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RESEARCH ARTICLE

A new green revolution or agribusiness as usual? Uncovering alignment issues and potential transition complications in agri-food system transitions

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Abstract
Agri-food system transitions are a considerable challenge requiring stakeholder alignment on what changes need to be made and how. When stakeholders do not agree on the goals or methods of a transition, this can be a serious obstacle to success. This paper analyzes 42 vision documents for the future of Dutch agriculture from a broad range of stakeholders to determine stakeholder alignment using an inductive coding approach. We identified 23 issues as the main challenges for the transition in these documents. We are the first to categorize them according to a recently proposed problem-solution space for wicked problems. Stakeholders were fully aligned in recognizing the problem for the majority of issues, but showed agreement on solutions for less than a quarter. For the issues of international orientation, sector size, and farm business models, we found a lack of consensus on the problem, indicating fundamental disagreement about the type of agricultural sector desired by stakeholders. The apparent consensus on environmental and social issues provides clear societal expectations for agronomic development and innovation, while the divergence on economic issues highlights the rift between growth-oriented paradigms and more holistic paradigms like agroecology. The crucial empirical novelty of this paper is that progress on environmental and social matters is restricted by divergent views on the economic characteristics of a future agri-food system, adding further complexity to mission-oriented transition and innovation policies.

Keywords Agri-food system · Sustainability transition · Vision · Mission-oriented innovation · Stakeholder alignment · Normative contestation

1 Introduction

There is a great need and urgency to imagine different futures for our agri-food systems, as these systems are now increasingly seen as fundamentally unsustainable. They threaten to push ecological systems beyond safe boundaries and undermine their future productive potential through strains on soils, water, air, and functional biodiversity (InterAcademy Partnership 2018; Springmann et al. 2018). Furthermore, agri-food systems are locked into logics and processes like an overemphasis on cost-price reduction that contribute to these unsustainable outcomes, and because of this lock-ins are resistant to change (Oliver et al. 2018; Plumecocq et al. 2018). A transformation of the ways in which we produce, process, trade, and consume food is therefore urgently needed (Gaitán-Cremaschi et al. 2019; Willett et al. 2019). Transforming such a large complex system also needs to be a collective effort, especially because of the economic interests of the large number of actors involved. In the EU alone, there were 9.8 million farm owners in 2016 (European Commission 2020). Changing the rules, structures, and incentives that currently lead to the unsustainable outcomes outlined above requires a broadly shared understanding, or vision, of what needs to be different in the future (Caron et al. 2018). Such a vision can guide transformations, including the necessary agronomic innovation, setting a distant but desirable and achievable goal (Ostrom 2009; Wiek and Iwaniec 2014).

Visions play a crucial role in changing the dynamics and outcomes of large, complex systems because they

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Fig. 1 Contrasting visions for sustainable dairy farming, showing an efficiency-focused approach with manure fermenter and low-diversity field (left) versus a diversity-focused approach with free range grazing integrated with fruit trees (right). Both photographs by Jerry van Dijk.

portray a desirable future state for a system that is currently not meeting societal needs or staying within ecological boundaries (Fig. 1) (Bui et al. 2016; Folke et al. 2005; Geels 2002; Hekkert et al. 2007; Loorbach 2010; Walker et al. 2002; Wanzenböck et al. 2020). Visions are part of a broader set of directionality-providing futuring and foresight outputs that include future images, i.e., "iconic symbols that mediate the exchange of values, ideas and information" (Beers et al. 2010, p. 724); scenarios, i.e., explorations of "how the future may unfold … from a defined initial situation" (Mitter et al. 2020, p. 2); and transition pathways, i.e., "patterns of changes in sociotechnical systems unfolding over time that lead to new ways of achieving specific societal functions" (Turnheim et al. 2015, p. 240). As such, visions are more overarching and forward-looking than images; less grounded in the status quo as a starting point than scenarios; and more static—presenting a future *state* rather than a change *process*—than transition pathways. Like images, visions can be explicit or implicit, and rhetorical or written down (c.f. Sovacool et al. 2019). Unlike scenarios, which tend to rely on some form of quantification or following a formalized methodology and are thus mostly developed by experts, visions are often generated by non-expert stakeholders and through multi-stakeholder initiatives. Being broader than scenarios, visions can act as a starting point to describe in detail and quantify scenarios that fulfill the general desires set out in a vision; transition pathways can then be developed to lay out the steps required to reach a scenario.

Studies of innovation systems in the agricultural domain frequently highlight a lack of direction for a practice or technology, variously due to a lack of coordination between actors (Turner et al. 2016), divergent agendas of actors (Menary et al. 2019), "lack of a common vision and policy coordination problems" (Sixt et al. 2018), or a lack of focus by responsible government agencies (Schiller et al. 2020). Commitment to the outcome of a foresight exercise is important for follow-up and implementation; this can be compounded when various actors try to implement competing or not fully aligned visions (van der Meulen et al. 2003). Furthermore, implementation gains traction when pursued through networks and processes of social learning, highlighting the importance of alignment (ibid). The increasing mission orientation of policy-making, including in the agricultural domain, provides a framework to formalize the follow-up to visions by linking the desired future state to coordinated structural change policies (or missions) to achieve this state (Hekkert et al. 2020; Klerkx and Begemann 2020; Pigford et al. 2018; Wanzenböck et al. 2020).

Because of the often normative and value-laden stances of practitioners and even researchers, notions and concepts pertaining to the future of agri-food systems are often contested (Plumecocq et al. 2018). Two illustrations are the "land sparing versus land sharing" debate (Mockshell and Kamanda 2017; Phalan et al. 2011; van der Windt and Swart 2018) and the recent critical scholarly examination of regenerative agriculture (Giller et al. 2021; Newton et al. 2020; Schreefel et al. 2020). While not all stakeholders in the transition of a large, complex system like an agri-food system need to share a uniform vision, a higher degree of alignment is beneficial to bringing about change in such a system for reasons of efficacy and legitimacy (Weber and Rohracher 2012). This is especially the case when the transition is of a more fundamental, transformative nature and where transitions are mission-oriented (Hekkert et al. 2020).

This paper proposes a method to determine the degree of alignment between stakeholders on diverse issues in the transition of a large, complex system. This approach is valuable for those wishing to better grasp future trends and potential areas of friction in transitions. Using the Dutch agri-food system transition as a case study and vision documents by stakeholders as the empirical material, it asks how the exploration of alignment between visions of stakeholders on diverse issues in this transition can help identify where momentum can be created, as well as where tension or conflict is likely. This enables scholars and transition stakeholders to prioritize negotiation, experimentation, and research avenues for such a transition.

Table 1 Problem-solution space to contextualize missions. Creating alignment on a wicked societal challenge is a result of the shared recognition of a problem (column headings) and agreement on solutions to that problem (row headings).

	Diverging views on the problem	Converging views on the problem
Diverging views on solutions	"Disorientation"	"Problem in search of a solution"
Converging views on solutions	"Solution in search of a problem"	"Alignment"

2 Materials and method

2.1 Theoretical framework

The function of visions in changing large, complex systems is to guide the development of innovation (Bui et al. 2016; Hekkert et al. 2007; Wanzenböck et al. 2020); to help set long-term goals and targets (Folke et al. 2005; Geels 2002); to help formulate change agendas and their monitoring frameworks (Loorbach 2010); and to set the boundaries for scenario development (Walker et al. 2002). Visions can offer powerful "leverage points" to intervene in such systems (Meadows 1999), and their absence is a common form of "directionality failure" hindering transformative change (Weber and Rohracher 2012). The concept of directionality is key to our analysis, and we operationalize it in Section 2.4.2.

The literature on visions presents vision development as a fairly straightforward process, where a group of stakeholders and experts deliberate on the system's problems and its desired future, and then produce a shared vision. This is the case for both socio-ecological systems governance and transition management frameworks (Folke et al. 2005; Loorbach 2010). Such a process is possible where a relatively small system is concerned, e.g., in the case of a particular technology (c.f. Truffer et al. 2008) or landscape (c.f. Folke et al. 2005) where the majority of stakeholders can be gathered in a "transition arena" to reach consensus. Such a process is also possible in the context of food and agriculture where particular production systems are concerned, as for example in the design of new poultry husbandry practices (Klerkx et al. 2012).

