



To adapt or not to adapt, that is the question. Examining farmers' perceived adaptive capacity and willingness to adapt to sustainability transitions

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ABSTRACT

The agricultural sector is one of the areas that has been highlighted as requiring a sustainability transition. For these kinds of transitions to succeed over the long-term, farmers need to be able to adapt to the required changes. Identifying which individual and institutional aspects are important for farmers' adaptive capacity and willingness to adapt is therefore an essential step in gaining insight into the role of farmers' agency in transition processes and their long-term sustainability. So far, adaptive capacity literature has mainly focused on adaptive capacity in relation to climate change or individual innovations, thereby leaving a knowledge gap on adaptive capacity in relation to sustainability transitions. In this study, we aim to address this by deepening our understanding of these aspects through 24 in-depth, semi-structured interviews with English farmers and organisations in the context of the post-Brexit agricultural transition. Whilst we found many similarities with previous adaptation literature in the context of climate change and individual innovation, we also found aspects that have not been prominent and thus seem to be specific for adaptation in relation to sustainability transitions. These include the dual role that access to finances and information can play; land ownership status in terms of having the right to implement adaptation measures; state of mind; feeling respected, appreciated, and understood; perceived level of control and ownership; and considerations of (global) consequences. Further research is needed to strengthen and further develop our findings, for example through case studies in other geographical locations or sectors.

1. Introduction

The agricultural sector is one of the areas that has been highlighted as requiring a sustainability transition (El Bilali, 2020; FAO et al., 2021; Young Park et al., 2021), both to address the negative environmental impact of currently dominant agricultural practices (Awuchi et al., 2020; IPCC, 2019; Poore and Nemecek, 2018) and to ensure sufficient food production under changing natural conditions (FAO, 2019; Mbow et al., 2019). In line with repeated calls for agricultural sustainability transitions by researchers (IPBES, 2019; IPCC, 2019), the international community has committed itself to bring about sustainability transitions (European Commission, 2019; UN, 1992a, 1992b, 2015a, 2015b, 2021) and efforts to set in motion these kinds of transitions have already begun. For example, in the European Union, reforms to the Common Agricultural Policy (CAP) are underway to bring it in line with the

environmental ambitions of the Green Deal (European Commission, 2021) and in England, Brexit is used by the Department of Environment, Food, and Rural Affairs (Defra) to structurally change agricultural policy to create a system where farmers will receive public money for the provisioning of public goods (Defra, 2018, 2020a, 2020b, 2022a, 2023). For these, and other agricultural sustainability transitions to succeed over the long-term, farmers need to be able to adapt to the required changes. Identifying which aspects are important for farmers' adaptive capacity and willingness to adapt and exploring what role institutional characteristics play within this is therefore an essential step in gaining insight into the role of farmers' agency in sustainability transition processes (Darnhofer et al., 2010; Martin et al., 2018) and forms a key step in creating the enabling conditions for the international community to be able to fulfil their commitment to bring about sustainability transitions.

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Recent theoretical developments by [de Boon et al. \(2022\)](#) provided a starting point to deepen this understanding by creating a comprehensive framework to underpin the governance of agricultural sustainability transitions, connecting the micro-, meso-, and macro-level and highlighting the interactions between these throughout a sustainability transition process. The framework integrates insights from multiple theoretical approaches including the Multi-Level Perspective, Agricultural Innovation Systems, Responsible Research and Innovation, Innovation Management, the Theory of Planned Behaviour, and literature on the governance of socio-ecological systems. However, the section of this framework that is concerned with adaptive capacity is primarily built on insights from governance literature that focuses on farmers' adaptive capacity in relation to climate change or individual innovations and it is to date unclear how far these insights transfer to the specifics of agricultural sustainability transitions. Agricultural sustainability transitions differ from individual innovation processes and adaptation to climate change in that they require adaptation to climate change and multiple innovations simultaneously. They are therefore much broader in scope (i.e. they strive for a complete system change) and have a higher disruptive potential. In addition, agricultural sustainability transitions, in contrast to historical agricultural transitions, have a deliberate directionality on improving environmental conditions (beyond reactively adapting to climate change), in contrast to more 'quasi evolutionary' innovation processes that tend to have no clear prior defined overarching direction and come about as a result of (economic) optimisation efforts and gradual evolution of interactions between (technological) innovations and their application in daily life ([Smith et al., 2005](#)). Agricultural sustainability transitions also differ from the majority of individual innovations and historical transitions in the sense that the focus of sustainability transitions is on the development of a collective good rather than on the creation of obvious (economic) benefits ([Geels, 2011](#); [Hekkert et al., 2020](#); [Meadowcroft, 2011](#)). Due to these differences in characteristics between agricultural sustainability transitions, climate change adaptation, and individual innovations, and given that adaptive capacity always stands in relation to what the actor is adapting to ([Ajzen, 1991](#); [Akkari and Bryant, 2017](#); [van der Veen, 2010](#)), the framework by [de Boon et al. \(2022\)](#) could be further improved. It is, therefore, the aim of this article to examine empirically what aspects are central to farmers' perceived adaptive capacity and willingness to adapt to agricultural sustainability transitions specifically and to explore what role institutional characteristics play within this.

To address this aim, we conduct a case study of English farmers' perceived adaptive capacity and willingness to adapt in relation to the English post-Brexit agricultural sustainability transition. This provides a good context for this study because the English farmers are directly confronted with a sustainability transition that they need to react to in one way or another. We can thus examine their perceptions in relation to the sustainability transition as it happens, rather than pro- or retrospectively. This is an important characteristic because the perceptions that farmers have in the moment will ultimately influence their adaptive behaviour, not the perceptions they have (far) in advance or afterward ([Ajzen, 2011](#)). In addition, as the English agricultural sector shares many characteristics with the agricultural sectors in EU countries, due to a long history of a shared CAP, lessons learned from this case will also be of relevance to sustainability transition efforts in an EU context. Overall, this study contributes by deepening our understanding of perceived adaptive capacity and willingness to adapt and the role of institutional characteristics within this in the context of sustainability transitions.

2. Case context: the English agricultural sustainability transition

In the UK, agriculture is a devolved matter, meaning that legislative and executive power is delegated from the central UK government to the nation states (i.e. England, Scotland, Wales, and Northern Ireland). Whilst the UK was part of the EU, this devolution had limited impact, as

all nations were governed with the same overarching EU agricultural policy through CAP. However, after leaving the CAP in 2020, each of the UK nations can now develop their own agricultural policy. In this study, we focus on England. In the period leading up to England leaving the CAP (2015–2018), 58% of the average farm business income came from direct payments, i.e. payments to farmers based on the amount of land that they manage. 75% of farms were profitable, but two thirds of them did so only due to additional income from diversification, agri-environment schemes, and direct payments ([Defra and Government Statistical Service, 2019](#)). A detailed overview of the structure of the English agricultural sector and the contribution of Direct Payments to farm business income prior to Brexit can be found in [Annex A Tables 1 and 2](#).

