



Agriculture (re-)territorialisation: Balancing the Promotion of Local Products and International Trade in Europe

Systemic barriers preventing farmer engagement in the agricultural climate transition: a qualitative study

John Whitton¹  · Andrew Carmichael¹ 

Received: 8 May 2023 / Accepted: 27 March 2024
© The Author(s) 2024

Abstract

Farmers and the agricultural sector are facing an uncertain future, due to rapidly changing agricultural policy and a nexus of commercial, environmental and biodiversity challenges brought on by anthropogenic climate change. Balancing the interests of the farming community and natural environment is generating organisational and personal conflict, rather than effective agricultural adaption and a focus on the net zero transition. In this paper, we consider how farmers and the wider farming community can participate in engagement and decision-making for the transition, on their own terms, whilst ensuring social justice for fair and equitable decision-making. We discuss findings from our research project, that used questionnaires and follow up semi-structured interviews with farmers and farming groups to reveal systemic issues that prevent farmers engaging with the climate transition to net zero during their everyday practice. We highlight the structural relationships that form these barriers and frustrate farmers when designing and implementing farm interventions to agricultural systems during times of transition. Farmers have highlighted barriers to be associated with policy, (uncertain government strategy, landowner bias in government policy and tenancy restrictions, government bureaucracy—particularly environment schemes), commercial (market forces—downward pressure from supermarkets on price points, availability of labour due to seasonal migration restrictions, increasing cost of labour) and interpersonal (succession—uncertain future of the family farm due to limited income). This frustrates the ability of farmers to address climate change through farming practices and undermines the implementation of innovative engagement practices, such as co-produced interventions, in policy and decision-making settings.

Keywords Agriculture · Farming · Stakeholder engagement · Participation · Co-production · Climate transition

Introduction: agriculture engagement on climate change transition

Anthropogenic climate change (hereto referred to as climate change) exacerbates habitat loss and is the greatest threat to biodiversity (Segan et al. 2016). People living within rural and farming communities in the UK are facing large-scale disruption due to the impacts of climate change and shifts

in agricultural policy as a result of international agreements to reduce greenhouse gas emissions (DEFRA 2020a). The future of farmland biodiversity and the effects of climate change are fundamentally linked. Historically, Farmers have been expected to address biodiversity loss through their land management practices but have been criticised due to poor progress (Bohan et al. 2022). Researchers point out that the historic low uptake of conservation practices can be explained by the lack of economic advantage for farmers in doing so (Pannell et al. 2006), whilst more recently the Regenerative Agriculture movement led by farmers has sought to improve biodiversity through the recognition of the ecological impacts of land management practices, whilst addressing economic and wider farming community concerns of this practice (Alexanderson et al. 2023). The impact of climate change and rising CO₂ levels on agricultural systems is not only a UK problem. The implications

Handled by Julie Hermesse, UCLouvain, Belgium.

✉ John Whitton
jwhitton@uclan.ac.uk

Andrew Carmichael
acarmichael2@uclan.ac.uk

¹ Centre for Sustainable Transitions, University of Central Lancashire, Fylde Road, Preston PR1 2HE, UK

are global and profound, slowing agricultural productivity growth (Ortiz-Bobea et al. 2021), impacting wetland and agricultural ecosystems (Chen et al. 2018), causing higher pest infestation, a shift in weed flora, and reduced crop duration (Malhi et al. 2021). In addition, other countries will also experience radical policy shifts as climate change intensifies, requiring global co-operation (Rasul 2021). Farm-based biodiversity solutions will likely be an important tool for us to alleviate environmental problems and encourage human wellbeing (Bawa et al. 2021). However, researchers have highlighted that despite subsidies to encourage environmentally friendly farming [the approach in the EU Common Agricultural Policy (CAP)], benefits are outweighed by other subsidies that lead to overproduction, agricultural expansion, or livestock production contributing to greenhouse gas emissions (McElwee et al. 2020), exposing the fragility of food systems.

Understanding that food production is part of a socio-ecological system is important; the recognition that agricultural practices have impacts beyond field-scale into ecosystems and broader society (Norton 2016). To reverse the current trend for intensification and move towards more sustainable farming practices, clear evidence is required regarding the interaction of natural, farming, and social systems from a range of scientific disciplines but also stakeholders and social actors that intersect and influence these systems. As others have observed, whilst rural communities have been subject to numerous “sustainability studies”, the social dimensions of agriculture in general, but specifically communities, are under-represented (Janker et al. 2019). We have been led by the academic and grey literature when conceptualising participatory forms of engagement involving farmers and the agriculture sector. Our study reinforces the notion expressed by other researchers that due to the demands of farm-based livelihoods, farmers are time poor and considered hard to reach as they simply don’t have the time to participate, particularly on family farms dealing with issues of intergenerational succession (Baker et al. 2016). To inform our conceptualisation, we asked farmers how they currently engage, who with and what on (see “Policy” section).

Researchers and governments are increasingly adopting innovative engagement methods to progress the transition towards participatory forms of dialogue, where farmers and other stakeholders contribute to interventions for climate change resilience and adaptation. This type of activity brings together diverse actors from different academic fields and citizens from across society to engage in a process of co-production and/or mutual learning and aims to find solutions to social-ecological problems—such as those found in farming communities—that advance both scientific and social objectives (Steger et al. 2021). International governments are increasingly including citizens in engagement and decision making; the EU promotes a ‘multi-actor’ process as

part of its CAP reforms. The UK Government has also promoted co-design with farmers to inform the transition from the EU Basic Payments Scheme (DEFRA 2020c). However, researchers have also recognised that government/state led co-design is difficult to achieve and tends to fail, largely due to government bureaucratic traditions and managerial resistance (Hurley et al. 2022).

In this paper, we discuss our research with farmers and farming groups that aimed to answer the following research question: *What do farmers and growers identify as barriers to participatory-based engagement with agricultural and food system stakeholders, that could support farm-based sustainable solutions to the climate crisis?* By considering the question, we seek to get to the heart of the challenge posed by this Special Issue of how we can progress farming practices for the agricultural climate transition whilst encouraging local practices of production and consumption. Agricultural and food (Agrifood) systems comprise human and non-human components that are developing and adapting as part of the transition to sustainability. These systems incorporate aspects of production, processing, distribution and regulation and can be considered as networks of stakeholders that are linked to agroecosystems and embedded in complex ecological, economic and social processes (Angeon et al. 2024).