Where larger, more complex systems like a nation's agri-food system are concerned, a more complicated process of negotiation and alignment is usually needed to reach consensus: the nature of the transition itself is more complex, because of system size and complexity; the interests and underlying beliefs of different groups can diverge significantly, meaning more divergent worldviews need to be bridged; and an alignment of expectations within a specific actor group on a specific issue needs to be further "collectivized," i.e., shared between stakeholders in different sectors (Truffer et al. 2008). Exogenous events like an outbreak of avian influenza or food safety scandals can catalyze such processes of negotiation and alignment, although more commonly a lengthier process of policy learning and argumentation in public discourse is required (Bulkeley 2000; Sabatier 1988). This is echoed in the field of policy studies, where social learning is recognized as a governance and negotiation mechanism (Ison et al. 2014). This has been applied in agri-food system research pertaining to participation in rural development (Leeuwis 2000), the reconfiguration of power dynamics in various case studies (Rossi et al. 2019), and conflict resolution in innovation platforms (Turner et al. 2020). We operationalize alignment as an outcome of such a social learning and negotiation process in Section 2.4.2 below.

Recent attempts at operationalizing a mission-oriented perspective on innovation and dealing with societal challenges acknowledge this: societal challenges become relatively less wicked if stakeholders converge on an understanding of the problem and then converge on a solution to that problem. This has been conceptualized as a "problem-solution space to contextualize missions," where divergence on both the problem and solutions is characterized as "disorientation" while convergence on both the problem and solutions is characterized as "alignment" (Wanzenböck et al. 2020; see Table 1). Section 2.4.2 below will operationalize this framework further.

Without consensus on societal expectations, sustainability transitions may be hampered. A divergence of visions or lack of clarity on societal expectations can lead to uncertainty about technological developments, their legitimacy, and potential uptake, thereby hindering entrepreneurial activity and innovation (Meijer et al. 2007; Negro et al. 2008). At a system level, dominant structures and power relations can remain locked-in if the challenge of alternative visions lacks concentration and support from a wide group of stakeholders and coalitions (Sovacool et al. 2019). Such situations are especially the case if dominant regime actors are particularly powerful and can influence policy and discourse (Geels 2014). We define regime in line with Geels as the "semi-coherent set of rules carried by different social groups

… providing orientation and co-ordination to the activities of relevant actor groups, [thereby accounting] for the stability of ST-configurations" (Geels 2002, p. 1260). In agri-food systems, this is the case when there are relatively few but powerful actors at certain points in the value chain. In the EU for example, there is high market concentration in both upstream and downstream markets, and value capture has increased significantly for retailers while it has decreased for farmers in the last 20 years (van der Ploeg et al. 2016). Such actors are strengthened by the fact that they are part of the current regime of modern agri-food systems, which is tailored to their business model, and by their ability to mobilize a discourse of output maximization in the interest of feeding a growing world population (De Schutter 2017).

At the same time, regimes are not monolithic: there is often, in practice, not one universal regime but rather a set of coexisting structures guided by different logics and responding to different kinds of societal expectations; regimes are in fact characterized by "institutional tensions and contradictions" as a result of different degrees of institutional coherence (Fuenfschilling and Truffer 2014; Niederle 2018). This means that a divergence in visions for food and agriculture need not necessarily translate to stalling the transition but offers the potential for different "subsystems" to go through their own transitions and for diverse transition pathways to emerge (Gaitán-Cremaschi et al. 2019). The development of such pluriform systems-within-systems can be possible if the institutional configuration and coherence of the regime allows this and if there is a relative absence of uncertainty for the "subsystem" in question. A period of contestation over visions and expectations can also be interpreted as a sign of society debating and sorting out its options for viable and legitimate transition goals (Smith and Stirling 2010). Furthermore, societal challenges "will be contested, will be negotiated, and will evolve over time" (Kuhlmann and Rip 2018, p. 451).

Ultimately then, the expression of visions can be seen as an important factor in societal contestation and negotiation. This is so not least because visions are an aspect of actors' discursive strategies, which can have a considerable impact on institutions (Beers et al. 2010; Hajer 2005). The framework we develop in this paper can help to better understand these processes by which society deals with urgent, complex, and evolving challenges. We apply it to the case of Dutch agriculture, which we introduce in the following section.

2.2 The Dutch agricultural transition

The Netherlands is highly efficient in the production of bulk food products for export. This is the result of social, economic, and technological trends in the second half of the twentieth century as well as policy responses to these trends (Council for the Environment and Infrastructure 2013; de Haas 2013; van der Heide et al. 2011). The main sectors are dairy farming, open and greenhouse horticulture, and arable farming (FAO 2020). While highly productive, this system has led to a range of negative externalities: agriculture accounts for 15% of the country's greenhouse gas emissions (Coenen et al. 2018); it has had a devastating impact on biodiversity, especially insect and bird numbers (Planbureau voor de Leefomgeving 2014); excessive nitrogen deposition has led to biodiversity loss in protected nature areas (Heer et al. 2017); excess ammonia, odor, and fine dust emissions impact air quality near livestock farms, contributing to increased incidence of respiratory disease (Planbureau voor de Leefomgeving 2018); ground and surface water quality are negatively affected by nitrogen and phosphorus losses, as well as the application of biocides (Berkhout et al. 2018; Centraal Bureau voor de Statistiek 2020); there is high income inequality between farmers and the rest of society, with two thirds of farmers earning less than a modal income; and farmers are furthermore reportedly at higher risk of suicide and Parkinson's disease, as well as feeling unfairly criticized by society (Joosten 2020; Natuur and Milieu 2017; NOS 2019; Trouw 2018).

While the future of agriculture in the Netherlands and elsewhere in the EU has been debated and contested for some time (Dijksterhuis et al. 2007; Fischer et al. 2012; Mansholt 1972; Veldkamp et al. 2009), two developments have recently sparked the discourse. First, in 2018, the Dutch ministry of agriculture published a vision for a transition towards circular farming as a solution for the problems identified above (Dutch Ministry of Agriculture 2018). Second, in 2019, the Council of State (the country's highest administrative court) has ruled that the current policy to alleviate the impacts of nitrogen deposition in nature areas is at odds with EU policy agreements and therefore needs to be revised completely (Schaart 2019). The ruling on nitrogen policy especially has put high pressure on agriculture to change, because it is the largest sector responsible for nitrogen emissions. Previous policies have led to emission reductions of for example nitrogen and greenhouse gases overall, but the rate of reduction is stagnating, legal targets for nitrogen deposition and water quality are not being met, and ambitious climate targets are looming (Berkhout et al. 2018). In the past, the main business strategy for most farmers had been a reduction of the cost of production through an increase in scale and efficiency. This was in line with post-WW2 policy goals of keeping food prices low and contributing to a positive trade balance (de Haas 2013; van der Heide et al. 2011). While continued efficiency and output gains are no longer necessary for food security and affordability in Europe, the underlying economic logic of cost price competition prevails and the system is locked into unsustainable dynamics (Vink and Boezeman 2018). After the Council of State verdict on nitrogen policy, however, it has become nearly impossible

for farmers to get a production or expansion permit while continuing to adhere to such a business strategy.