The transition period away from CAP to a new agricultural system started in 2021 and is scheduled to be completed in 2028. The overall aim of the transition is to create an agricultural sector that produces healthy food, is profitable without subsidies, and contributes positively to the environment ([Defra, 2020b](#)). This transition is, therefore, not just a restructuring of subsidy policies, but a full-scale attempt at a sustainability transition, fulfilling the key characteristics of a sustainability transition as described by [Geels \(2011\)](#). Whether this attempt in the end will result in an agricultural sustainability transition on the ground remains to be seen. The [Agriculture Act 2020](#); [Agriculture Act \(2020\)](#) forms the legal basis for the sustainability transition efforts, but the exact plans are still under development. At the time of our interviews, it was the plan that over the transition period, direct payments would be phased out through progressive reductions (this started in 2021) and payments would be delinked from farming activity (starting in 2024). Farmers could also opt to receive a one-off lump sum payment, which would cancel further entitlement to Basic Payments. The old Countryside Stewardship scheme would stay available until 2024, after which it would be merged into new Environmental Land Management schemes ([Defra, 2021a](#)). These schemes, which were set to be at the heart of the new agricultural policies, offer public money for the provisioning of public goods, such as clean air and water, thriving plants and wildlife, and climate change mitigation and adaptation. The idea of paying farmers to provide public benefits through agri-environment schemes is not new, as there were already similar schemes available under CAP (e.g. the prior mentioned Countryside Stewardship scheme) ([Ingram et al., 2013](#); [Morris, 2006](#)). However, their currently envisioned design, their key role in agricultural policy, combined with the abolishment of the basic payment system, changes in law through the [Agriculture Act \(Agriculture Act, 2020\)](#) and [Environment Act \(Environment Act, 2021\)](#), as well as further changes through new trade agreements ([Department for International Trade, 2022](#)) and other support schemes ranging from one-off environmental projects and equipment and technology investments to innovation research and a lump sum exit scheme ([Defra, 2021b](#)) alter the immediate contextual structures within which farmers operate. An overview of the various schemes as proposed at the time of our data collection is provided in Annex B. It should be noted, however, that this is a dynamic policy area. The strong dependence on basic payments prior to the sustainability transition reveals the potential disruptiveness of this sustainability transition to the English agricultural sector and the scope of adaptations that farmers are expected to make.

3. A starting point to examine farmers' perceived adaptive capacity and willingness to adapt

The Theory of Planned Behaviour states that attitudes, subjective norms, and perceived behavioural control determine behavioural intentions ([Ajzen, 2020](#)). Thus, asking farmers directly what they think of the sustainability transition, whether they feel like they can and want to adapt to it, and what they think the consequences of (not) adapting would be, gives an indication of the most salient elements that make up farmers' perceived adaptive capacity and willingness to adapt ([Ajzen, 1991, 2011](#)). Below, we summarise the dimensions and elements of

farmers' adaptive capacity and willingness to adapt that have been identified in the context of climate change and individual innovations. They form a starting point through which we structure our examination of farmers' perceived adaptive capacity and willingness to adapt to a sustainability transition. A schematic overview is provided in Fig. 1.

It is important to keep in mind here that adaptation strategies can be diverse, ranging from adapting (parts of) the farm business structure or farming practices to exiting farming altogether. We refer to the exit strategy and continuing in the same way as before the sustainability transition as maladaptation and non-adaptation respectively. Whilst the exit strategy is a form of adaptation that requires adaptive capacity and is a manifestation of the disruptive nature of a sustainability transition, like non-adaptation, over time and at scale, this strategy can stand in the way of a successful agricultural sustainability transition. If a significant number of farmers choose this option, food production would be at risk (Grothmann and Patt, 2005).

3.1. Perceived adaptive capacity

In de Boon et al.'s (2022, p. 413) framework, adaptive capacity is defined as "the capacity to adapt to (anticipated) change through the implementation of innovative or old practices". The elements comprising farmers' adaptive capacity included social capital, access to resources, innovative capacity, the (flexibility of) the institutional context, psychosocial factors, knowledge and education, local embeddedness, perceived adaptive capacity, the ability for collective action, and the degree of diversity. We focus on farmers' perceptions of these aspects, i.e. perceived adaptive capacity, because even if farmers have the capacity to adapt, they will not likely conduct adaptive behaviour if they do not think they have it (Ajzen, 2011; Armitage and Christian, 2003; Grothmann and Patt, 2005). Furthermore, we will address psychosocial factors, or the willingness to adapt, in section 3.2. And perceptions of the institutional context in section 3.3.

The elements identified as comprising perceived adaptive capacity can, as shown in Fig. 1, broadly be grouped into two categories: perceived social capability and perceived access to resources and skills. *Perceived access to resources and skills* relates to financial and material capital, natural capital, and human capital (Aase et al., 2013; Akkari and Bryant, 2017; Bussey et al., 2012; Li et al., 2019). Perceptions of financial and material capital describe the extent to which the farmer perceives the financial and material resources they have access to as sufficient to successfully adapt (Bitterman et al., 2019; Lowitt et al., 2015; Zeweld et al., 2019). Natural capital refers to the farmer's perceptions of the sufficiency of the natural capital of the farm to undergo adaptation (Aase et al., 2013; Li et al., 2019; Lyle and Ostendorf, 2005). It also includes land ownership status, where insecure land tenure is often a barrier to investment in innovation (Akugre et al., 2021; Bradford et al., 2023; Mugure et al., 2013; Yang et al., 2022). Human capital relates to the farmer's perceptions of the sufficiency of their own knowledge and skills to implement the required adaptation (Bussey et al., 2012; Makate, 2019; Morton et al., 2017), including perceptions of the sufficiency of their innovative capacity (Cohen et al., 2016; Schut et al., 2018; Turner et al., 2017), as well as the perception of having sufficient access to labour to carry out the required work (Lyle and Ostendorf, 2005; van der Veen, 2010). Across all these types of resources, perceptions of diversity are also relevant (Akkari and Bryant, 2017; Lin, 2011).

Perceived social capability encompasses the social networks, or social capital, of the farmer (Akkari and Bryant, 2017; Asfaw et al., 2016; Cohen et al., 2016; Makate, 2019; Shah et al., 2019), also sometimes referred to as relational capital (Zeweld et al., 2019), and the farmer's perceptions on whether these networks can support them with the adaptation. These networks or social relations can potentially be drawn on to access additional resources or mental support. A distinction can be made between bonding, bridging, and linking social capital (Arnott et al., 2021; Claridge, 2018). Bonding social capital relates to informal

relations within homogenous networks, bridging social capital relates to more formal relations across heterogeneous networks, connecting multiple dense networks with each other, and linking social capital refers to formal relations to institutions and organisations with authoritative power (Cinner et al., 2018; Hall and Pretty, 2008; Pelling and High, 2005). Strong social capital across these dimensions can increase levels of trust, local embeddedness, social learning, knowledge exchange, and mutual understanding, all of which strengthen the perceived ability for collective action (Hurley et al., 2022; Knox et al., 2010; Lowitt et al., 2015; Rust et al., 2020; Schut et al., 2018; Zeweld et al., 2019). However, it can also function as a hampering factor for adaptation, for example if the network is not supportive of adaptation, if the bonding capital is so strong that it does not allow for the uptake of knowledge from outside the homogenous network, or if the linking social capital is perceived to be concentrated in a select few people who receive privileged access to important information that is not made available to all (Cofré-Bravo et al., 2019; Saint Ville et al., 2016).

Regardless of whether a farmer perceives themselves as having sufficient capacity to adapt to a sustainability transition, this perceived adaptive capacity will not likely lead to the behavioural intention of adapting without a willingness to adapt (Ajzen, 2020; Bosnjak et al., 2020).