The term stakeholder engagement (SE) is contested in a wide range of literatures, including natural resource management. This critique often focuses on both the discourse that supports participatory development and the lived experiences of people on whom it is imposed. The view that SE is used to further pragmatic policy interests to achieve development outcomes at low cost without being seen to impose development on communities, is not new (Cooke and Kothari 2001). SE is a constructed concept, representing a broad range of practices in multiple contexts (e.g. Global North and South), with a divergence between rigorous theoretical stakeholder engagement approaches and practice-based case studies (Talley et al. 2016). We move away from static definitions that categorise stakeholders as those who simply contribute knowledge to a process (top-down consultation), to a more participatory role in defining what constitutes engagement in the first instance (bottom-up). Here, stakeholders are defined as those individuals whose “claims are perceived to be more salient in terms of power, legitimacy and urgency” (Aaltonen et al. 2008), or engagement as “a process where public or stakeholder individuals, groups and/or organizations are involved in making decisions that affect them” (Reed et al. 2018). However, as others argue, it is also important to move beyond participation based on pre-defined normative principles about what constitutes good deliberation, towards participation as an emergent, co-produced phenomenon in itself (Chilvers and Longhurst 2016).

Recent participatory trends in environmental governance, such as co-production to generate new knowledge, has led to new relationships between governments and civil society and has also enhanced standard science communication strategies (Turnhout et al. 2020). The expectation from participants is that such processes will produce actionable knowledge that can transform governance and knowledge production processes, with a degree of disempowerment of science and other elites (Wyborn et al. 2019). Only by doing this is it possible to deepen the degree of engagement, reduce inequality and exclusion, whilst confronting power asymmetries (Pereira et al. 2015).

As our research shows, there are many system based (systemic) barriers to engagement that need to be overcome before participative processes can become meaningful and have influence. These barriers are derived from the perception of farmers, growers and those groups that provide support and services and can be based in any of the component parts of the agrifood system described previously. Following a description of our research methods, we report our quantitative and qualitative results, incorporating a discussion that emphasises the context of the comments and impact as perceived by the participants.

Methods

Mixed methods research is well established and increases both the validity of research results and level of confidence in the work (Alexander et al. 2008). While quantitative data methods can provide a summary of the field being reviewed, identifying its overall scope (Kelle 2006), the advantages of qualitative data collection include its “source of well grounded, rich descriptions and explanations of processes in identifiable local contexts” (Miles and Huberman 1994, p. 1). One of the strengths of qualitative data, is the flexibility to attribute comments and meaning reported by participants to events, processes, and structures they encounter, and how these relate to wider society (Miles and Huberman 1994).

A survey relating to farmers’ experience of climate change and participation in the transition to sustainable farming was created in the Qualtrics online survey distribution platform. This comprised 30 questions on subjects relating to: type of farm; farming operations; experience of, and attitudes towards, climate change and the environment; engagement; finance; thoughts on the future of farming. Some of the questions offered selection from pre-populated lists (e.g. whether farmers had experienced flood, drought, and other environmental challenges) while other questions were open (for example, thoughts on financing farm improvements). This dual approach allowed for both comparative analysis and the generation of themes for subsequent interviews. The survey was distributed with the

support of farming organisations across the UK, through membership newsletters and their social media channels during a Covid-19 national lockdown in October/November 2020.

These organisations regularly engage with farmers on a range of issues so are well placed to support a survey. Agricultural policy is a devolved matter in the UK, with the four nations (England, Scotland, Wales, and Northern Ireland) able to pursue their own strategies. However, they have all experienced two key impacts on the future of their farming, namely the UK leaving the European Union and the legally binding Paris Agreement on climate change. Agriculture is a sector that can aid progress towards carbon reduction targets. Presently, individual UK nation governments’ responses to these two factors are yet to be determined: in England the Path to Sustainable Farming (DEFRA 2020c) is being updated on a regular basis; the Scottish government intends to introduce a new agriculture bill in 2023; the Welsh Agriculture Bill is being introduced currently; and Northern Ireland at the time of writing has no power sharing executive for any legislation. Consequently, we were effectively asking comparable questions of respondents on the likely extent of their participation in agricultural transitions against the backdrop of these two sector-defining decisions, and yet to be confirmed policies.

Distribution via farming organisations would generate self-selecting responses, and the motivations of those responding had to be considered. Farmers in the UK are, however, frequently surveyed, both officially for government statistics and by sector bodies and interest groups. As a result, we recognised the prospect of questionnaire fatigue alongside the typically low response rate to surveys (Gilbert and Stoneman 2015). Working with farming groups raised the profile of our survey, facilitated the generation of responses, and began the dissemination of the research activity. We contacted 67 organisations identified through internet searches of the UK agriculture sector, but also those recommended by other organisations. 20 groups/organisations agreed to include the link to the survey in communications with their membership.

Following the survey, we re-contacted the farming organisations to request an interview. The aim was to support the development of semi-structured interview questions for farmers. Though the authors have on-farm experience, being aware of subjects that might be well-received or contentious was important in helping address any perceived credibility issue or potentially difficult conversations. Representatives from 8 of the 20 organisations agreed to be interviewed. These organisations included both UK and nation-specific interests, representing media, research, landowner, small producer, nature-focused, wellbeing, and national advisory sectors. Semi-structured interviews with these representatives included questions derived from the results of the

survey, informed by these initial responses of farmers. Of particular interest were the themes that farmers highlighted in the additional comments section of the survey as these could cover areas we had potentially not foreseen. The questions to interviewees covered subjects including: climate change transitions; the UK's departure from the EU; current pressures and trends; potential welfare issues; and likely reactions to our research. Informed by these, we then undertook a purposive sample of farmers who had completed the survey and agreed to be interviewed.

Purposive sampling allows for investigation of the beliefs surrounding an issue and has precedent in agricultural research (Adams et al. 2005; Brodt et al. 2006). It is a logical and powerful method when requiring information-rich data (Patton 1990). Patton identifies fifteen types of purposive sample with 'criterion sampling' one that seeks to identify and understand cases that "may reveal major system weaknesses that become targets of opportunity for program or system improvement" (p. 177), a highly appropriate fit with the aims of this research study. Geographical locations, farm type, and the limited data we had on farm size were the only factors considered when contacting respondents, to eliminate any potential concerns regarding selection bias based on survey comments.