Various stakeholders have been responding to these issues and to external incentives to change such as the Paris Climate Agreement. This takes many forms: farmers and consumers are experimenting with alternative farming practices and value-adding processes, like strip farming crop rotation or processing beer brewing side streams into breakfast cereal (ERF BV, 2019; Instock, 2019). Other initiatives aim to bring consumers and producers closer together, such as community-supported agriculture (Van Oers et al., 2018). At a high policy level, the Dutch government has defined six food- and agriculture-related innovation and sectoral policy missions (Dutch Ministry of Economic Affairs and Climate Policy, 2019). Also, concurrently with and partly in response to the vision of the Ministry of Agriculture, farmers' associations (LTO, 2017), civil society organizations (Natuur and Milieu 2017), and research and advisory institutes (Council for the Environment and Infrastructure 2018) have produced their own visions. This increased "visioning activity," together with the increased pressure to change, presents an interesting case to study which futures are being sketched for Dutch agriculture, how they overlap, and what the expected impact on the transition as a whole may be. More broadly speaking, this transition is emblematic of how diverse groups of stakeholders attempt to deal with complex societal challenges or "wicked problems." Actors whose interests, norms, and values are not always aligned need to collectively determine how to address an agroecological crisis within the boundaries of liberal democracy and free markets; this is the case across the EU (European Commission 2019) and other advanced economies such as Great Britain (Department for Environment Food Rural Affairs 2018).

2.3 Materials

This paper analyzes vision documents for the Dutch agricultural transition. A vision document is a written portrayal of a desired future state. We developed a threefold search strategy: a simple Google search; a more targeted search in the Lexis Nexis news archive; and via the researchers' network. Lexis Nexis covers 40,000 news sources from the past four decades (http://academic.lexisnexis.nl/). For both the Google and news archive search, the following search terms (and their Dutch equivalents) were used: "Vision" OR "strategy" OR "future;" AND "farming" OR "agriculture" OR "food system;" AND "Netherlands" OR "Dutch." Furthermore, stakeholders involved in ongoing research projects of the authors were asked to provide us with vision documents their respective organizations had developed. This search strategy yielded 57 vision documents. To be included in the analysis, the documents had to fulfill the following criteria: publication since 2015 (to ensure that the foresight activities of different actors occurred in a similar post-Paris Agreement context and reflect the current position of the actor publishing the vision, to enable a reasonable comparison between visions); contain the expression of expectations of the future of the Dutch agri-food system or its impact on broader social and ecological systems; not be merely a forecast or extrapolation based on the current state of the system; not be a description of practices or principles applied in the present. This yielded 42 documents, which are listed with name, name of the publishing stakeholder, and the type of that stakeholder in supplementary materials C.

2.4 Method of analysis

2.4.1 Identification of issues

Documents were inductively coded to identify issues discussed in multiple documents. This created distinct categories of statements concerning the state of the Dutch agri-food system. We chose a data-driven rather than a theory-driven approach (*cf.* Fereday and Muir-Cochrane 2006) so as not to impose thematic categories *a priori*. The issues are as follows:

1. Agrochemical use
2. Antibiotics use
3. Biodiversity levels
4. Diet shift
5. Farmer livelihoods
6. Farmer-society relationship
7. Food waste
8. GHG emissions
9. Growth and scale of the sector
10. Human health
11. Individual farm business models
12. International food and feed trade
13. Meadow grazing
14. Mega barns
15. Nature areas
16. Nutrient circularity
17. Recreation
18. Regulatory intervention
19. Renewable energy production
20. Soil
21. Water availability
22. Water quality
23. Young farmers

A short review of the current state concerning these issues can be found in supplementary materials A. It shows that issues identified match current sustainability problems in Dutch agriculture. The documents analyzed differed in the extent to which they mentioned current problems:

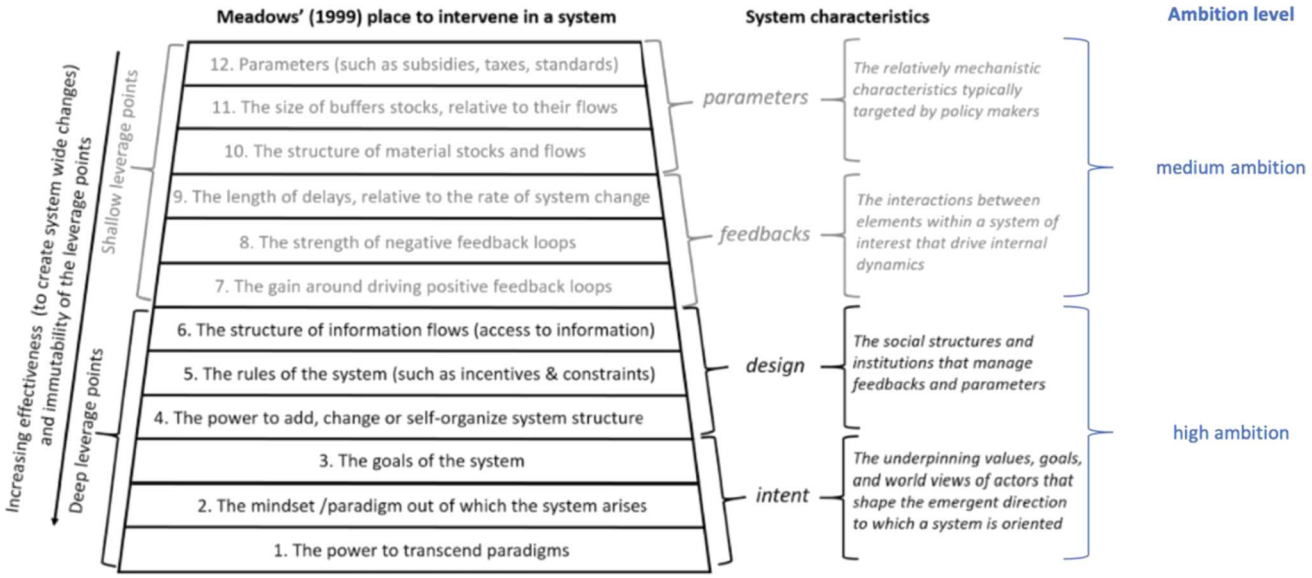

Fig. 2 Leverage points, system characteristics, and corresponding ambition level, modified from Abson et al. (2017). Vision statements not addressing any leverage points were classified as "low ambition."

while some prefaced the vision of the future with an explicit description of the current situation (to justify and legitimize the vision), others omitted this and described only the future in a positive tone with different degrees of explicit justification. For example, while one document may describe at length the negative effects of nitrogen and phosphorus emissions before describing a future in which nutrient cycles are closed, another document may only state that in the year 2050, all nutrient cycles are closed at the farm level.

Having coded all documents according to these issues, the number of distinct vision documents making a statement on an issue was counted. Assuming that more frequently mentioned issues reflect actors' perceptions of the importance of an issue, these issue frequency counts give an indication of the priority of different issues in the Dutch agricultural transition. We acknowledge that there is a need to also look at the nature, specifically the power, of the stakeholders making statements on an issue; this is dealt with in the third step of the analysis (Section 2.4.3).

2.4.2 Determining alignment

To determine alignment between stakeholders on the issues identified, statements were classified according to the *direction* and *ambition* of the statement. Speaking metaphorically, direction refers to the "dot on the horizon," while ambition refers to the desired rate and/or level of change. This second level of analysis allowed us to identify what kind of change relative to the status quo a vision contained, how drastically this change ought to be achieved, and the extent to which this is shared between stakeholders. As our focus is on the alignment between a variety of stakeholders publishing vision documents independently of each other, we do not assess the internal coherence or validity of individual vision documents. We measure alignment by analyzing whether stakeholders articulate standpoints in the same direction and with the same level of ambition.

For direction, the variables were binary: change in a progressive direction on the one hand or maintaining the status quo on the other hand. For the issue of "diet shift" for example, some actors may advocate for less meat consumption whereas others may advocate for the currently prevalent diet. Direction is expressed as a single percentage, with 90% "for" implying 10% "against" and so on, expressing the proportion of stakeholders in agreement on a problem.

For ambition, three possible levels—low, medium, or high—were assigned based on Donella Meadows' hierarchy of leverage points to intervene in a system (Meadows 1999). This framework sets out an impact achievability ranking of possible interventions in complex systems, ranging from adjustments to parameters (easiest to achieve, lowest impact) to transcending paradigms (highest impact but most difficult to achieve). It has been adapted to the sustainability transitions field, for instance to identify how different types of leverage points address different system characteristics (Abson et al. 2017). Following Abson et al. (2017) and as shown in Figure 2, we hold that an actor can advocate for deep, transformational change in their vision by stating a desire for change of the system's design and intent (deep leverage points—high ambition level); they can espouse less fundamental changes to the system's parameters and

feedbacks (shallow leverage points—medium ambition level); or they can make more superficial affirmations of norms and values underpinning the system without addressing any leverage points (no leverage points—low ambition level). For each issue, the proportion of statements falling into each ambition level is expressed as a percentage, producing three indicators.