3.2. Willingness to adapt

The determinants that make up the willingness to adapt, or psychosocial factors, were identified in the framework by de Boon et al. (2022) as being the attitude to innovation, risk attitude, (social) norms and values, and self-identity (see also Fig. 1). *Attitude to innovation* encompasses how far farmers are interested in finding out about and trying new things in general and whether they perceive this specific sustainability transition as something positive that will be able to achieve desired outcomes. The more interested farmers are in innovation and the more positive they think about this transition in particular, the more likely they are to be willing to adapt to it (Bosnjak et al., 2020; Caughron et al., 2021; Lockwood et al., 2015; Marshall et al., 2012; Mase et al., 2017; van der Veen, 2010). *Risk attitude* describes if a farmer is in general risk averse or risk seeking and their perception of the risk of being negatively affected by the sustainability transition when continuing their current way of farming relative to the risk of changing their behaviour and other challenges that they might be facing simultaneously. When the farmer perceives not adapting as a higher risk, it is more likely that they will be willing to adapt (Cinner et al., 2018; Eakin et al., 2016; Grothmann and Patt, 2005; Zeweld et al., 2019). *Social norms and values* refer here to the farmers' perceptions of whether or not adapting to the sustainability transition is in line with the norms and values of the people whose opinions they value. This can include both perceptions on whether others that they value are adapting and more general perceptions of social pressure to adapt or not (Ajzen, 1991, 2020; Bosnjak et al., 2020). This is closely related to farmers' perceived social capital. When the social norms and values are perceived to be in line with adapting to the sustainability transition, then the motivation to engage in adaptive behaviour will be higher than if this is not the case (Darnhofer et al., 2010; Lockwood et al., 2015). *Self-identity* encompasses here the farmers' personal norms, values, and goals and occupational identity. When the sustainability transition and required adaptive behaviour is in line with the personal norms and values of the farmer and contributes to the achievement of their personal goals, then the farmer will have a higher degree of motivation to adapt to the sustainability transition (Grothmann and Patt, 2005; Lockwood et al., 2015; Ingram et al., 2013; Mills et al., 2021). Occupational identity relates here to the attachment the farmers have to their job and their perception of what it means to be 'a good farmer'. If adapting to the sustainability transition requires a substantial change in their job, farmers with a strong attachment to their occupation will likely be less inclined to conduct that adaptation. Likewise, if the adaptation goes against their

perception of what ‘good farming’ is, then it is less likely that the farmer will be willing to adapt (Marshall et al., 2012; Morton et al., 2017; Warren et al., 2016).

Both the willingness to adapt and perceived adaptive capacity are influenced by the immediate context within which farmers operate (Bitterman et al., 2019; de Boon et al., 2022; Eakin et al., 2016). The immediate context is to a large extent formed by institutions, i.e. “systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles” (IDGEC Scientific Planning Committee, 1999, p. 14). They influence the ease with which farmers will be able to adapt to a sustainability transition (Berman et al., 2012) and farmers’ perceptions of the institutional context influence their perceived adaptive capacity and willingness to adapt.

3.3. Institutional characteristics to enable adaptive capacity

Gupta et al. (2010) have identified six dimensions that can be used to examine whether institutions are perceived to enable adaptive capacity: variety, learning capacity, room for autonomous change, leadership, resources, and fair governance. Grothmann et al. (2013) have extended this with two further dimensions: adaptation motivation and adaptation belief (see Fig. 1). *Variety* refers to a diversity of problem framings and solution strategies and the inclusion of diverse actors and stakeholders across all societal levels and multiple sectors in the process of solution identification (Gupta et al., 2010). This variety gives room to diversity in individuals’ motivations (Pedersen et al., 2020) and can be of value in addressing uncertainty. *Learning capacity* describes the extent to which the institutions foster learning, are open to uncertainty, have an institutional memory, and promote mutual trust. *Room for autonomous change* describes the institutions’ capacity to provide individuals with the information they require to adapt and clear plans that can be followed, as well as room and support for improvisation. *Leadership* refers to the degree to which the institutions encourage visionary, entrepreneurial, and collaborative leadership to emerge to lead through adaptation by example and support collaborative efforts. *Resources* include the institutions’ capacity to generate human resources, such as knowledge, skills, and financial resources to support adaptation, as well as having the authority to direct adaptation. *Fair governance* refers to the perceived legitimacy and equity of the institutions, the institutions’ responsiveness to society, and the existence of mechanisms of accountability (Gupta et al., 2010). Finally, *adaptation motivation* refers to the degree to which decision-makers in the institutions give the impression that adaptation is relevant and *adaptation belief* refers to whether the institutions instigate the feeling that adaptation can be achieved (Grothmann et al., 2013). The latter relates thus not to perceptions of one’s own adaptive capacity and willingness to adapt, but to perceptions of whether the institutional context provides effective measures to realise the aimed for sustainability transition.

4. Methods

To examine farmers’ perceived adaptive capacity and willingness to adapt and the role of institutional characteristics within that in relation to the English agricultural sustainability transition, we conducted in-depth semi-structured interviews. We contacted farmers through mailing lists of farming organisations, the Just Farmers platform,¹ the Farming Forum,² a farmer WhatsApp group, and snowballing. In doing so, we contacted 61 farmers directly, and many more indirectly. We

aimed to include farmers across England, spanning all agricultural sectors and farm types, ownership types, and a diverse range of age, gender, farm size, and experience with farming and environmental schemes. To ensure that we could also include farmers with poor or lacking internet connections, we offered to conduct interviews either via MS Teams, telephone, or in person. Through these methods, we identified 16 farmers who were willing to be interviewed, two of whom were married to each other so that we conducted a total of 15 interviews with 16 farmers.

To broaden our reach, we invited all of the 19 organisations, who at the time had received an assignment from Defra under the Future Farming Resilience Fund to provide business support to farmers in the early transition stages, to participate in an interview (Powley, 2021). Eight of these organisations agreed to take part in an interview. Together, they are active across England, cover all agricultural sectors, and have collectively supported over 5000 farmers in relation to this sustainability transition through workshops or one-on-one advice. They therefore have detailed insights into the challenges and opportunities that farmers see on the road to adaptation. For two of the organisations, we spoke to two representatives within the same interview and for one organisation we had two separate interviews with two different representatives, meaning that we conducted nine interviews with organisations and spoke to a total of 11 representatives. By combining these interviews with the farmer interviews we reached data saturation. Annex A Table 3 summarises key background characteristics of the interviewees.

We used the three overarching categories of our analytical framework, i.e. adaptive capacity, willingness to adapt, and institutional characteristics, to structure the interviews. In the interviews with farmers, we asked about their views on their ability to adapt to the English post-Brexit agricultural sustainability transition and what they perceived to be the biggest challenges and sources of support for adaptation (linking to the institutional characteristics). We also asked about their general views on this transition, their willingness to adapt to it, and their motivations for adaptation. In the interviews with the representatives of the organisations, we focussed on what views the farmers they work (ed) with expressed to them in relation to the same questions that we asked in the interviews with the farmers. The focus in these interviews was thus still on farmers’ views, albeit as perceived by the organisations through their work with farmers, not on the perceptions of the organisations on these aspects as such. In neither of the interviews did we use the sub-categories of our analytical framework to formulate questions because we wanted to capture aspects that were most salient to the farmers without our questions steering their thinking in a specific direction. Instead, we let the interviewees describe freely what aspects were relevant to them. The interview guides that we used as a starting point for the interviews are provided in Annex C. The interviews received ethical clearance, took place during April–July 2022, lasted between 27 and 68 min, and were all conducted, transcribed, and analysed by the first author.