From those participants that provided contact details, 42 were emailed with a request for interview and 21 people agreed. Owing to the geographical range and the restrictions of the Covid-19 lockdown, interviews were conducted via the Microsoft Teams platform, recorded with participant's permission, and transcribed. The transcriptions were uploaded to NVivo (release 1.5.1). Interviews were semi-structured, and again the initial questions were based on previous responses and themes, this time from both the survey and the interviews with farming organisations. This process of using the sector's own earlier responses to guide our final round of interviews was highly effective as we were far better informed, could focus on topical issues, elicit more complete data, and were able to verify the accuracy and strength of feeling of earlier comments (Curry et al. 2009). One example of this related to environmental schemes for farmers. Having not personally applied for and managed a scheme we did not anticipate the high level of frustration they generated among our participants. Our survey asked respondents to identify schemes they had used, but the additional comments section of the survey prompted numerous negative remarks about the schemes. We used this data to develop questions to interviewees about environmental schemes and received some very deep and emotional responses. We asked farmers a range of open questions on: the type of farm and main operations; environmental stewardships and associated government schemes; observed changes to weather patterns and association with climate change; impacts of adverse weather on crops or livestock; farmer adaptations to changes

in climate/adverse weather events. We also asked questions on the daily challenges farmers face, to help us understand farmer priorities, and if something could be introduced to help farmers. This helped us understand if farmers might participate in climate transitions, how, and what may prevent them.

The transcriptions were analysed and coded in NVivo according to established techniques (Miles and Huberman 1994) with descriptive and holistic coding (Saldana 2013) capturing the overarching themes in the first cycle before more focused coding in the second cycle. Some of the codes were a priori, those relating to climate observations and on-farm mitigation for example, whilst others were formed from interview responses indicating sector issues that influenced farmer activity, for example the challenges of funding environmental improvements. Thematic analysis (Braun and Clarke 2012) is a widely used (Terry et al. 2017) and comprehensive method for analysing qualitative data, one that is particularly valuable when seeking to interpret evidence and understand relationships (Alhojailan 2012). The themes that emerged from our data were analysed for relevance to our research question.

Results and discussion

Survey

We received 100 valid responses to our survey, from farmers in all eight of the English regions identified by (DEFRA 2020a), and Scotland and Wales (Table 1). There was no intention to omit Northern Ireland from the results, but despite best efforts we did not receive responses from either

Table 1 Location of survey respondents

	Survey	Interview
Farming region	Number of respondents	Number of respondents
South-East England	21	2
South-West England	18	3
North-West England	11	4
Yorkshire and Humber	10	1
West Midlands	8	2
East England	6	3
East Midlands	4	0
North-East England	3	1
Wales	10	3
Scotland	9	2
Northern Ireland	0	0
Total	100	21

Table 2 Farm type of survey respondents

	Survey	Interview
Farm type (generalised)	Number of respondents	Number of respondents
Mixed	24	5
Grazing LFA only	23	4
Grazing lowland only (Lowland and LFA)	19	4
Horticulture only	6	1
Dairy only	9	2
Cereal only	7	1
Cropping only	5	3
Specialist pigs	2	1
Specialist poultry	1	0
Other (incl non-classifiable)	1	0
Total	3	0
	100	21

farmers or organisations based there. Likewise, we could not secure an interview with a farmer from the East Midlands.

Responses came from a broad range of farm types (Table 2) that reflect the UK farming sector. Of the UK's 17.5 million hectares (mha) utilised agricultural area in 2019, approximately 10.2 mha was permanent grassland and 3.2 mha was cropped with cereals (DEFRA 2021). Temporary grassland and woodland comprised over 1 mha each, with oilseeds, potatoes, horticulture, and other crops completing the usage. Ideally, we would have included more surveys and interviews with dairy farmers but the responses we received from the sector was that significant time pressures on them made organising these difficult, itself a limiting factor.

While respondent's farm location and type were given in every survey and interview, farm size proved challenging to identify. Many of those questioned sublet land to neighbours, had arrangements to share grazing, or identified that a lot of their land was not actually farmable. In 2019 there were 219,000 agricultural holdings in the UK with an average size of 81ha, of which only 64 ha is croppable (DEFRA 2021), a non-farmable land average of 21% of the holding. Almost half of all holdings in the UK ($n = 103,000$) are under 20 ha, while fewer than 20% ($n = 41,000$) exceed 100 ha (DEFRA 2021). This pattern does not vary greatly across the four nations with the smallest category of holding (under 20 ha) being the most common in each nation (DEFRA 2021). The farm sizes we could secure from our respondents ranged from 28 to 1000 ha, with an average of 207 ha, clearly larger than the UK average.

Farmers were keen to comment on both the original research question of engagement and climate change transitions, together with a broad range of other subjects. Initially

some of these appeared interesting but disconnected from our research, focusing on the relationship with the public, government, commercial markets, and within their own families. However, it was evident that these perceptions were highly relevant to the farmers, the system they worked in, the work they carried out, the way they could be engaged, and the changes they might make. Consequently, it is insufficient to simply display the data from the survey identifying paths to engagement, or coded topics farmers would like to be informed about; the conversation must embrace the systemic aspects of farming. For this reason, we have blended both survey and interview responses with previous findings from relevant literature in our discussion. It became clear that to support farmers to co-produce farm-based climate transition interventions, we needed to understand the systemic barriers that would impact on this process, not only in the more obvious engagement with nature. These have been grouped into four areas where systemic relationships are perceived by farmers to be of most relevance to participation in climate transitions and are summarised in Table 3.

We did not discern any significant variations in the themes between farmers from different nations of the UK. While local context was often provided in discussion the points made were relatable and universal, such as excessive administration within environmental schemes, or the failures of the market. Therefore, we feel able to place our discussion within a UK context, acknowledging the lack of responses from Northern Ireland.

Table 3 Thematic analysis—barriers to participation for climate change transition

Theme	Subheadings
Natural systems	Weather Land Climate Change Time
Interpersonal relationships	Pressure to generate income Family relationship Succession problems
Policy	Industry bodies/messaging Government bureaucracy Environmental schemes: payments; penalties; subsidies Schemes: not well paid; complex; Prescriptive; additional income Tenancy: agricultural holding vs farm business
Commercial	Market forces Prices Independence Supermarkets Diversification to survive Profitability: cannot pay employee salaries

We discuss our results within the context of the four main themes (see Table 3) and the existing literature.