To give an example, acknowledging the importance of soils with a statement such as "soil health is important" would be classified as low ambition: the statement does not address any leverage points or imply any changes. Aiming for increased soil organic matter would be classified as medium ambition, as it relates to a change in the parameters of a stock without any higher-level system changes. A high ambition in this example would be to let the soil's production capacity define the use of the land, indicating a paradigm shift from output maximization to agroecology.

Our variables of alignment on direction and ambition can be transposed onto two common features of the frameworks reviewed in Section 2.1: the need for a shared understanding of a problem, or more broadly speaking the fact that transitions need *some* normative guidance or directionality, and the subsequent need to formulate expectations of *how* a problem is to be solved in the future. These two dimensions align with the axes of the "problem-solution space" by Wanzenböck et al. (2020), shown in Table 1. Agreement on direction is presented, in terms of this framework, as alignment on the problem: a statement in the direction departing from the status quo indicates that there is a problem with the current situation, whereas a statement against change or affirming the status quo indicates that there is no problem with the current situation. Likewise, agreement on ambition is presented as alignment on solutions: the different ambition levels signify different types of solutions, and when stakeholders share an ambition level, they can be said to converge on a solution. This is not to say that agreement on ambition signifies agreement on a specific, concrete solution. Rather, we argue that when actors have similar views of a type of solution for an issue, they are likely to then support and implement concrete solutions as they become clear. Table 2 below describes all three ambition levels, details the types of solutions they correspond with, and gives examples from the data.

For the purposes of this paper, issues showing 90% agreement on direction or more were included in the category of issues showing full alignment on the problem. This is based on the assumption that if between 10 and 20 statements were made on an issue, one or two stakeholders (10%) would not be powerful enough to detract from the overall convergence of views on the problem. Similarly, issues with more than 80% agreement on ambition level were considered as essentially converging on the solution; note that the lowest possible value for ambition is 33%, as opposed to 50%

Table 2 Descriptions of ambition levels, types of solutions, and examples from the data.

Ambition level	Description	Type of solutions	Example
Low	Leverage points are not utilized; superficial treatment of the problem	Recognition of the problem; rhetorically ascribing importance to it	"Meadow grazing is valued by society" on the issue of meadow grazing (Dutch Ministry of Agriculture 2018)
Medium	Shallow leverage points are utilized; system parameters and feedbacks are addressed	Aiming for resource use reductions or parameter changes; minor adjustments to existing rules	"Reducing the use of and replacing fossil resources by sustainably produced biomass" on the issue of GHG emissions (Dutch Ministry of Infrastructure and the Environment and Dutch Ministry of Economic Affair, 2016)
High	Deep leverage points are utilized; system design and intent are addressed	Significantly changing the rules or directionality of the system; aiming for a change in mindset/culture; moving towards a new paradigm	"Net greenhouse gas emissions, including carbon sequestration, across a full dairy value chain are zero, or even negative" on the issue of GHG emissions (van Ooijen et al. 2016)

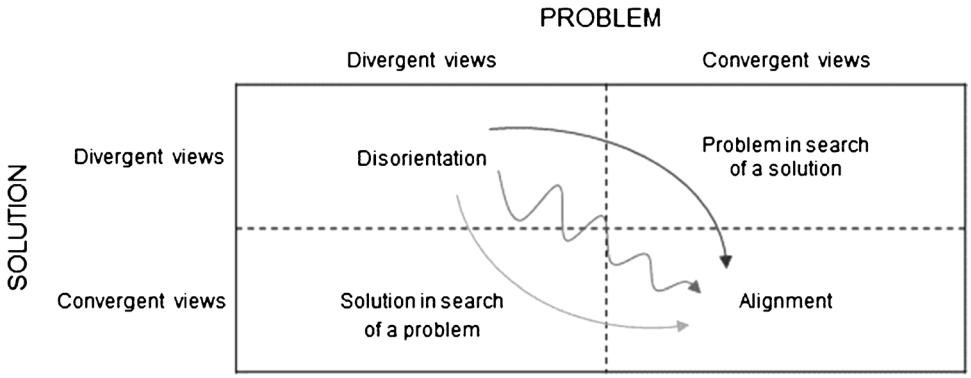

Fig. 3 Problem-solution space with schematic representation of strategies to reach alignment. Upper arrow: problem-led pathway; lower arrow: solution-led pathway; zig-zag arrow through center: hybrid pathway. Reproduced from Wanzenböck et al. (2020). Reproduction permitted under Creative Commons Attribution 4.0 International (CC BY 4.0).

for direction, and therefore, the threshold for convergence on ambition is lower. Having calculated these percentages, we populated the problem-solution space with the issues identified in the first step of the analysis. This presents an overview of the level of alignment in the Dutch agricultural transition. In providing this analysis, we do not take a normative stance on the need for full alignment on every issue; rather, we point out that a mismatch between stakeholders' positions in a transition (as evidenced by their visions) has the potential to lead to tensions and contestation, and therefore to impact that transition (Grin et al. 2010).

A sample of NVivo code summaries was verified by a researcher on the authors' research project who was not further involved in this study. That researcher's categorization of statements matched 89.9% of the first author's categorization of the same statements. Using a set coding scheme based on frameworks may have improved intercoder reliability, but the authors decided that this would have come at the cost of comparability of statements for issues that do not easily fit into pre-existing categories.

2.4.3 Expected transition dynamics

In addition to providing a framework to classify issues, Wanzenböck et al. (2020) propose three policy strategies to reach the lower-right quadrant of the problem-solution space, i.e., alignment on both the problem and the solution. These are a problem-led pathway focused on creating a broadly understood and legitimized problem framing; a solution-led pathway focused on creating innovations that will eventually "find" a problem and gain societal support; and a hybrid of the two which consists of iterations of negotiation and experimentation (see Figure 3). The underlying theory is that when stakeholders agree on both the problem and the solution, moving towards implementing the solution (and trying to solve the problem) will be easier.

In order to assess the likely success of these pathways in the case at hand, we tested issues with some degree of divergence against three additional criteria. First, we looked at how far removed actors were from alignment on the solution for an issue. Here we assumed that issues with agreement on ambition of > 66% have a higher chance of reaching convergence on the solution than those of a lower level of agreement, because fewer other actors needed to be convinced of the solution proposed by the majority of actors. Second, we analyzed the mix of stakeholder groups in agreement. Here our criterion is that at least two actors each from the public sector, private sector, and civil society should be in agreement for the transition to be legitimate. This is in line with Wanzenböck et al. (2020) who talk of "different social groups" having to come to a shared understanding, as well as Truffer et al. (2008) who posit that collective expectations for system transformations go beyond specific actor groups.

Third, we assessed whether at least two regime and two non-regime actors are present in the group of actors in agreement on the solution. The assumption here is that agreement among only regime actors or only non-regime actors is not sufficient to come to consensus: in the former scenario, an exclusively incumbent-driven transition could meet societal resistance, while in the latter scenario, it may be difficult to persuade powerful incumbents to change. Regime actors are defined as stakeholders in the conventional food and agricultural value chain, as well as government agencies who have the power to determine the rules and practices for the sector. This includes for example the major farmer associations, large dairy cooperatives, government ministries, and political parties that have been in government in the period studied, but excludes NGOs, peasant farming movements, opposition parties, or individual farmers that do not sell to major cooperatives or retailers. This is in line with a recent systematic review of research on sustainability transitions in agriculture and food systems (El Bilali 2019).

