt that they were being left out of the discussions and that there was an insufficient dialogue between the affected stakeholders (see also Munnichs & de Vriend, 2018). However, the Dutch government has been active in this regard and organized four stakeholder meetings (Ministerie van Algemene Zaken, 2019) to fundamentally rethink manure policy to make it simpler, more effective, and more future-oriented. In September 2020, LNV presented the contours for future manure policy (Schouten, 2020), resulting in more critical responses from farmer's organizations. While inclusion and communication are essential for policy to move in the right direction, simply increasing dialogue will not solve wicked problems, especially if it is felt that only certain groups are given a voice in these discussions (i.e. justice issue 6 from Table 2).

Instead, more significant efforts must be made to help farmers implement these policies (i.e. justice issue 10 from Table 2). The Dutch government must provide more than top-down policies that farmers must abide by. They must also offer different support infrastructure, guidance, collaboration, and co-development steps to ensure this just transition (i.e. justice issue 9 from Table 2). In response to the wicked problems posed by the Dutch manure policy case study, there is a middle-ground between paralysis in the face of animosity and protests against the sustainability policy on the one hand and simply implementing top-down restrictions and expecting farmers to toe the line without any real clear and practical guidance on how to do this (thus, making them feel like they have no freedom or control over their farms – i.e. justice issue 1 from Table 2). This point was very clear in the interviews, with most farmers stating that the government needs to be more flexible and accommodating with the very challenging requests it poses to farmers (this was also reflected in the literature, see.

Therefore, instead of watering down sustainability goals, which creates environmental justice issues, governments should invest in making their targets more achievable and motivating farmers to work on these sustainability goals (i.e. the 'more' which needs to be done to help farmers meet sustainability goals – see justice issue 10 from Table 2). For example, our study illustrates (e.g. farmer 2 states this) that it is difficult for farmers to become land-based due to high prices and restricted availability of land. Earlier studies have also shown that many farmers feel stuck in a specific farming system, among others, due to economic dependencies and the lack of collectively sharing transition risks (Hoes et al., 2023; Meuwissen et al., 2020; Siebrecht, 2020; Vermunt et al., 2022; Vrolijk et al., 2020). This point suggests that many farmers cannot simply adopt new ways of farming

and that changes are also needed at the chain (processing, distribution, consumption) and policy levels (i.e. justice issue 10 in Table 2).

At the policy level, investments could be made to collectively develop a shared vision of the future on a local scale that energizes, connects and fits into a European context. In addition, instead of primarily targeting policy at the larger group of dairy farmers who need to take steps to become more sustainable, the investment could be made in identifying, appreciating and supporting the development of pioneering alternative dairy farmers that develop sustainability solutions that satisfy all parties (i.e. 'small wins' where instead of only dwelling on the most prominent issues, one focuses on trying to resolve smaller, more achievable, challenges and opportunities for positive gains) (see Termeer & Dewulf, 2019; Termeer & Metze, 2019).

In the Netherlands, the Field Lab arrangement is a policy instrument that could support the real-life testing of bottom-up solutions. Here, farmers, researchers and other actors can get funding to develop technological and social innovations that contribute to farmers, nature and a liveable countryside (i.e. not only giving advantage to biological or high-tech farms, a criticism seen in justice issues 5 and 6 in Table 2). In addition, the current area-oriented approach by the Ministerie van Landbouw, Natuur en Voedselkwaliteit (LNV) (the Ministry of Agriculture, Nature and Food Quality in English) (Ministerie van Landbouw, Natuur en Voedselkwaliteit, 2023) might assist in shaping shared integral future visions at a regional scale that include environmental and farmers' justice. For this area-oriented approach to make progress on the diverse sustainability goals, the government has earmarked €24.3 billion (Rijksoverheid, 2023). During the writing of this article, the progress of these policies was somewhat uncertain due to the collapse of the Dutch coalition in 2023 and the current negotiation for a new coalition.

Essentially, to avoid paralysis and overestimation, the Dutch government needs to take a multi-tiered approach for their sustainability agendas to be successful. There needs to be dialogue and collaboration with farmers, the co-development of achievable and practical goals; they need to work with farmers to try innovative methods for implementing sustainable approaches, and there need to be local and regional organizations involved to identify nuances and differences on a local and regional scale. There needs to be a responsive policy agenda grounded in the sound scientific, economic, and social reality of achieving these goals. Adopting a justice-focused approach to wicked problems, policymakers can better identify some of the main issues and concerns felt by farmers. By doing so, policymakers can develop better policy approaches that are fair and considerate for those expected to implement and fulfill sustainability policy, creating (both) just and sustainable farms of the future.

5.1. Limitations and Future Research

This study focuses on the perspective of dairy farmers and does not include the perspective of policymakers, as this was impossible within the time, budget, and project constraints. The focus of this paper is to provide a starting point on justice concerns and issues about sustainability policy, so we wanted to encapsulate farmers' perspectives on policy fully. Therefore, it only portrays the viewpoints of farmers. However, identifying some of the concerns from the farmer's viewpoint is an essential first step.

Furthermore, the interviews were carried out before the establishment of the Nature and Nitrogen Policy, before the buy-out plans, and before the loss of EU derogation (where dairy farmers could use more animal manure per hectare for the nutrient needs of their land under strict conditions). Therefore, future research would benefit from focusing on the effects of these recent events and how farmers in the Netherlands have felt them.

Notes

1. https://www.pbl.nl/sites/default/files/downloads/pbl-2020-nationale-analyse-waterkwaliteit-4002_0.pdf.
2. Biodynamic agriculture has overlaps with organic farming and takes an integral system perspective to farming.
3. In addition to nutrients, adding carbon is seen as an important benefit of manure as this improves soil quality.
4. The government would present the new manure policy in September 2022, but during the writing of this article this manure policy was still not presented.
5. https://www.rvo.nl/onderwerpen/agrarisch-ondernemen/mest/gebruiken-en-uitrijden/hoe-mest-uitrijden/mest-bovengronds-uitrijden.
6. All of the quotations from the Rathenau Instituut Report were directly translated from Google Translate.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Funding

The authors would also like to acknowledge funding from the Wageningen University Knowledge Base programme: Towards a circular and climate neutral society (Project KB-1-1D-1): Governance in transitions (Subtheme 1D), that is supported by funding from the Dutch Ministry of Agriculture, Nature and Food Quality.

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