The analysis of the interview transcripts was conducted in NVivo 12 in an iterative manner, following the steps of analysis as suggested by Braun and Clarke (2006). Here, we built on the complete version of our analytical framework, categorising the material into initial themes following the dimensions and sub-dimensions of our analytical frame as summarised in Fig. 1. Where the interview material did not fit within any of the sub-dimensions of our initial analytical frame, we added additional themes inductively. These additional themes represent aspects that were not prominent in previous literature on the governance of adaptive capacity, willingness to adapt, and institutional characteristics influencing adaptive capacity and willingness to adapt in relation to climate change or individual innovations. They, therefore, present additional aspects that seem to be of importance for adaptive capacity and willingness to adapt in relation to sustainability transitions in specific.

¹ A project that aims to increase openness in British agriculture by providing a platform through which researchers and media can get in contact with independent farmers.

² A UK-run online forum for discussions of agriculture.

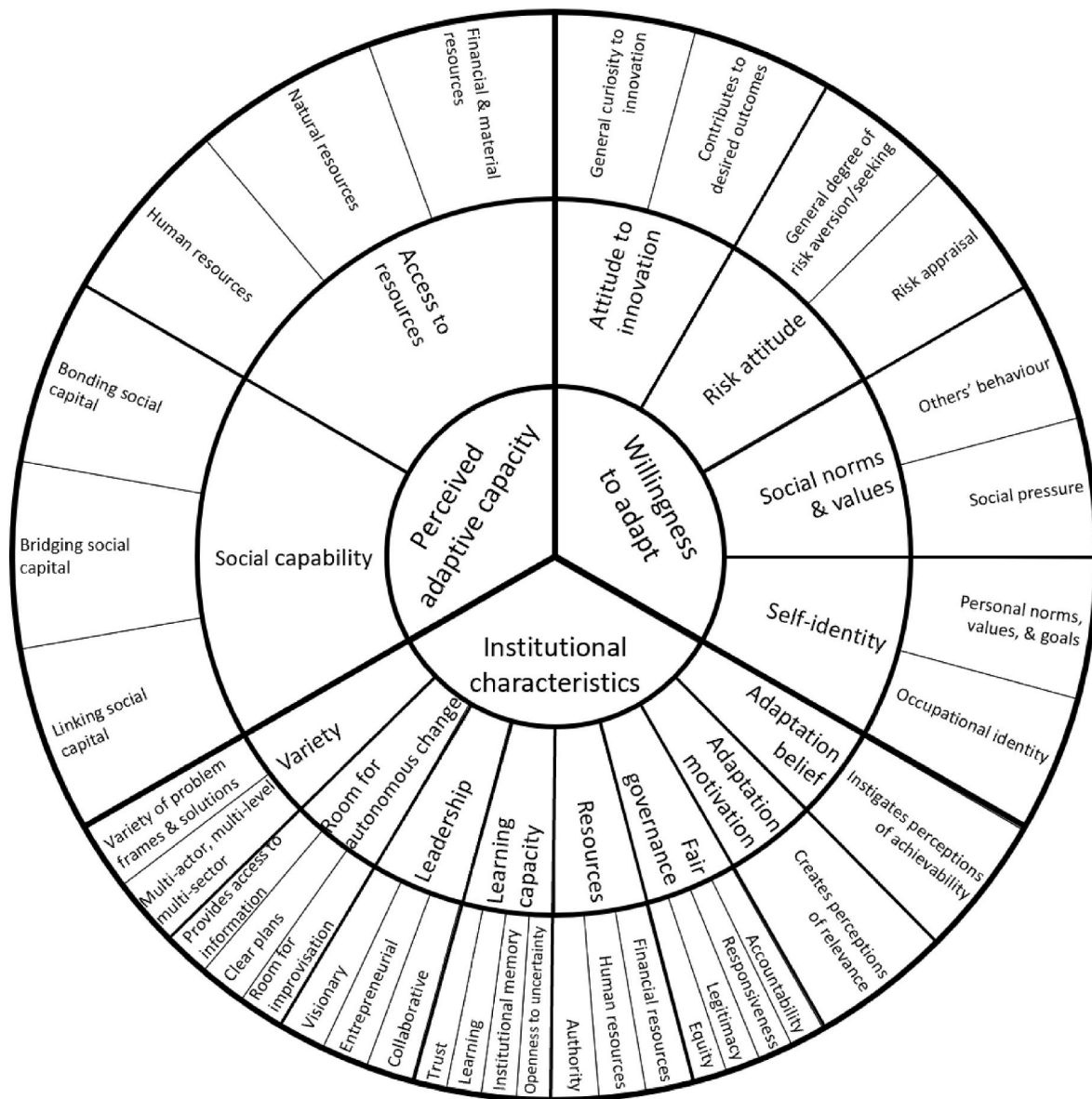


Fig. 1. Operationalisation of perceived adaptive capacity, willingness to adapt, and institutional characteristics important for adaptation based on the literature. Adapted from Gupta et al. (2010) and Grothmann et al. (2013).

5. Results

Overall, the themes in the interviews showed many similarities with the dimensions of adaptive capacity and willingness to adapt identified in previous literature in relation to climate change and individual innovations. However, we identified several new aspects that have not yet been prominent in the adaptation literature discourse and additional nuance and detail that indicate that some of the already known aspects may have a slightly different role in relation to sustainability transitions specifically. A summary of the dimensions and sub-dimensions is provided in Table 1.

5.1. Dimensions of farmers' perceived adaptive capacity to agricultural sustainability transitions

Most prominently mentioned were access to resources (financial, labour, and natural characteristics), bonding social capital, and farmers' state of mind. In terms of financial resources, it was highlighted that these can be both an enabling and preventing factor to adaptation.

Having insufficient financial resources can be a hampering factor as there is no money available to invest in change, or a motivational force to make changes to keep your head above water. Equally, having access to sufficient financial resources can enable farmers to invest in adaptation, but can also form a barrier to it, as it reduces the incentive or need to make changes. This duality of the role of financial resources becomes clear in these contrasting statements:

"And I'm in the lucky position where financially it's not gonna have a significant impact if we don't bother following it through." (F3)

and

"So it's all well and good to be 'do this, do that and you make loads of money'. If you don't have the money in the first place to do it, you've got to think of other sort of routes." (O9).

In terms of natural characteristics, this included whether the soil quality or type, farming system, and/or the climate are seen as appropriate for specific measures that fall under the government proposals for the sustainability transition. In addition, the size of the farm and the

Table 1

Summary of contributing factors to farmers' perceived adaptive capacity and willingness to adapt to sustainability transitions.