Fourth, we assess whether actors with a diverging view on the problem are in a position of power. Different actors can exercise different forms of power: they may be able to exercise material power, i.e., mobilize capital to impact technologies, physical infrastructure, and information flows; rule-setting power, i.e., make or change rules and regulations; agenda-setting power, i.e., influence the political agenda; and discursive or ideational power, i.e., shape framings and

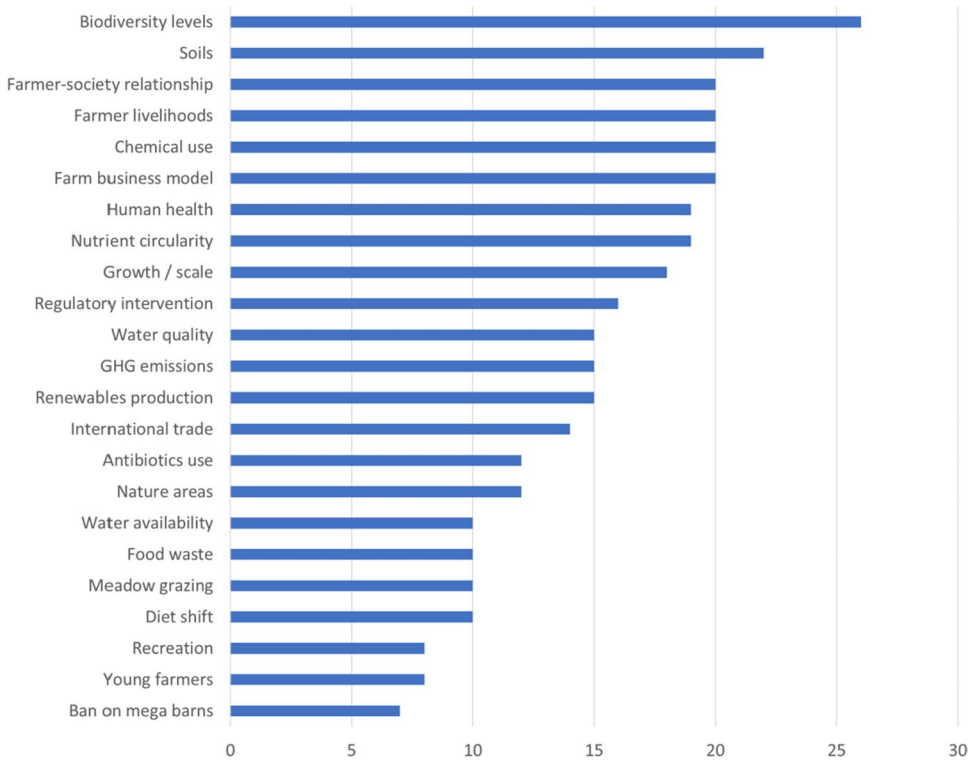

Fig. 4 Count of vision documents adressing each issue. The total number of documents was 42.

perceptions and thus influence institutions (Fuchs and Glaab 2011; Hajer 2005). If an actor with a diverging standpoint on a problem holds material or rule-setting power, this has a relatively higher negative impact on the transition than if a dissenting actor holds other types of power.

While non-incumbents can play a prominent role in framing problems and experimenting with solutions and thereby drive transition pathways (Gaitán-Cremaschi et al. 2019; Niederle 2018), resistance from regime actors is likely to stifle transition efforts that are not supported by at least some incumbents (Geels and Schot 2007). In addition, recent research indicates that regime transitions can also occur "from within" (Runhaar et al. 2020). Based on these criteria, issues were either classified as having a low, medium, or high likelihood of reaching alignment (low: meeting none of the three criteria; medium: meeting one or two of the criteria; high: meeting all three criteria).

3 Results and analysis

In this section, we present the results of our analysis in line with the three steps of our method. First, which issues appear important in the transition? Second, how aligned are stakeholders on these issues? Third, on which issues can we expect quick convergence, and where can we expect contestation and negotiation? We furthermore reflect on the analysis with reference to relevant literature where appropriate to allow for broader, more general reflections in the following discussion (Section 4).

3.1 Importance of issues

The prominence of different issues, in terms of how many documents discuss each, ranges from 7 to 26. The top 10 issues were discussed in more than 15 visions, and the bottom 3 by less than 10; Figure 4 provides an overview.

In general, environmental and social issues are more prevalent than economic issues: 174 statements were made on environmental issues, 140 statements on social issues, and 83 statements on economic issues. This indicates a high concern of most stakeholders for the effect of agriculture on Dutch ecosystems and society. The issues identified differ in kind: whereas some describe the state of the food system itself (e.g., soils or farmer livelihoods), others concern production techniques and technologies (e.g., antibiotics and chemical use) or the interactions between agriculture and other sectors (e.g., renewables production) as well as society as a whole (e.g., farmer-society relationship, human health). The issue of banning mega barns (barns housing more than 7500 pigs, 120,000 laying hens, or 250 dairy

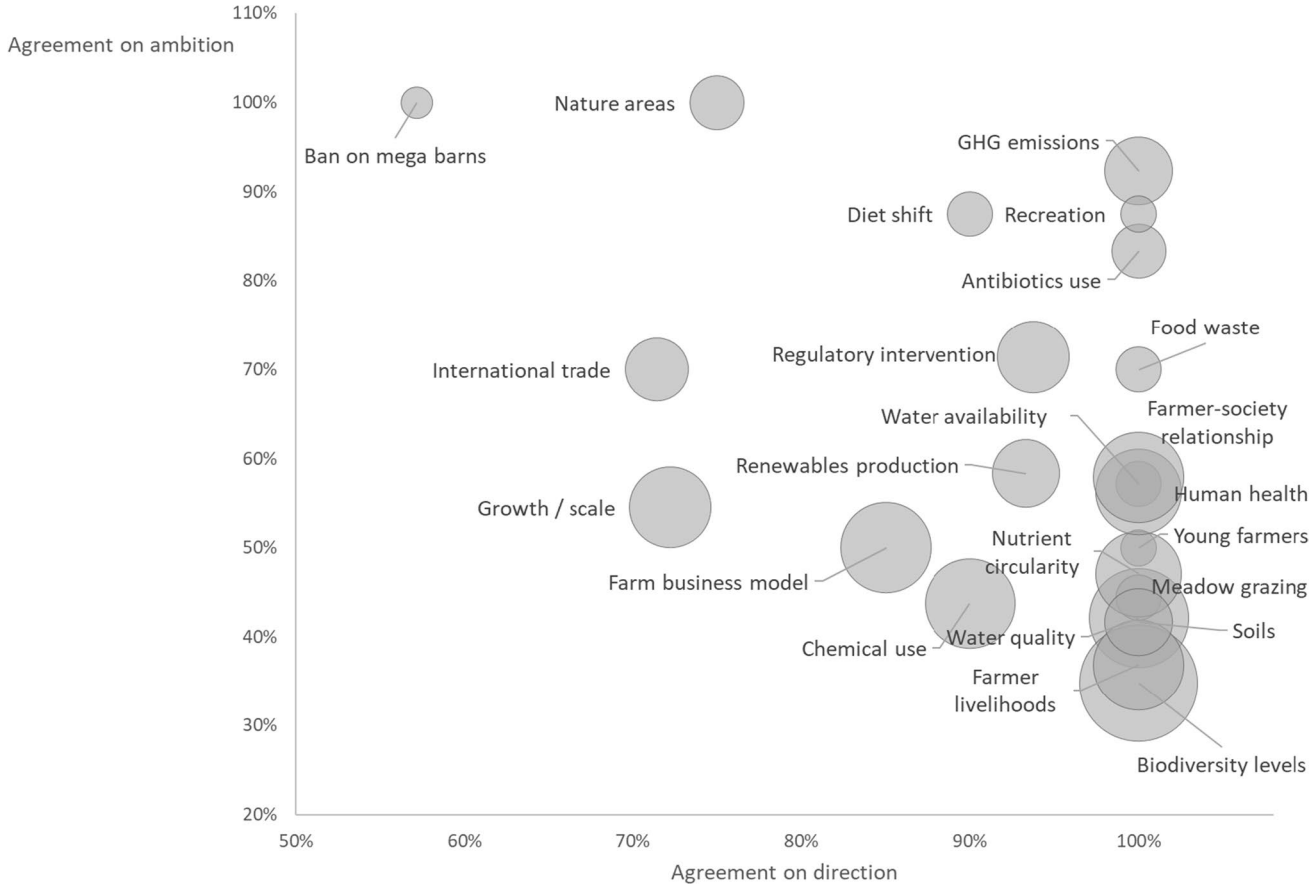

Fig. 5 Relative alignment on direction (*x*-axis) and ambition (*y*-axis) for different issues. Bubble size indicates prominence of the issue (count of stakeholders making a statement on the issue; see Figure 4).

cows; Gies et al. 2007) is very specific and appears to be influenced by contemporary politics rather than the agri-food system's future: this issue was exclusively discussed by political parties in their election manifestos, indicating that it was particularly salient before the 2017 general election. The absence of digitalization or "smart farming" as a distinct issue may be due to the already relatively high diffusion of technology in Dutch farming; however, this is speculative.