Natural systems

The utilised agricultural area of the UK is approximately 70% of its total land mass (DEFRA 2019), a dominant usage, that offers both opportunity towards creating sustainable natural resource practices yet also comes with risk (Marr and Howley 2019). Farmland management is being severely tested by climate change and the increasing frequency of extreme weather events (Osborne and Evans 2019). The success of agriculture has historically depended on stable conditions in which to develop approaches (Cradock-Henry et al. 2020). However, impacts such as fluctuations in rainfall, water availability, and the erosion of soil present risks to a sector whose understanding of, and response to, climate change is under-researched (Arbuckle et al. 2015; Moss et al. 2021; Wreford and Topp 2020). This uncertainty damages rural communities that not only rely on the income from farming but look to agriculture for social and cultural provision (Cradock-Henry et al. 2020). Yet amidst the urgency of this challenge and the need to develop adaptive strategies, there are gaps in policy and provision. For example, there is no agricultural water strategy in the UK, despite it being the largest sector user of water with a particular sensitivity to drought (Knox 2020). Farms at the forefront of climate challenges, such as the UK's hill farmers, with peat-rich soils, water catchments, and challenging contours, are expected to make individual environmental adaptations while facing uncertain financial futures (Vigani and Dwyer 2020).

Responses

Our participants discussed at length the inherent connection they have with natural systems and how this had been changing (Table 3). Farmers depend on the land to provide them with an income; transition will also be made within the confines of natural systems and the impacts of ongoing climate change. Interviewees agreed these impacts were tangible and significant:

“Everything seems to be a bit more extreme now”
(Farmer 15)

“Harvest time seems to be earlier in the year” (Farmer 1)

“Insects at strange times of the year that probably shouldn't be there” (Farmer 16)

These changes impact both profits and the ability to make the operational decisions and independent adaptations. One farmer (Farmer 5) summarised the necessary response to this challenge as a need to be “light on your feet”, in so far as management of farmland must be responsive to climate

change. Sometimes this means intervening with measures that would not necessarily be considered as farming (for example, removing fallen trees from water courses), and not simply engaging in the practice of long-established activities. This is interesting as farming itself is the imposition of will on the physical environment and a mastery over nature by humans, however our interviewees told us that they were the ones having to change, that the familiar was no longer a given and nature was providing them with new challenges. Farmers' perception of their ability to shape or reduce their intervention in the landscape, was an important factor in our discussions relating to the future of farming. They feel that their ability to exert influence on the landscape is being eroded. In the survey, 61% of farmers identified issues with drought, and 51% flooding. While the two are not mutually exclusive they highlight that farmers' are struggling to plan, with greater uncertainty over the challenges they may face, which in turn impacts both the time they have available for participation in off-farm activities and the value and confidence in engaging with strategies that may not immediately promise improvement. Only 12% of respondents identified no experience of extreme weather events. Yet the relationship with nature is just one of the challenges farmers believe they are facing. There are numerous other factors at work that are perceived to exercise power over engagement, decision-making, and delivering solutions within the UK farming community.

Interpersonal relationships

The number of people working on agricultural holdings in the UK is approximately 476,000 of which 62% are either the farmer, their partner, a director, or spouse (DEFRA 2016). In 2019 the average income of cereal farms declined by 7% on the previous twelve months, whereas that of lowland grazing livestock fell by 25%, to a mere £9400 of farm income per annum. On average, mixed farms failed to record a profit on their farming activities, despite greater diversity of agricultural output improving farm income stability (Harkness et al. 2021). The figures demonstrate the uncertainty over the viability of UK farming and highlight the pressure that this can place on the farming family unit. Future planning, and succession within farming is a difficult and complex issue; power relationships permeate inter-generational aims and ambitions for the land (Conway et al. 2017). Declining incomes can only exacerbate tensions. If the family wants to continue managing the land, senior male farmers—the group most resistant to innovation—can be reluctant to retire and transfer responsibility for daily activity to their children (Conway et al. 2017). Linking these pressures to other considerations, researchers identify the poor mental health of farmers as a contributing factor to a lower uptake of government agri-environmental schemes (Hounsborne et al. 2006).

For those outside of the family-owned farm, short-term agricultural tenancies of under four years are the most-likely route for new entrants to the industry (Association 2020), stability and planning are in short supply. The combination of challenging financial circumstances, family relationships, and absence of secure futures all have the potential to derail attempts to engage in a response by farming communities to climate change over the long-term.

Responses

In our surveys, when farmers were asked if they would like to attend future engagement workshops on sustainable transitions only 32% said yes, compared with 34% who would like to be involved in decisions and 51% who would prefer to comment on proposals. The most frequent reason (38% of those who gave a reason) for declining this invitation was the inability to spend time away from the farm. Large farms may be more likely to have staff available to attend, whilst smaller operations (the largest group in the UK) could consider this unworkable. Farmers are unable to contribute knowledge and influence engagement if they are absent. During interviews farmers spoke of having to do tasks alone, or with immediate family members. This does not mean that there is insufficient work to be shared, rather the farm simply does not make enough profit to provide paid employment for others. Several interviewees spoke of the impact on recruitment from low revenues:

“There was five people here. But now there’s only me” (Farmer 1)

“It’s [the farm] not a big enough for enterprise to, you know, to employ someone else to help” (Farmer 11)

In both these and other examples from our interviews, the farms owned by respondents were larger than the UK average, so might be expected to be more profitable than smaller enterprises. And yet they seem to similarly struggle for time and assistance. If help is needed it is usually contracted for a particular task or solved by neighbour co-operation. The image of a lone-working farmer with all the potential issues that could create for physical and mental well-being is reinforced by our findings. Both survey respondents and interviewees regularly cited a lack of available hours to do their work. Farmers spoke about tasks that consumed a lot of their day but did not relate to output (for example, fencing repairs):

“All those jobs that aren’t directly linked to managing the livestock just take up so much, so much time that that’s my biggest, my biggest problem” (Farmer 11)