Perceived Adaptive Capacity	Willingness to adapt	Institutional characteristics
Access to resources	Attitude to innovation	Resources
<i>Financial & material resources</i>	<i>General curiosity to innovation</i>	<i>Financial resources</i>
sufficient money (+/-)	openness to change	long-term funding
internet*	willingness to try & fail	<i>Human resources</i>
technology	<i>Contributes to desired outcomes</i>	independent advice & research
active ingredients (fertiliser, pesticide, etc.)*	addresses perceived problems	labour
<i>Human resources</i>	keeping business going	<i>Authority</i>
labour	improving environment	market control
knowledge	aligned with personal interests	steering through regulation
skills	Social norms & values	Leadership
<i>Natural resources</i>	<i>Others' behaviour</i>	<i>Visionary</i>
natural characteristics	gaining inspiration	commitment to long-term plan
assets for diversification	<i>Social pressure</i>	<i>Collaborative</i>
land ownership	market pressure	enabling farmer-to-farmer learning
farming system	consumer support	involving farmers in transition design
Social Capability	Risk attitude	time consuming & reduces clarity (-)
<i>Bonding social capital</i>	<i>General degree of risk aversion/seeking</i>	Fair governance
local farmers	openness to risk	<i>Responsiveness</i>
staff	<i>Risk appraisal</i>	to global change
friends	spreading risk	to feedback
<i>Bridging social capital</i>	reducing risk	<i>Legitimacy</i>
farmer organisations	no perceived alternative	communicate openly on aims
environmental organisations	risks from other developments	showing competence
internet	Self-identity	fostering good relationships
consultants	<i>Personal norms, values, & goals</i>	<i>Equity/fairness/justice</i>
agronomists	succession options	morally acceptable policies
vet	stage in life & career	fairness compared to other countries
salesmen	lifestyle	Variety
accountant	<i>maintaining business</i>	<i>Variety of problem frames & solutions</i>
consumer	improving environment	acknowledge difference
<i>Linking social capital</i>	policy preferences	no one-size fits all
government support	<i>Occupational identity</i>	within reason (not too many options)
knowing people in government	good farming practice	<i>Multi-actor, multi-level, multi-sector</i>
participating in pilots	part of the job	holistic
State of mind*	Feeling respected, appreciated, & understood*	comprehensive
<i>Mental health*</i>	<i>Recognition for work*</i>	coherent
<i>Confidence*</i>	<i>Valuing food*</i>	Learning capacity
<i>Positive outlook*</i>	Perceived level of control & ownership*	<i>Learning</i>
	<i>Ownership over change*</i>	showing willingness to learn
	<i>Control over situation*</i>	act on lessons from the past
		<i>Institutional memory</i>
		not re-inventing the wheel
		build on what is there
		<i>Trust</i>
		following through
		providing support
		showing competence
		consistency
		Room for autonomous change
		<i>Room for improvisation</i>
		flexibility
		<i>Provides access to information</i>
		timeliness
		quantity*
		accessible language
		through multiple channels
		<i>Clear plans</i>
		detailed
		consistent
		complete
		Adaptation motivation
		<i>Political will</i>
		<i>Showing action</i>
		Adaptation belief
		<i>Considering (global) consequences*</i>
		<i>No greenwashing*</i>
		<i>Effectiveness</i>

* Indicates aspects that were not prominent in previous governance literature on adaptive capacity and willingness to adapt in relation to climate change or specific

individual innovations.

Aspects marked in green were most prominent in the interviews.

presence or absence of other assets such as empty buildings that can be repurposed for diversification options have a strong impact on perceived adaptive capacity. Equally, ownership over the land was seen as an important factor in terms of having the right to implement adaptation measures, with landowners being perceived as having a better position to adapt:

“And also tenants depending on what their landlord is thinking and with the new opportunities coming through that might just, they might not really have a choice with what the landlord wants to do” (O8).

In terms of bonding social capital, having interactions with other (local) farmers was mentioned as a way to acquire needed skills and new ideas through peer-to-peer learning, sharing concerns, experiences, and frustrations, as well as a way to share costs of adaptation by sharing needed machinery, thereby interacting with perceptions on access to resources.

The role of farmers' state of mind was brought up both by the organisations and the farmers. Both stated the importance of being in the right mindset to engage with change, feeling confident, having a positive outlook on life, and being able to cope with the mental stress of change: *“And there is my health as well to bear in mind, obviously my sanity and my well-being.” (F14).* Some of the organisations made this even more explicit by highlighting that there is a challenge of poor mental health among farmers and that this makes engaging with the sustainability transition very difficult for many.

Less prominently mentioned aspects that were regarded as important included reliable access to the internet, technology, and active ingredients (e.g. fungicides, pesticides, and biostimulants), having people onboard with a business mindset, having the skills to sort through large amounts of information to understand how the government documents translate into specific on-farm practices, having (access to) the skills and knowledge to be able to implement required changes, and bridging social capital. Several farmers highlighted how being part of (farmer) organisations gives them a platform to give feedback to the government on the sustainability transition plans and learn from experience and ideas from farmers across the country. Other actors that farmers lean on for advice and support in relation to the sustainability transition include consultants, the vet, the bank, and salesmen (agronomists, machinery, fertilizer), although the latter were on occasion referred to in a negative light.

Linking social capital was least prominent in the interviews. Three of the organisations mentioned the importance of being able to seek out the government for financial support, highlighting interactions with perceptions on access to resources. Several of the farmers talked about the importance of having links to the government in order to influence policy development or knowing people working for the government who can give direct advice on how to interpret and action on government policy. Yet, two of the farmers expressed wanting to have as little as possible to do with the government, for example:

“I try to have as little involvement with the government as I can, so in some ways BPS going would be great.” (F7).

Several expressed more generally that they are not in need of any kind of support and do not feel like they need input from anyone else, indicating that they do not think social capability contributes to their adaptive capacity.

5.2. Dimensions of farmers' willingness to adapt to agricultural sustainability transitions

Most prominently mentioned were risk appraisal, perceptions of the sustainability transition contributing to desired outcomes, alignment with personal norms, values, and goals, occupational identity, and

feeling respected, appreciated, and understood. Risk appraisal could work in favour of willingness to adapt, for example when the risk of not adapting was deemed too high or when adapting through diversification was seen as a strategy to spread risk. Equally, it could also work against willingness to adapt, when making changes is seen as being too uncertain:

“I'm not sure what the changes are that I need to make. It is a bit like you hop out of bed to go to the loo. You shut your eyes and run down the corridor. You know that the bathroom is there somewhere, but exactly where is it? Are you going to find the bathroom first, or are you going to run into a brick wall?” (F10).

Overall, it not only influenced whether farmers are willing to adapt, but also the kind of adaptations they are considering. The risk of adapting or not adapting to this sustainability transition was also generally considered in a wider context of risk and uncertainty stemming from climate change, new trade agreements, the current global political situation, and market changes, with this sustainability transition often not taking centre stage.

In terms of perceptions of this transition contributing to desired outcomes, the focus was on feelings of whether the required adaptation would benefit business profitability, whether it would address practical problems that the farmers were experiencing, whether it was aligned with changes that they were already thinking of making, and whether potential adaptation options aligned with personal interests around diversification options. This was also linked to whether the sustainability transition plans are regarded as being aligned with personal values such as caring about the environment or not being reliant on subsidies, or are perceived to contribute to personal goals such as maintaining a certain lifestyle, keeping the business going, and being able to pay staff. One aspect that stood out in relation to personal goals was farmers' perceptions on succession options, seeing succession as a way to make the required adaptations happen or as a motivator to do them:

“obviously I'm heavily influenced by the idea that I was left this farm by my dad and I hope to make it available for my children to stay here if they want to.” (F5).