3.2 Stakeholder alignment

We explored the degree to which stakeholders (i.e., actors with an interest in the Dutch agri-food system) align on the direction and ambition of the various issues contained in the documents analyzed. Supplementary materials B provide detailed results per issue.

As Figure 5 shows, a majority of issues (18 out of 23) show full or near-full (> = 90%) alignment on direction. These are predominantly environmental and social issues, indicating that these kinds of issues are not only high on the agenda (as established in Section 3.1) but are also based on a shared understanding of problems by the stakeholders. The remaining five issues show considerable disagreement on direction (57–85% alignment); three of these are of an economic nature, indicating that these types of issue are more contentious. Where ambition is concerned, nine issues have 70% or higher agreement levels, while the majority (14 issues) have agreement levels below 60%. This indicates that while actors in this transition generally have a common understanding of the problem, they do not necessarily agree on what types of solutions would be appropriate.

3.3 Expected transition dynamics

Using these results, we categorized the issues using the quadrants of the "problem-solution space" proposed by Wanzenböck et al. (2020) as presented in Table 1. Issues are characterized according to level of convergence on the problem (columns) and solution (rows) in Table 3.

Issues were further tested against three criteria to determine how easily the issue would move towards alignment (see Section 2.4.3). With these criteria in mind, we will now

Table 3 Problem-solution space with vision analysis issues categorized by convergence on problem (related to direction) and solution (related ambition level); The characterisation of each quadrant is given between quotation marks and the number of statements on the issue between brackets. Row and column categories, as well as characterization of quadrants were taken from Wanzenböck et al. (2020).

	Diverging views on the problem	Converging views on the problem
Diverging views on solutions	"Disorientation" • Farm business model (20) • Growth/scale (18) • International trade (14)	"Problems in search of solutions" • Biodiversity levels (26) • Soils (22) • Farmer livelihoods (20) • Farmer-society relationship (20) • Nutrient circularity (19) • Regulatory intervention (16) • Chemical use (20) • Human health (19) • Water quality (15) • Renewables production (15) • Food waste (10) • Meadow grazing (10) • Water availability (10) • Young farmers (8)
Converging views on solutions	"Solutions in search of problems" • Nature areas (12) • Ban on mega barns (7)	"Alignment" • GHG emissions (15) • Antibiotics use (12) • Diet shift (10) • Recreation (8)

explore each quadrant of the problem-solution space and the expected transition dynamics for the different issues.

3.3.1 Quadrant one: "disorientation" (divergence on both problem and solution; 3 issues)

This is the most problematic quadrant, as stakeholders making statements on these three issues agree neither on the problem nor on possible solutions. These issues are the position of the Dutch agricultural sector in the global economy, the scale of the Dutch agricultural sector and size of Dutch farms, and the types of business models within that sector. With regard to the first, stakeholders are divided between a group that envisions limits to Dutch agriculture's impacts abroad and some limits to trade volumes, and a group that envisions a strong export orientation without additional limits. With regard to the second, one group envisions limits to farm size while another foresees continued growth and upscaling. And with regard to the third, most actors see business model diversification and innovation as the future while a smaller group of regime actors envision a reliance on existing business models.

These three issues are closely related to each other: the export orientation of the sector as a whole depends on increasingly productive farms, which in turn require business models that are cost-efficient and input-intensive (Thorsøe et al. 2020; van der Ploeg et al. 2016; Wageningen University and Research 2018). Moreover, these issues have considerable implications for virtually all other issues. This is illustrated by the fact that high-tech, intensive, and large-scale farms generate greater nitrogen surpluses than smaller-scale, more extensive farms while providing less employment opportunities (Kleijn et al. 2012; van der Ploeg et al. 2016), and the fact that non-productive natural and social capital are not rewarded on high-input, profit-maximizing farmland (Sardaro et al. 2020). These tensions signify a fundamental disagreement on what the agricultural sector of the future will look like and how it will function. These tensions need to be defused before progress in other areas can be achieved. A logical order to negotiations on these issues starts with the sector's international orientation, as the volume of exports "required" shapes the size and character of sub-sectors and farms. This will be a difficult process, because private sector actors especially have legitimate concerns that limits to trade and farm growth threaten their business model, and because a logic of cost price reduction (made possible by farm upscaling and consolidation) is deeply embedded in the Dutch agricultural sector (van der Heide et al. 2011). It will also be difficult because of the power wielded by stakeholders with diverging views. Actors with rule-setting power favor the status quo when it comes to the sector's international orientation (the Christian-democrat party CDA, the Ministry of Economic Affairs, and the provincial governments of Drenthe and North Brabant) as well as continued growth and upscaling (the Ministry of Agriculture and the conservative-liberal party VVD). On the issue of business models, it is the dairy farming and processing industry—with considerable material and agenda-setting power—that favors a continued reliance on existing business models.

3.3.2 Quadrant two: problems in search of solutions (convergence on problem, disagreement on solutions; 14 issues)

This quadrant contains the highest number of issues. Generally speaking, they fall into three categories. In the first

group, there are eight issues where the emerging coalition includes all types of stakeholders as well as regime and non-regime actors, but there is relatively low consensus on a solution—i.e., the largest emerging coalition is not substantially larger than groups proposing other solutions. Issues in this quadrant include biodiversity levels, soils, chemical use, farmer livelihoods, farmer-society relationships, nutrient circularity, human health, and young farmers. They are also among the most prominent issues, being mentioned in 19 visions on average. For this quadrant, Wanzenböck et al. note that "the formulation of clear and approachable research and innovation missions … could indeed be an effective instrument for a targeted transformation" (Wanzenböck et al. 2020). The Dutch Ministry of Economics and Climate Policy has already formulated innovation missions for all these issues except for the young farmers (Dutch Ministry of Economic Affairs and Climate Policy 2019). This indicates that in the Dutch context, the transition dynamic of finding solutions via a solution-led pathway is already underway and that we can expect relatively quick convergence on these issues. In the case of chemical use, one of the actors not agreeing on the problem is the Christian-democrat party CU, which was part of the governing coalition and the party of the Minister for Agriculture, Nature and Food Quality from 2017 to 2021. By our criteria in Section 2.4.3, this makes it a regime actor, and the party wielded rule-setting power despite its small vote share of 3.4% in both 2017 and 2021; however, it may not be part of the next government.