Most survey participants and interviewees were farm owners, rather than tenants. Tenancy agreements cover around a third of the agricultural land of England and

Wales (Association 2020) and for those farmers who may be on short-term contracts there may be far less incentive for undertaking non-production work. Farm owner participants spoke of wanting to leave the land in “better shape”, yet alongside time pressures, succession, as the literature records was identified as a significant concern (Conway et al. 2017; Baker et al. 2016). One of our farming organisation interviewees (Farming Organisation 4) had warned this was “the elephant in the room”. Allied to the need to recruit family members to farm labour there is an uncertainty of where that effort, towards what is also the family home, is leading. Some farmers talked about being put in a position to where they inherited the farm unexpectedly, and contrary to their ambition, another interviewee felt lucky that financial difficulties had forced their parents to sell the farm before they were due to take on its management. Rather than senior male farmers expressing a reluctance to retire, interviewees in that category did not know whether their children wanted to become farmers, or whether there would be a future for them in farming. The financial reality of the business is that farming is a very challenging lifestyle choice, rather than a career decision:

“You don’t go into farming to get rich. Yeah, it’s a way of life” (Farmer 8)

“Farming is looking after a capital asset, not making a profit” (Farmer 18)

One participant spoke of the family deciding it would not be in anyone’s best interests for his son to become the farm manager. His son subsequently had a well-paid and successful career, retiring aged 55, whilst his father continues to manage the farm in his eighth decade.

In 2022, the English government launched the Lump Sum Exit Scheme, essentially a payment to support farmers into retirement. The strategy appeared to clear a path for younger people, perhaps family members, wanting to take on the leading role on farms and help those who wanted to retire to afford it. New entrants, perhaps less encumbered by previous experiences, may be more inclined to participate in the changes farming faces, engaging with a different mindset. However, this seems misguided based on participants’ responses. Farming organisation interviewees spoke of how the older farmers identify through their farms and their occupation, that for many of them the lifestyle choice transcends the economics in a way that is perhaps not felt by their children:

“You know, [if] your family’s been in dairy for two hundred years it strikes at the core of who they are as people and how they identify” (Farming Organisation 4)

“We want to be farmers. There’s still that deep-seated sort of mentality” (Farming Organisation 2)

Scheme responses so far appear to be bearing out this suggestion of complex relationships. When the initial application window closed in September 2022 only 2706 farmers had applied (3% of basic payment claimants), with more than 500 of these already withdrawn or rejected and an expectation of the number registered to decline further (Farmers Weekly 2022). If the thinking is that ‘new blood’ in the sector might lead to a more engaged and energised farming community this scheme appears not to be the means to achieve that.

Policy

To achieve sustainable agricultural systems as a way to urgently address climate change and food systems vulnerability issues, transformative systemic change to agriculture governance is required (Williams et al. 2018). Currently, UK farmers receive a “Basic Payment” from government for farming and observing compliance activities—an average of £27,800 in 2019 (DEFRA 2020b). As part of “the biggest change in agricultural policy in half a century” (DEFRA 2020c, p. 4), direct payments to English farmers will cease in 2027, with the intention that farming businesses will be viable without a reliance on government subsidies (the Sustainable Farming Scheme will replace them in Wales). The Scottish Government has expressed support for continuing direct payments but with an increased level of conditionality and a farm sustainability scheme will exist in Northern Ireland from 2024. This appears to align with research that finds that increasing subsidies based on farmed land area (the current UK system) can cause the stability of farm income to decrease (Harkness et al. 2021).

Farmers can also enter land into government funded agri-environmental schemes, payment that encourages farmers to take environmental stewardship actions to support biodiversity and positive environmental impact. Approximately 70% of UK farmland is currently enrolled in agri-environmental schemes (Clements et al. 2021), and although discussions continue as to the substance of new programmes there are projected to be 88,000 enrolments by 2028, contributing to the UK achieving net zero carbon targets (DEFRA 2020c). Therefore, farmers are facing the prospect of generating new sources of income from enterprises that were previously identified as yielding declining revenues (DEFRA 2019), making independent adaptations to climate change whilst simultaneously meeting their stewardship requirements. Research examining farmers’ decisions to engage with such agri-environmental schemes (Marr and Howley 2019) highlights numerous perceived internal, external, and contextual factors that influence engagement behaviour. Some scholars assert that a clearer understanding of engagement with farmers and the agricultural sector is needed (Coyne et al. 2021; Viganì and Dwyer 2020). Combined with such

a significant shift in approach, this uncertainty is such that researchers have concluded that withdrawal of the current system, without additional support and incentives, is likely to reduce farmer-led environmental stewardship (Marr and Howley 2019).

We sought to address this question of engagement by initially asking which organisations farmers wanted to engage with. Our research had thus far established that farmers needed to be, and were, highly selective over whom and with how they engaged. We asked farmers about their preferred sources of advice on climate change and environmental stewardship, and who they felt should be involved in the discussions about farming transitions, as a way of understanding how farmers perceive governance structures and the current system of farming, including industry bodies and institutions.

Responses

The results revealed that the source of farmers’ information varies. We asked participants to name as many trusted providers as they wished: 67% seek information on climate change from farming publications, 63% from scientific media, books, and other publications, 39% via online searches. Questions on the quantity and quality of information available met with a mixed response: 33% were “neither satisfied nor dissatisfied” with the volume of information, 29% said the quality was “good”, 39% said it was “acceptable”, whereas 25% said it was “poor”.

We noted scepticism towards the motivations of certain sector interest groups, during our interviews with farmers. The National Farmers Union (NFU) of England was mentioned frequently with, for example, dissatisfaction over the extent of their consultations, suggestion of a close association to intensive livestock operations, and querying if this research was being funded by the NFU. Other responses stated that farming was too closely associated to the agro-chemical industry, and that there was a need for independent advice to farmers, not salespeople “tied to any company” (Farmer 7). Only 21% of our respondents said that they sought advice from agricultural consultants. There were, however, numerous positive comments about the work and advice from organisations such as the Pasture-fed Livestock Association, Soil Association, and Country Land and Business Association. These might reasonably be described as agricultural consultants. Some interviewees cited academic research as informing their decision-making, whereas others cited the knowledge they had acquired via wildlife groups and local initiatives.