However, if the general idea of the sustainability transition is perceived as being in line with personal norms, values, and goals, but the way the transition is being designed is regarded as wrong, farmers become less willing to adapt:

“growing crops to go in a biomass boiler, from an ecological point of view, makes absolutely no sense at all. Yet you can earn money out of it. And you think it's just madness.” (F11, Interviewee 1).

In terms of occupational identity, the organisations highlighted that being a farmer is often not only an occupational identity, but part of farmers' general identity. If a sustainability transition is regarded as contradictory to the ability to produce food, farmers will be less inclined to adapt: *“I think they're all frustrated. [...] What they're doing the job for is to produce food.” (O3).* The farmers differed in their views, with some stating that farming is so much more than just food production, which could also include taking care of the environment and taking on various diversifications. Others highlighted that all these things are *“another job”* (F11, Interviewee 2), and that it is therefore not something they want to do. Furthermore, when proposed adaptation strategies are regarded as poor farming, farmers are less inclined to implement them: *“And I think you gotta believe in it before you jump into it really.” (F12).*

In terms of feeling respected, appreciated, and understood, the organisations stated that farmers would be more willing to adapt to this transition if they would receive respect and recognition from the general public and the government for the work that they are doing. This was

also echoed by the farmers, for example:

"I'm exasperated really with the blinkered one sided view. I'm offended actually, to be accused that what I do isn't sustainable." (F2).

Several of the farmers stated that the feeling that they are not respected and understood and that society is out of touch with farming can be demoralizing and potentially a reason to give up on farming altogether, i.e. maladapt.

Less prominent in the interviews were general curiosity about innovation, behaviour of others, social pressure, and perceived level of control and ownership.³ In terms of general curiosity to innovation, important traits that were mentioned included being curious, open-minded, and willing to try things out and learn from mistakes. Being traditional, set in your ways, and not open to change on the other hand was pointed out as standing in the way of proactive advice seeking and engagement with this sustainability transition. The behaviour of others was only brought up by some of the organisations as giving inspiration by being able to see the possibilities of how other farmers are adapting. In terms of social pressure, emphasis was put not so much on conforming to the norms and values of people whose opinions farmers value, but primarily on feeling pressure from consumers and the market to farm in a specific way. In terms of perceived level of control and ownership, several organisations highlighted that farmers are focusing on making adaptations around aspects that they feel like they can control, but do not adapt when they feel like something is out of their control, i.e. focusing on the day-to-day activities that need to be completed on the farm rather than focusing on engaging with an uncertain sustainability transition. Furthermore, when farmers feel like they have ownership over the adaptation decisions and the kind of adaptation pathways they can take, they are more willing to make the required changes:

"Maybe if you've decided you're gonna change something about your business, that's much easier, so that feels very different to feeling that you have to change because the government is painting the goal post." (O8).

An aspect that was not prominent in the interviews was the role of the general degree of risk aversion or risk seeking.

5.3. Dimensions of institutional characteristics perceived by farmers to influence adaptation to agricultural sustainability transitions

Most prominently mentioned were three clusters of aspects: 1) legitimacy, trust, institutional learning, institutional memory, equity-fairness-justice, and inclusion of multi-actors, multi-levels, and multi-sectors, 2) visionary leadership, clear plans, access to information, and variety of problem frames and solutions, and 3) adaptation motivation and belief. All three clusters were strongly interrelated.

In the first cluster, in terms of legitimacy, or the lack thereof, the organisations highlighted that the relationship between farmers and Defra is constrained:

"I think it's also worth noting that 49–50% of the farmers weren't confident with their relationship with Defra, but that's of a cohort of mostly arable or mixed farmers. And that's not including many solely livestock farmers, which I imagine would have very little confidence in Defra." (O7).

This situation was perceived as hampering farmers in wanting to give support to the government and adapt to Defra's plans. This constrained relationship was rooted in past experience, different views on how land should be used, a perception that Defra does not communicate openly on

their real aims, and a belief that they do not know what they are doing:

"Not over positive for the way this government, no, at the moment not. I don't think they've got it really. I don't think they do, yeah. There is people within there that are, but they're not being heard." (F12).

Linked to this lack of legitimacy, and further hampering willingness to adapt, was a lack of trust. The organisations pointed to a distrust in the government, government agencies, and experts that is keeping farmers from taking up their advice and following their directions:

"There's something, if that's the advice they're being offered, it can't be the advice that they need. Do you see? It's that thing about not trusting expertise." (O3).

This was echoed by the farmers. The farmers indicated that this lack of trust stems from a variety of reasons, including the impression that the government does not care about agriculture due to the kind of trade agreements that they are entering into and not stepping up to support farmers when they need it, feeling that the government does not have the capability or even desire to do what is right for farming, and perceptions that the government is saying that it will do A but then does B or nothing at all.

Interacting with this were also perceptions on institutional learning and institutional memory, where perceptions that the government is not learning from the past, is trying to re-invent the wheel, and has seemed to have forgotten previous schemes, are negatively impacting trust. They also practically hamper perceptions of adaptive capacity when there is a disconnect in the sustainability transition from old to new schemes:

"And I suppose the other challenges as well is that as the BPS and one scheme comes to an end, you want to be in a position to immediately seamlessly move to another scheme. But there's a sort of hiatus gap between the old scheme and the new scheme." (F6).

In terms of the inclusion of multi-actors, multi-levels, and multi-sectors it was highlighted that these all need to be linked up through a holistic approach in order to foster adaptive capacity. The diverse range of actors that interact with farmers need to have a shared understanding and communicate a joint message on this sustainability transition. Impacts and influences across governance levels need to be considered. Furthermore, as farmers are affected by multiple policy areas, it is important for adaptive capacity that these areas do not work in siloes and ask contradictory things of farmers:

"And I think that one of the issues at the moment is that there is less than perfect clarity about what government really want from farming. Different bits of government seem to have sort of slightly different agendas." (O2).

This lack of a coherent, holistic structure and message around this sustainability transition also negatively impacted perceptions of legitimacy, institutional memory, and trust.

A perceived lack of fairness and justice in the sustainability transition policies was mentioned by farmers as another strong hampering factor for adaptation. For example, when sustainability transition policies were considered to be morally wrong by neglecting their implications on a geographical scale beyond England, when they were seen as unfair because they do not alter the cheap food policy, or because farmers in other countries are receiving support that English farmers are not receiving:

"I think I can compete and produce beef and lamb as well as anyone else. But I can't do it if I'm continuously having my hands tied on my back and somebody else is being helped. You know it's just getting too unfair really." (F5).

In the second prominent cluster, all aspects that were brought up related to the need for clarity. In relation to visionary leadership, it was highlighted that farming requires long term planning, so any adaptation efforts require a stable long-term vision, as one farmer stated:

³ Note that perceived control and ownership here does not refer to 'perceived behavioural control' as used in the Theory of Planned Behaviour, but to feelings of being allowed to make decisions for themselves rather than having decisions prescribed to them by others as well as being able to control the situation (in terms of process and outcomes) that they are adapting to.

“So I think clarity. We were talking about it being a long term job. You can’t jump in and out of food production.” (F2).

The lack of long-term thinking, understanding of potential long-term consequences, and assurance of the stability of the direction that this sustainability transition is taking by the government were regarded as hampering factors for adaptive capacity.

Equally, clear (short-term) plans were also emphasised as being essential. Without these in place farmers feel like they are unable to make decisions and adapt their farms:

“It’s so unknown what the plans are of the government. I think everyone’s a bit up in the air about it. And a bit like we just carry on how we’re doing it because we don’t know what’s gonna happen.” (F1).