The second type of issue in this quadrant is characterized by relatively low agreement on ambition as well as a lack of buy-in from different stakeholder groups. These are the issues of renewable energy production, water quality, and meadow grazing. Meadow grazing is interesting because the majority of actors are evenly split between a group aiming to make meadow grazing obligatory (high ambition), and another group trying to preserve the status quo where the practice is welcome but not obligatory (low ambition). It is also notable that the local branch of the Netherlands Agricultural and Horticultural Association (LTO) for the island of Texel is in the former group and the overall LTO dairy sector vision belongs to the latter. This highlights the importance of local context in developing a vision: whereas obligatory grazing is desired on the small island of Texel to aid in landscape management and to cater to tourists, such a measure may not be feasible for all farmers across the mainland. While there is an overall consensus on the problem here, a problem-led pathway may nevertheless be prudent to follow since the support base for apparent solutions is still relatively slim and legitimacy problems may arise if they were widely implemented. Given the context-dependent nature of these issues, provincial governments could play a facilitating role here to determine which solutions are most suitable for different regions. Notable for issues of this kind is that powerful regime actors tend to express non-committal and vague low-ambition standpoints. This can be interpreted in two ways. These actors may be uninterested in a transition and prefer not to engage on these issues. In this case, efforts by actors with higher ambitions to convince these regime actors to join their coalition may not be fruitful. Another interpretation is that regime actors make such statements due to a lack of knowledge on the topic or lack of knowledge of how other stakeholders prioritize these issues. In such a situation, actors with higher ambitions could lobby incumbents successfully and shift the balance towards certain transition strategies.

Lastly, there are issues with relatively high agreement on ambition but lacking certain stakeholders in the coalition. This suggests a solution is crystallizing but the support base is not broad or inclusive enough. A way forward on these issues could be for stakeholders making statements to test their plans with other stakeholders from other types of organizations both in and outside of the dominant agri-food regime.

One way to interpret the issues in this quadrant is that they are both considered as problematic and requiring attention and highly complex and difficult to find solutions for. This is true especially for issues concerning ecological aspects of the agri-food system. Biodiversity for example is impacted by non-agricultural activities like traffic and highly variable between different types of landscapes (Concepción et al. 2008; Heer et al. 2017). This is compounded by a lack of knowledge on suitable management practices and possible technological solutions, as well as doubts about the cost and feasibility of such practices and solutions (Cuperus et al. 2019; Westerink et al. 2019). This underscores the need to invest in innovation and experimentation, though bearing in mind the need to innovate and scale responsibly (Wigboldus et al. 2016).

3.3.3 Quadrant three: solutions in search of problems (convergence on solution, disagreement on problems; 2 issues)

The two issues in this quadrant, the banning of mega barns and the enlargement of nature areas (which would likely come at the cost of agricultural land), are both highly polarizing in terms of direction and show full convergence on ambition for those stakeholders that do agree on direction. This can be explained by the fact that there was no nuance between the standpoints of stakeholders: nature areas were either to be better connected and enlarged or not; mega barns were to be banned or not. The former is frequently presented as a measure to improve the state of biodiversity, but two-thirds of the actors who oppose this measure also envision improved biodiversity levels (quadrant two). While connecting and enlarging nature areas is not the only way to reach

this goal, this highlights the difficulty of developing—and creating legitimacy for—solutions to highly complex socio-ecological problems. Provincial governments have played a key role in nature protection since the decentralization of this policy domain in 2013, and an explicit goal of this decentralization was to create increased societal support for nature governance (Folkert and Boonstra 2017). As visions from private sector actors contain no explicit statements on this issue, more inclusiveness towards this stakeholder group could be a point of attention for the provinces in this process.

3.3.4 Quadrant four: alignment (convergence on problems and solutions; 4 issues)

The last quadrant contains four issues where there is consensus on both the problem and possible solutions. These issues are greenhouse gas emissions, a diet shift from animal to plant proteins, antibiotics use, and recreation. The first two of these test well against all criteria for transition dynamics: agreement on the solution is high; both regime and non-regime actors are in agreement; and all types of stakeholders (public and private sectors as well as civil society) are represented in the coalition. This is perhaps not surprising as climate change is a major policy priority for the Netherlands: the country is a signatory to the Paris Climate Agreement; the government has reached an ambitious cross-sectoral agreement to reduce greenhouse gases by 55% instead of the more common 49% by 2030 in a national Climate Agreement; and the Ministry of Economic Affairs has added "Climate Policy" to its title, elevating the importance of this dossier to the highest level (Rijksoverheid 2019). This suggests that the issue has already followed the alignment trajectory through the problem-solution space. In the case of the transition to a more plant-based diet, the only actor not agreeing on the problem was, understandably, the Dutch poultry farmers' association. This organization holds some agenda-setting power by virtue of being part of the wider Agricultural and Horticultural Organization LTO, but given the relatively small economic importance of this subsector (€1.59bn value added compared to €7.6bn of the dairy sector), this actor may not be in a position to stall the transition. For issues like these, it is suggested that policies "focus on the targeted development and diffusion of innovations, and the embedding (widening and deepening) of new social practices" (Wanzenböck et al. 2020). The Dutch Climate Agreement specifies more than 30 specific innovations that have been calculated to reduce sector emissions by 1.8–4.6 Mt CO_2e by 2030. The diffusion of social practices to aid in this transition is acknowledged in a goal to halve the climate effects of consumer choices by 2050, but specific measures or practices are not named (Planbureau voor de Leefomgeving 2019; Rijksoverheid 2019). We therefore suggest more explicit focus on consumer behavior and the embedding of climate-friendly social practices in the agri-food system as an additional policy focus. Furthermore, the Climate Agreement has a relatively short time horizon of 2030 as opposed to 2050. To reach 2050 targets of lowering emissions by 95% or more, more drastic measures need to be taken. These include reducing agricultural land use by as much as 11% and reducing livestock numbers by as much as 42% (Lesschen et al. 2020). This indicates that the coalition on this issue as apparent from our analysis may only stay aligned until the moment more detailed plans beyond 2030 are made. This is a further illustration of our main new finding: alignment that has been reached on crucial topics like greenhouse gas emissions may well dissipate if alignment on trade and sector size is not reached.

The other issues in this quadrant are characterized by high agreement on ambition and coalitions that include regime and non-regime actors but lack certain stakeholder groups: civil society in the case of antibiotics use and the private sector in the case of recreation. In the case of antibiotics use, the vision of one civil society actor states that while antibiotics use has led to an increase in antibiotic-resistant germs, use levels have dropped considerably in past years (Natuur and Milieu 2017). This suggests that this actor does not consider the issue important or worrisome enough to make a statement concerning the future of antibiotics use in the Dutch agri-food system, and that a lack of civil society visions on this issue is not an impediment to the transition. Furthermore, livestock sectors already follow sectoral plans and reference values to guide the further reduction of antibiotics use, suggesting that a diffusion of measures has taken place (CLO 2019).

4 Discussion

Our approach of mapping issues in the Dutch agri-food system transition clearly shows issues on which stakeholders are aligned, which issues are contested, and which actors appear to form emergent coalitions around certain issues. This is a useful first step for the design of transition policies and can play a role in the mapping of missions in (agricultural) innovation systems (Klerkx and Begemann 2020). We furthermore add a dimension to the mission-oriented innovation systems approach: the potential interdependencies and hierarchies between societal problems that are in different quadrants of the problem-solution space. Our methodology provides a starting point for researchers to bring these interdependencies to the surface. Furthermore, policymakers need to be aware of these interdependencies when they design and implement innovation missions.

This study took place against the backdrop of growing awareness and urgency about sustainability in the Dutch agri-food system. A key result is that for a majority of issues,

stakeholders in the Dutch agri-food system acknowledge that there are in fact problems to be addressed. For a number of issues, broad and inclusive coalitions are emerging around a set of solutions (top-right quadrant of the problem-solution space; Table 3). Many of these are supported by the Dutch government and are explicitly addressed by its innovation agenda to pursue a transition towards circular farming. In some cases, a solution is crystalizing but has yet to receive support from key stakeholder groups, including regime actors. Here the transition will require more awareness-raising, policy learning, and negotiation before concrete solutions can be pursued with legitimacy and a chance of success. For a number of these issues, provincial governments seem well-placed to steer this process, especially considering regional differences in the size and nature of a problem. The decentralized governance structure of the Netherlands lends itself to such a role division.