Despite the variety of sources farmers use for information, we were told by farming organisations and farmers that the source was a vital consideration, whether it be

the authority from which they spoke, a perceived lack of understanding of farming, or a tainted reputation:

“One thing we do hear, is that DEFRA (the UK Government Department) struggles to actually get through to the farmers a lot of the time. Farmers don't necessarily want to hear from DEFRA.” (Farming Organisation 1)

“You suddenly realize the person on the other end of the phone, or on the other end of the email just doesn't understand farming” (Farmer 6)

Mainstream media received significant criticism, whether it be BBC news, other television programmes, or national newspapers. Two points were frequently mentioned in relation to these groups; perceived inaccuracies in the reporting of climate change factors, and the categorisation of ‘farming’ as one homogenous entity, rather than many types, sizes, and approaches to practice:

“I think what frustrates me sometimes is you see these articles about, you know the methane emissions from cattle farming whatever, and they show you this film footage of a massive great big feed lot and I don't know any farmer in the UK who does, who farms that way” (Farmer 11)

Despite this, farmers appear to remain receptive to different perspectives. We expected to find that a high percentage of participants required other farmers and farmer organisations to be involved in engagement initiatives, and 92% and 73% respectively reported this to be the case. Case studies of other farms are included throughout the agriculture literature, and interviewees were keen to discuss what their farming neighbours, or those they knew in the industry, were doing whether it be good or bad. However, farmers did not want engagement to be exclusive to the farming community (only 4% of survey respondents said they would only invite fellow farmers to engagement events). Rather, nearly 70% wanted to include researchers and academics, over 60% wanted to include local government decision makers, and more than 50% wanted input from conservation charities. This speaks less to hardened attitudes and intentions formed by existing perceptions and socialisation, and more to a sector willing to consider objective data, or at least be open to opportunities for their perspectives and opinions to be modified or changed. Engagement with UK farmers has the potential to be successful if it is led by people that farmers respect, trust, and perceive that they can learn from, who understand farming and act without a commercial agenda. Responses from both farmer and farming organisation interviewees detail this:

“I understand the sort of theory behind it, but it would be very nice to back it up with some facts and figures” (Farmer 8)

“The people (that) have chosen to come to those workshops have been clearly ‘I want to stay in farming into the future, I know I need to do something differently, can you tell me what you're suggesting, and I'll see if I could do it to my farm’. So, there has been a willingness there”. (Farming Organisation 2)

We identify the need to include government decision makers (or organisations that represent them) in future engagement, as most farmers we surveyed are engaged with government agri-environmental schemes; 61% mentioned funding environmental stewardship improvements through schemes in our survey. That does, however, mean that almost two fifths of farmers we surveyed do not use the designated government schemes for positive environmental management of land towards that outcome. Only 2% of respondents said they entered schemes solely for financial benefit, whilst 56% noted the additional revenue on offer alongside other reasons for participating. More than a third of our survey respondents (35%) have encountered barriers with finance when attempting to implement stewardship measures. These results point to problems and perceived issues with agri-environmental schemes.

Existing agri-environmental schemes are broadly considered by farmers to be highly prescriptive. This was a phrase used repeatedly with reference to what farmers considered strict rules without flexibility or respect for local or on-farm knowledge. Examples given by respondents included the number of plants that constituted a hedge, tree planting, and restrictions on livestock per hectare. Some farmers acknowledged the necessity of the regulations, and the implausibility of having multiple clauses and variations, but there was a clear contrast between the rigidity of the schemes and the previously mentioned necessity for being flexible. Moreover, it is found that there can be complications with these regulations:

“You can talk to someone....and they go ‘all you gotta do is put a tick in that box’. Yeah but which bloody box. Then we have to read the whole thing over again and we have 300 pages” (Farmer 13)

“You know they're (documents) like War and Peace” (Farmer 15)

“Our farming Department makes life a misery for many farmers with their ridiculously overcomplicated bureaucracy” (Farmer 2)

Some farmers felt the schemes were so challenging that they needed to pay people to help them to apply, with no guarantee of success.

Late payment for work that farmers have undertaken was mentioned frequently in both our survey and interviews. Delays were ascribed to errors by scheme administrators, disputes about land that had not changed from previous years, and simple resignation that this was the norm:

“Biggest problem I would say is actually getting paid for the work (by DEFRA). It's about 15 months now since I was paid last”. (Farmer 1)

Payment is for work that requires financial outlay by farmers and carries quite severe penalties for transgression. Some farmers spoke of feeling intimidated by inspectors and entering hostile atmospheres when arguing their case (if accused of contravening their agreements). Others suggest that schemes are devised with the primary intention that nobody should be able to deviate from the rules. Given the efforts of and risk borne by farmers, some feel that such schemes offer little incentive. The financial returns can be good for some, but not others, and factors such as the size and type of farm, and opportunity cost of the land are relevant in this regard:

“We've put probably about 3 miles of our hedgerow into the Stewardship Scheme. Out of four and a half miles to 5 miles of hedgerow that we've got, most we planted ourselves. And for that under the Countryside Stewardship mid tiered scheme we get £600 a year” (Farmer 2)

“I've looked at some of the schemes but there's... It's generally for, you know, for that for the level of farming that I'm doing, it's too much effort”. (Farmer 11)

“They were designed for arable farming. As far as I could see. And with fruit farming we're in a different financial dynamic” (Farmer 14)

Short-term agricultural tenancies are not only a potential factor in the failure to attract new entrants to farming, but they can also be responsible for reduced uptake of environmental schemes. There are two main types of tenancy agreement: Agricultural Holding (AH) Act and Farm Business Tenancies (FBT). Agricultural Holding tenancies (usually a lifetime tenancy) typically pre-date 1 September 1995 (the date of the Agricultural Tenancies Act) and provide compensation to tenants for improvements made or changes in farming system that benefitted the farm. Farm business tenancies followed the 1995 Act and include variations based on individual agreements (including length of occupancy), and a requirement for written agreements, between landlord and tenant. For one of our farm interviewees the distinction is clear:

“Our farm still works because we're still on an AH tenancy. If you're on FBT you are stuffed, royally stuffed” (Farmer 13)

While the terminology used may be harsh, there is little doubt that the change of terms and potentially reduced time afforded to tenants could make them consider whether a long-term scheme is something they can contemplate or see a return on investment. When asked about environmental improvements that they had made, one interviewee said:

“Those things need upfront investment and for many farmers that's not easy or not even possible. Tenant farmers there's all sorts of issues as well”. (Farmer 19)

That some farmers still enter land into schemes reinforces findings relating to the income from farming and the need for diversification to stabilise their business. Farmers are not mandated to enter schemes, and some feel the schemes reward environmental improvements that farmers would make, or compensate for land that cannot be brought into agricultural production. One of the most frequent criticisms was that the schemes are not retrospective, and farmers are not rewarded for having existing ecological diversity and environmental quality on their land. This represents a strong argument for change to the current system, yet the lack of detail in proposals for their replacement is making farmers anxious. The conclusion that simple withdrawal of existing arrangements will lead to reductions in environmental provision (Marr and Howley 2019), is supported by our results. Perhaps as one farmer concludes, not just a reduction in provision, but in farming entirely:

“It's a lifeline if you're, and I'm sure the same as any other Upland area. If you're farming just to break even, not make any significant amount of money you need the livestock receipts. You need something from agri-environment [schemes] and you need the equivalent of Basic Payments” (Farmer 12)

Commercial

During the Covid-19 pandemic, suppliers, such as farms, came under increasing pressure from large retailers to reduce prices, themselves having seen a loss of market share to discount outlets (Giles 2020). Supermarket influence on farmers and the agricultural sector remains strong. Over 80% of fruit and vegetables sold in the UK (Menary et al. 2019) and around 70% of lamb sales (NFU 2023) are via supermarkets. While 98% of UK households purchase cow's milk (AHDB 2021) only 3% of milk sales are through doorstep delivery (DairyUK 2023). It is one of numerous structural forces that negatively impacts farmer autonomy (Grant 2016). As researchers note (Brooks et al. 2017), power in commercial relationships within the agriculture sector is explicit in the way that food processors have introduced measures to deter collective action by farmers and keep them subservient in their dealings. While alternatives to market are available

through direct farm shop sales, co-operatives, and other small scale or more local initiatives, it is the large retail companies who are now the principal directors of the production and consumption of the UK's food (Trewern et al. 2021). The market has effectively failed as a few influential organisations have aimed to control the entire food supply chain (Menary et al. 2019) removing farmers' capability to set pricing for their goods. The ability of farms to start returning a profit may depend on diversification of their services and output—on average, more diversity stabilises farm income (Harkness et al. 2021). However, farmers' potential to undertake this diversification may be challenging due to a lack of entrepreneurial skills (Yoshida et al. 2020) and the privatisation of many agricultural advisory services making it expensive to access knowledge relating to innovation (Menary et al. 2019). This may in part account for our finding that only 21% of farmers sought advice from agricultural consultants. Family farms are unlikely to seek such change due to an aversion to risk and desire for familiar levels of income and activity. Additionally, it has been found that profitability and efficiency is influenced most by increasing the farmed area (Vanhuyse et al. 2021). However, the high price of land puts this option beyond the small family farm (Grant 2016), which may help to explain the decline in the number of such farms in England over the last decade (CPRE 2017).

Responses

As supported by our findings, farmers and farming organisations agree that the market for agricultural goods and services is not working. We find significant barrier to engagement between farmers, their customers, and the supply chain:

“You still get the same [financial] reward for wheat, for example, as you did 25 years ago... A beef animal was worth £1000 ten years ago and it's still only worth £1000. Every single thing, I always say this.... Everything is bought off us 'cause we never actually sell anything” (Farmer 13)

“Must be the only industry where you can't dictate the price of your end product” (Farmer 20)

“I looked at the costings and did a spreadsheet and it was it was losing roughly a penny a litre on the milk” (Farmer 16)

Some interviewees directly reference large supermarket chains and their purchasing power; their ability to specify exact requirements, their control of pricing, and the ease at which they can disconnect suppliers. However, supermarket contracts are welcomed by some farmers, providing a steady income throughout the year. The challenge can be to meet year-round demand for a particular product such as milk,

which means farmers need look to expand their operations to guarantee supply. There is an additional suggestion that well-known retailers exert an environmental pressure; “they don't want their suppliers on the 9 o'clock news for destroying the environment” (Farmer 14). However, fulfilling the contract might require an intensification of practices that increases pressure on the environment. Criticism is aimed more at what is perceived as a system that allows such failures in demand and supply:

“The system is broken so you've got individuals solving their own problem. Yeah, which is why you've got so many....different types of farming going on” (Farmer 13)

“I just think it's the whole system is so chronically wrong at the moment” (Farmer 15)

The repeat mention of “the system” points to what might initially be thought of as the realities of a commercial market but is actually an inherent systemic failure in UK agriculture. Farmers in our interviews felt they had to reduce the time they spend farming to devote more effort to work that provides them with more income, not so much a diversity of agricultural output as a diversity of the whole business. Activities mentioned included the promoting of the farm as a wedding venue, organising educational visits, or providing a livery yard for horses.

Rather than intercede in commercial arrangements the various UK government proposals appear to be encouraging this move away from the perception of what farming is, to the supply of public goods and a means of income that does not rely on food production. This does not sit easily with some farmers, as one farming organisation explained:

They've got this into their mentality that they're important from an agricultural perspective and reluctant to move to being seen as well... well they used to describe themselves as being like a park ranger” (Farming Organisation 2)

If this is the new system, then UK farmers will be at the centre of multifarious pressures, including their relationship with the land, the social dynamics of farm life, and the way they earn a living.

Conclusion

In line with our research aims we have identified a range of systemic barriers to effective engagement for farmers and farming groups to mitigate the effects of climate change and support agricultural climate transition efforts. Many of these barriers are beyond simple incentives to change behaviour and connect strongly to social justice through universal issues ranging from a shifting balance in farmers' experience

of extreme climate events, to pressures upon the family farm unit. These systemic challenges foster a perception of a lack of support, and a skewed market for agricultural goods and services that is simply broken. The combination of challenging financial circumstances, family relationships, and absence of secure futures all have the potential to derail attempts to engage in a response by farming communities to climate change over the long-term.