Incomplete or constantly changing plans make it difficult to grasp what is required and do not provide a solid basis to make sometimes drastic, long-term adaptation decisions. This also relates to the availability and accessibility of information on the sustainability transition plans as they currently stand and what is to be expected further down the line. However, several organisations highlighted that it is not just the availability of information and the way in which that information is communicated (in accessible language) that is important, but also being able to know what to do with it:

“However, the downside of so much information is that people are just generally feeling really quite bamboozled. [...] They’ve got the information but it’s now what do you do with it?” (O5).

In addition, it is about the right balance, as the availability of too much information can also be a hurdle.

The right balance and clarity are also important in relation to variety of problem frames and solutions. The existence of some variety is important according to both the farmers and organisations because every farm is different, and therefore one-size-fits-all solutions to bring about this sustainability transition would be inappropriate. However, the availability of too many different solutions can be overwhelming and complicate finding an appropriate adaptation strategy:

“it’s almost at the moment there is so much permutations and variations of schemes and requirements and understandings and undertakings. It’s pretty tricky at the moment to try and find a way through it all.” (F8)

The third cluster of prominent aspects that were highlighted links the other two together. A lack of trust, legitimacy, and clear plans strengthened perceptions that there is a lack of adaptation motivation amongst the government, which in turn was brought up as an important separate factor in farmers’ adaptation decisions:

“Well, I think I’m not confident that the government is going to see it through. That is the problem.” (F15).

Feeling that the government does not really want to make the sustainability transition work, that there is a lack of political will, and that statements on the sustainability transition are just made for PR purposes, negatively impact farmers’ willingness, and sometimes ability, to make any adaptations on their farm, as one farmer explained:

“But I want to be in environmental schemes and Defra have been obstructive. I do not believe that they believe the rhetoric of their own publicity.” (F2).

In addition, there was a feeling amongst the farmers that the sustainability transition is not done properly, and therefore will not succeed in reaching the aimed for outcomes, indicating a lack of adaptation belief. They had the perception that the government does not know what it is doing, for example:

“I would say it’s a mess. I don’t think, the politicians certainly don’t understand what they’re doing.” (F4).

There was also a perception that the proposed plans are not capable

of solving the problems that the farmers think this sustainability transition should be addressing. Both of these aspects created a negative perception of this sustainability transition, and made the farmers less willing to adapt to it.

An important factor that the farmers highlighted here includes a worry that the sustainability transition plans cannot be integrated with food production, thereby creating food insecurity and rising food prices. Other important factors highlighted included that the policies are designed to fail, that the timescale is too little too late, and that other governmental activities relating to trade agreements will undercut this sustainability transition by effectively lowering environmental and animal welfare standards. Another major worry and hampering factor for adaptation belief was a perception that the whole of this sustainability transition was a form of greenwashing, as an expected reduction in food production due to this sustainability transition would mean that England would import more food and thereby only move the environmental footprint of food production elsewhere, rather than actually improving environmental impact. As one farmer stated:

“And do you then just shift food production elsewhere in the world and import it? And if you’re doing all of this for environmental reasons, that to me also doesn’t make sense, because if you’re importing food that could be grown locally, and eaten locally, why spend sort of carbon credits, if you like, on importing it to this country?” (F9).

Less prominently mentioned were access to resources, room for improvisation, responsiveness, and collaborative leadership. In terms of access to resources, the capacity of the government to provide financial support to farmers to help them make changes on the farm and clarity about the availability of government funding was highlighted. Likewise, the lack of availability of human resources, in the form of impartial, independent expertise was stated as negatively contributing to perceived adaptive capacity. This also included perceptions on the inadequacy of infrastructure for independent research and training, as well as the unavailability of enough staff to administer this sustainability transition. Several of the farmers also discussed government authority as an important resource by providing some degree of market control and steering through regulations. This was perceived to give farmers a better position to make adaptations. However, one organisation and one farmer pointed out that it was important to have some flexibility in guidelines, thereby providing room for improvisation. That way, the farmers themselves could decide how to enact guidelines in a way that works best for their farm: *“but if they’re too restrictive, we just won’t do it.” (F7).*

Responsiveness, or a lack thereof, was also brought forward as being important. Especially the governments’ (lack of) responsiveness to market change and reactions from other countries to this was regarded as influencing the ability of farmers to adapt. As one farmer described: *“the world has changed. But the government is not thinking.” (F10).*

Collaborative leadership was mentioned in a dual light: it was perceived that support from the government to create collaborations between farmers and involving farmers in the sustainability transition design was valuable and would ease adaptation. But it was also stated that collaboration takes up a lot of time and takes away from the clarity of this sustainability transition process, thereby making it more difficult to adapt.

Aspects that were not mentioned in the interviews include entrepreneurial leadership, accountability, and institutional openness toward uncertainty.

6. Discussion

The results of this study present deeper insights into aspects influencing perceived adaptive capacity and willingness to adapt and the role of institutional characteristics within this in the context of agricultural sustainability transitions. They showcase the complexity of farmers’ agency in deciding if and how to react to an ongoing sustainability

transition and the impact that institutional structures and processes have on these decisions. The qualitative nature of this study allowed us not only to identify key influencing aspects but also to gain a more nuanced understanding of their role. The limitation of this approach is that whilst we ensured to include interviewees across farming sectors, farming types, locations across England, and stage in life, and furthered our reach by including representatives of organisations who work with many farmers, our sample is not representative and relatively small compared to the total number of farmers that are active in England. In addition, it is a commonly known problem that some farmers are more difficult to include in research (Hurley et al., 2022), indicating that it is highly likely that a sample of farmers such as ours is skewed toward farmers who are generally more engaged with the sustainability transition. However, many of the sentiments that were expressed in our interviews are also reflected in the general trends in opinions that have been recorded in Defra's Farmer Opinion Tracker for England in the last three years (Defra, 2020c, 2021c, 2022b), and therefore are likely to be largely in line with the wider farming community.

Whilst we found many similarities with previous adaptation literature in the context of climate change or individual innovations, indicating that some of the insights from this literature can be transferable to the context of agricultural sustainability transitions, there were also aspects that have not yet been prominent in the literature and thus seem to be specific for adaptation in relation to sustainability transitions. These included the dual role that access to finances and information can play (especially the potential hampering factor of having access to plenty of financial resources and 'too much' information); land ownership status in terms of having the right to conduct certain adaptation measures rather than solely being a barrier to investment; state of mind; feeling respected, appreciated, and understood; perceived level of control and ownership; and considerations of (global) consequences. In terms of the hampering factor of access to too much information and the role of farmers' state of mind, a potential reason why this is more prominent in relation to sustainability transitions than in relation to climate change and individual innovations is the scale and diversity of change of a sustainability transition. Rather than receiving information and needing to react to one particular innovation or threat, they receive information and need to make adaptation decisions about multiple changes simultaneously (Geels, 2011) which more easily might become overwhelming and create mental stress. In addition, individual innovations are generally speaking less impactful than a sustainability transition, as only one thing changes rather than the entire context within which the farmer has to operate.