Our main novel result is that a small number of issues are contested (top-left quadrant; Table 3) and moreover present major constraints on the change potential of the aforementioned, relatively well-aligned issues. This echoes Zurek and colleagues, who warn that "there is the potential that the 'directionality' of pathways of change does not line up, with the risk of exacerbating trade-offs towards the future" (Zurek et al. 2021, p. 17). The current size and scale of the Dutch agri-food system, shaped by the strong export orientation of the sector, makes it difficult to meet long-term ecological targets as well as societal expectations with existing business models and technologies (Berkhout et al. 2018; Council for the Environment and Infrastructure 2013; Planbureau voor de Leefomgeving 2018; Wereld Natuur Fonds 2020). This presents a great challenge for the sector, which can be dealt with in different ways. On the one hand, technologies can be developed to meet ecological targets while continuing with business (and trade) as usual. Nanotechnology, robotics, drones, gene editing, and digitalization are just a selection of innovations that have the potential to reduce agriculture's negative externalities (The Food and Land Use Coalition 2019). Critics however point out that such "techno-fixing" is simply a continuation of the industrialization and intensification of agriculture; that the long-term ramifications of such technologies are unknown; and that matters of responsible innovation and food sovereignty are often insufficiently considered by proponents of this type of solution (De Schutter 2017; Della Rossa et al. 2020; Klerkx and Rose 2020; Mooney 2018; Zurek et al. 2021). An alternative is offered by more extensive, "low-tech" approaches like agroecology, permaculture, or regenerative farming. These approaches commonly strive for the protection and utilization of ecosystem services as well as a reduction in resource use (Duru et al. 2015; Oberč and Schnell 2020). Both approaches can help meet the social and ecological requirements that stakeholders almost universally acknowledge (top- and bottom-right quadrants; Table 3).

These insights can serve as starting points for the development of different scenarios which make the visions analyzed here more concrete (see, for example, Lesschen et al. 2020; Mitter et al. 2020). Such scenarios can show what is possible given the ecological limits and legal agreements an agri-food system are bound by, and can provide a transparent view of which tradeoffs will need to be made (Daw et al. 2015; Milestad et al. 2014). This can support the learning and implementation process bridging the development of visions as a type of futuring on the one hand and their implementation on the other (Klerkx and Begemann 2020; van der Meulen et al. 2003). This pursuit of diversity is in line with a view of large complex systems as often being loosely structured around different institutional logics and allowing for multiple parallel development pathways (Fuenfschilling and Truffer 2014; Niederle 2018). Our method provides insights in the logics associated with perceived problems and solutions. Whichever transition course is embarked upon however will be constrained not only by the rules of an agri-food regime, but also by the rules and customs of political economy across scale levels. Furthermore, any changes in agri-food systems are limited by the demands of other sectors on scarce resources like land, water, finance, and labor. The recent Dutch nitrogen crisis has made this question more pertinent than ever, as illustrated by the title of a high-level advisory report on the matter: "You can't have it all." (Remkes et al. 2019).

To some extent, the implementation of some visions can already be observed. The societal expectations apparent from the analysis have been translated into knowledge and innovation agendas by the Dutch government (Sonnema and Osinga 2019) as well as the Top Sector Agri & Food, a platform organization for industry, science, and government stakeholders (Topsector Agri & Food 2019). In line with our analytical framework, the agendas are fairly concrete for issues where consensus is high on both problem and solution, primarily the climate challenge. In addition to these "fully aligned" issues, these research and innovation strategies also spell out priorities for issues where there is no consensus yet on the solution, such as nutrient circularity and biodiversity. This can be interpreted as a tentative search for solutions to problems that most stakeholders agree on. However, the proposals in these agendas largely fall into the category of high-tech solutions (such as nanotechnology, robotics, and gene editing) to further improve input use efficiency. While this may be advantageous for agronomists studying such solutions, it also poses a problem because the issues are presented as "fixable" within the current socio-technical paradigm, leaving solutions within other paradigms insufficiently explored and as a consequence

underfunded (Tittonell 2013). Such a focus furthermore begs the question of who will pay for such technologies and who will benefit from their sale, especially given the widely acknowledged problem of farmers' precarious livelihoods (in the Netherlands and elsewhere). Other avenues besides novel technologies need to be explored; in fact, we argue that it is the task of agronomists to demonstrate the viability of solutions that regime actors currently ignore. More importantly perhaps, it is the task of researchers to emphasize that the challenges our agri-food systems face can be dealt with by implementing a great variety of solutions in different contexts. The granularity of issues that our analysis of visions has brought to the surface shows that farmers can meet societally desired outcomes with many different farming styles. Continuing debates along the lines of false dichotomies (nature versus farming; high-tech versus low-tech; land sharing versus land sparing) will not bring us closer to achieving our goals. Researchers and policymakers are thus advised to pursue research, policy, and governance paradigms that embrace diversity.

5 Conclusion

This paper has shown that a closer look at vision documents can give a preview of the degree of conflict and negotiation that is likely to occur in the transition of a large complex system. Most importantly, this can help identify issues that restrict the change potential and research agendas for other issues where the apparent level of agreement suggests that a transition is likely to proceed with relatively little conflict. We have shown for the first time that in the case of the Netherlands, there is broad consensus on which challenges need to be addressed, but less agreement on how these challenges ought to be addressed. Crucially, regime actors appear to be converging on high-tech solutions within the dominant economic paradigm, leaving limited space and funding for alternatives like agroecology or regenerative agriculture. This is also increasingly apparent at the EU level, with the new Common Agricultural Policy falling short of the holistic approach set out in the Farm to Fork Strategy and to a considerable degree continuing with business as usual (Pe'er et al. 2020).

Our analysis shows conflict over the underlying economic model in different visions, with incumbents favoring continued reliance on a growth-oriented paradigm. This leaves little hope for an open discussion, at a high level, of how this paradigm needs to change if broader societal goals are to be achieved. If this matter cannot be addressed head-on, pursuing food production models in line with "new social practices and narratives of post-capitalism, post-growth and post-consumerism" (Blühdorn 2017, p. 58) would be a valuable endeavor (Koretskaya and Feola 2020). Either way, policymakers must acknowledge the repercussions of dominant economic logics on agri-food system sustainability—and act accordingly.

Our novel methodological approach builds on the theory of a problem-solution space for mission-oriented innovation systems proposed by Wanzenböck et al. (2020), allowing identification of interdependencies and hierarchies in and between missions that may lead to trade-offs. In the case at hand, while there appears to be consensus on how to tackle ecological and social issues in the agri-food system, the future of that system's economic characteristics is contested, with powerful incumbents favoring the status quo. Any optimism about apparent alignment on ecological and social issues must be tempered when we acknowledge that the current economic paradigm constricts the solution space, something that is especially relevant for policy makers to be aware of when designing innovation missions and implementation strategies.

Agricultural sustainability research needs to focus more on highlighting the exact mechanisms by which prevalent economic models and logics pose a hurdle for long-term and holistically sustainable solutions, especially for those on which many stakeholders already align. This can prevent the implementation of costly, but ineffective policies. A prime example is the case of greenhouse gas reduction in Dutch dairy farming. All relevant stakeholders in the sector aligned on the need to reduce emissions, for which a stakeholder platform was organized. Using increased efficiency measures, the platform was successful in reducing the amount of greenhouse gas emissions per unit of production, but because the underlying economic model required continuous growth, the sector as a whole only increased its emissions (Doornewaard et al. 2017). Interdisciplinary research undertakings with colleagues from political science, science and technology studies, and other adjacent disciplines could help this. A first step in this direction can be for researchers to reflect on their research stance and identify dimensions or topics that could benefit from more attention from disciplines they are not familiar with (Hazard et al. 2020). A more structural solution could be for research funding bodies to establish more inter- and transdisciplinary research projects tackling societal challenges. Researchers can furthermore consider roles beyond knowledge production, for example, as advocates confronting incumbent preferences or as brokers clarifying the implications of different policy pathways given the variety of stakeholder concerns (Pielke 2007).

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JVD: conceptualization, writing—original draft preparation, writing—review and editing, supervision, project administration

MD: conceptualization, writing—original draft preparation, writing—review and editing, supervision, project administration

PGK: conceptualization, writing—review and editing, supervision, project administration, funding acquisition

MH: conceptualization, writing—review and editing, supervision, project administration

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