In terms of the potentially hampering role of access to plenty of financial resources and perceptions on considerations of global consequences; as well as the role of feeling respected, appreciated, and understood; and feelings of control and ownership; a potential reason for why these aspects are prominent in our results but not in the previous literature is the more overt normative and prescriptive nature of sustainability transitions in comparison to individual innovations or climate change. Where there exist generally multiple pathways to adapt to climate change, with multiple accepted new 'end states' (Eisenhauer, 2016; Leach et al., 2007), sustainability transitions tend to be more prescriptive, following a specific mission, with only few accepted and supported adaptation pathways (Geels, 2011; Hekkert et al., 2020; Klerkx and Begemann, 2020). Equally, individual innovations generally do not question the overall acceptability of the agricultural system as a whole and the role and identity of farmers within that.

In terms of the prominence of land ownership status with a focus on having the right to implement certain adaptation measures rather than as a hampering factor to investment, we think that this was more prominent in relation to sustainability transitions than in the previous literature because several of the adaptation options that are supported by the government in the specific sustainability transition that we looked at require large-scale, long-term changes to the landscape (e.g. rewilding, planting trees, taking land out of agricultural production)

(Defra, 2022b; 2022c). In the case of tenant farmers, such actions generally require approval by the land-owner. This will less often be the case when it comes to specific individual innovations (e.g. adopting a new kind of tractor or harvester, feed for livestock).

There were also a number of aspects that have been prominent in previous literature (e.g. Grothmann and Patt, 2005; Gupta et al., 2010; Zeweld et al., 2019) but that were not brought up in our interviews, namely general degree of risk aversion/seeking, institutional accountability, entrepreneurial leadership, and institutional openness toward uncertainty. The fact that we did not capture these aspects in our interviews was not necessarily because our analytical framework makes it difficult to capture these aspects per se, but rather because our application of the framework during the interviews meant that we only captured aspects that the respondents brought up themselves, i.e. we did not capture any insights into aspects that were not mentioned by the respondents. In terms of the absence of the aspect of general degree of risk aversion/seeking in the interviews, this may be the case because it requires a high degree of self-awareness to recognise one's own character traits as being a hampering or enabling factor for adaptation and it is thus likely not something that people will reflect on and discuss without being explicitly prompted to do so. In terms of entrepreneurial leadership, we expect that this aspect has been overshadowed by the stated lack of trust and perceived legitimacy, i.e. if there is no trust in, and perceived legitimacy of, institutions, it is not likely that one would look at these institutions for leadership by example (Stupak et al., 2021). In terms of the lack of mentions of the aspect of accountability, a potential reason for this is that, in our institutional context, it is clear that Defra is the responsible institution to develop and implement this sustainability transition. In the case of climate change or individual innovations on the other hand, there are often many more (institutional) actors who potentially carry responsibility, which makes accountability more blurred and, therefore, a more salient aspect in the minds of farmers. In terms of institutional openness toward uncertainty, we think that this was not addressed by our interviewees because it was overshadowed by the perception that there currently is too much uncertainty in the sustainability transition plans. So, rather than focusing on room to discuss doubts, our interviewees wanted clarity.

Overall, our results showed that multiple of the aspects influencing perceived adaptive capacity and willingness to adapt are highly interconnected. An aspect that individually could be an enabling factor can potentially become a hampering factor when it interacts with another aspect. An example of this is access to sufficient financial resources becoming a hampering factor when the sustainability transition is not aligned with personal, norms, values, and goals, as it then provides the option to not adapt to the sustainability transition. This means that when policy makers want to improve perceived levels of adaptive capacity and willingness to adapt, it is essential that they do not only focus on one aspect in isolation but take a more holistic approach (Mills et al., 2021). The overview of the structure of perceived adaptive capacity and willingness to adapt that we have built in this study can be used by policy makers in support of that. Furthermore, we also identified that perceptions of trust, legitimacy, clear (long-term) plans, and institutional memory and learning have a strong reinforcing impact on each other and on multiple other aspects, including adaptation belief, adaptation motivation, and risk appraisal. For example, having negative perceptions of trust also negatively influences perceptions of adaptation belief and institutional learning and vice versa. Focusing efforts to amplify perceived adaptive capacity and willingness around these sets of aspects will therefore likely be an effective and efficient approach.

Whilst our study focused on agricultural sustainability transitions specifically, we expect that these overarching lessons can also be relevant for sustainability transitions in other sectors, as they appear to be linked more generally to the nature of sustainability transitions than to the specifics of agriculture. However, the more detailed lessons, such as the ones in relation to land ownership status in England, will likely be more specific to agriculture and similar sectors that are based around

land use. Indications that underpin these expectations are similarities in our findings to findings for example by Hagerman (2016) and Lawrence and Marzano (2014) who examined adaptive capacity in forestry and Phan et al. (2021) who looked at adaptive capacity in tourism. In addition, whilst this study builds on the English agricultural sustainability transition as a case, the lessons from this study can be of relevance to agricultural sustainability transition efforts beyond this specific case. Specifically, insights from this study will be of value for agricultural sustainability transition efforts throughout the EU, due to the similarities in culture, economic systems, and the way in which the agricultural sector is structured and governed as a result of a shared history with the CAP. Or, as Hill (2020) describes it, this English agricultural sustainability transition can function as “a massive field experiment for CAP reform” (p. 62).

7. Conclusion

In this study we set out to gain a deeper understanding of the aspects that influence perceived adaptive capacity and willingness to adapt in the context of sustainability transitions and the role of institutional characteristics within that, both of which impact individual agency in adaptation decision-making and are influenced by the disruptive and normative nature of sustainability transitions. Understanding which aspects make up the perceived level of adaptive capacity and willingness to adapt is a first stepping-stone to understanding who is likely to benefit or lose out from a sustainability transition, and thus who might need to receive extra support through governance arrangements. Our study of English farmers' perceptions in the context of the post-Brexit agricultural sustainability transition highlighted that there are a wide variety of interconnected aspects that influence perceptions of adaptive capacity and willingness to adapt, the majority of which are expressions of the normative and disruptive nature of sustainability transitions. Through our in-depth qualitative approach and our use of insights from previous adaptive capacity literature as a starting point rather than as a checklist for assessment of specific predefined aspects, we identified several aspects that have not yet been prominent in previous literature on perceived adaptive capacity and willingness to adapt in relation to climate change and individual innovation. Therefore, if we want to understand these aspects in the context of sustainability transitions, we cannot solely rely on adaptive capacity literature that has been developed within other contexts. The updated framework that we provide in this article (Table 1) combines and connects insights from various strands of the adaptive capacity literature in relation to climate change and individual innovations with our empirical findings in the context of a sustainability transition. It complicates the previous framework by de Boon et al. (2022), but in doing so, it provides a tool with more detail and nuance that policy makers and organisations supporting farmers can build on to strengthen and target their efforts to support farmers through a sustainability transition. In a similar way as how we operationalized and applied Fig. 1 in this study, our updated framework is not meant as a checklist. Rather, it is meant as a way to deepen our understanding of the complexity of adaptive capacity, willingness to adapt, and the role of institutional characteristics within this in the context of sustainability transitions and provide a starting point for discussion and reflection. Further research is needed to strengthen and further develop our findings, for example through case studies in other geographical locations or sectors.

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Author contributions

Auvikki de Boon: Conceptualization, Methodology, Investigation, Formal analysis, Writing – Original Draft, Writing – Review & Editing, Visualization Camilla Sandström: Supervision, Writing – Review & Editing David Christian Rose: Supervision, Writing – Review & Editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

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Appendix A. Supplementary data

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