It is clear, as discussed earlier in this paper, that these systemic barriers not only exist and manifest in the engagement process itself, but that these relationships significantly influence outcomes, interventions, and the likelihood of success for implementation. We have categorized the four main barriers that UK farmers perceive or have experienced during their day-to-day farming practice as: Natural Systems; Interpersonal relationships; Policy; Commercial. The research recorded in this paper has allowed us to: understand the multiple organizational spaces where engagement currently takes place; identify who participates; who and what is represented; how current deliberations are structured and how outcomes are able to be circulated. The findings are important for a range of stakeholders that are seeking to engage with agricultural systems at multiple scales.

Declarations

Conflict of interests We would like to thank the University of Central Lancashire (UCLan) Centre for Sustainable Transitions (CST) for providing financial assistance to support data collection with farmers and farming groups. The research has been fully approved by the University of Central Lancashire (UCLan) Science Ethics Review Panel (Ref: Science 0073). We also thank the organisers and participants of the interdisciplinary workshop series supported by the Agriculture and Food Research Initiative (AFRI), USDA National Institute of Food and Agriculture titled: “Advancing Scholarship and Practice of Stakeholder Engagement in Working Landscapes”. Grant no. 2020-01551, project accession no. 1023309. The workshop comprised US and EU academics and practitioners from universities and government agriculture services and allowed us to develop our ideas for this paper significantly.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Aaltonen K, Jaakko K, Tuomas O (2008) Stakeholder salience in global projects. *Int J Project Manage* 26(5):509–516. <https://doi.org/10.1016/j.ijproman.2008.05.004>
- Adams CE, Higginbotham BJ, Rollins D, Taylor RB, Skiles R, Mapston M, Turman S (2005) Regional perspectives and opportunities for feral hog management in Texas. *Wildl Soc Bull* 33(4):1312–1320. [https://doi.org/10.2193/0091-7648\(2005\)33\[1312:RPAOFF\]2.0.CO;2](https://doi.org/10.2193/0091-7648(2005)33[1312:RPAOFF]2.0.CO;2)
- AHDB (Producer) (2021) Cow’s milk remains a staple in British households. <https://ahdb.org.uk/news/consumer-insight-cow-s-milk-remains-a-staple-in-british-households>. Accessed 5 Mar 2024
- Alexander VD, Thomas H, Cronin A, Fielding J, Moran-Ellis J (2008) Mixed methods. In: Gilbert N, Stoneman P (eds) *Researching social life*, vol 3. SAGE Publications, London, pp 125–144
- Alexanderson MS, Luke H, Lloyd DJ (2023) Regenerative farming as climate action. *J Environ Manage* 347:119063. <https://doi.org/10.1016/j.jenvman.2023.119063>
- Alhojailan MI (2012) Thematic analysis: a critical review of its process and evaluation. *West East J Soc Sci* 1(1):39–47
- Angeon V, Casagrande M, Navarrete M, Sabatier R (2024) A conceptual framework linking ecosystem services, socio-ecological systems and socio-technical systems to understand the relational and spatial dynamics of the reduction of pesticide use in agrifood systems. *Agric Syst* 213:103810. <https://doi.org/10.1016/j.agry.2023.103810>
- Arbuckle JG, Morton LW, Hobbs J (2015) Understanding farmer perspectives on climate change adaptation and mitigation. *Environ Behav* 47(2):205–234. <https://doi.org/10.1177/0013916515503832>
- Association TF (2020) Vision for agriculture from the perspective of the tenanted sector. Retrieved from Tenant Farmers Association. https://www.tfa.org.uk/wp-content/uploads/2013/05/10July27_TFA2002VisionforAgricultureV7LoRes.pdf. Accessed 27/07/22
- Baker JR, Lobley M, Whitehead I (2016) *Keeping it in the family: international perspectives on succession and retirement on family farms*. Routledge, London
- Bawa KS, Sengupta A, Chavan V, Chellam R, Ganesan R, Krishnaswamy J et al (2021) Securing biodiversity, securing our future: a national mission on biodiversity and human well-being for India. *Biol Conserv* 253:108867. <https://doi.org/10.1016/j.biocon.2020.108867>
- Bohan DA, Richter A, Bane M, Therond O, Pocock MJ (2022) Farmer-led agroecology for biodiversity with climate change. *Trends Ecol Evol* 37(11):927–930
- Braun V, Clarke V (2012) Thematic analysis. In: Cooper H (ed) *APA handbook of research methods in psychology*, vol 2. American Psychological Association, Washington, DC
- Brodth S, Klonsky K, Tourte L (2006) Farmer goals and management styles: implications for advancing biologically based agriculture. *Agric Syst* 89(1):90–105. <https://doi.org/10.1016/j.agry.2005.08.005>
- Brooks S, Leaver A, Spence M, Elliott CT, Dean M (2017) Pragmatic engagement in a low trust supply chain: beef farmers’ perceptions of power, trust and agency. *Compet Chang* 21(2):114–131. <https://doi.org/10.1177/1024529417691053>
- Chen H, Zhang W, Gao H, Nie N (2018) Climate change and anthropogenic impacts on wetland and agriculture in the Songnen and Sanjiang Plain, Northeast China. *Remote Sens* 10(3):356
- Chilvers J, Longhurst N (2016) Participation in transition(s): reconceiving public engagements in energy transitions as co-produced, emergent and diverse. *J Environ Plan Policy Manage* 18(5):585–607. <https://doi.org/10.1080/1523908X.2015.1110483>

- Clements J, Lobley M, Osborne J, Wills J (2021) How can academic research on UK agri-environment schemes pivot to meet the addition of climate mitigation aims? *Land Use Policy* 106:105441. <https://doi.org/10.1016/j.landusepol.2021.105441>
- Conway SF, McDonagh J, Farrell M, Kinsella A (2017) Uncovering obstacles: the exercise of symbolic power in the complex arena of intergenerational family farm transfer. *J Rural Stud* 54:60–75. <https://doi.org/10.1016/j.jrurstud.2017.06.007>
- Cooke B, Kothari U (2001) *Participation: the new tyranny?* Zed books, London
- Coyne L, Kendall H, Hansda R, Reed MS, Williams DJL (2021) Identifying economic and societal drivers of engagement in agri-environmental schemes for English dairy producers. *Land Use Policy* 101:105174. <https://doi.org/10.1016/j.landusepol.2020.105174>
- CPRE (2017) Uncertain harvest: does the loss of farms matter? Retrieved from Campaign to Protect Rural England. <https://www.cpre.org.uk/resources/uncertain-harvest-does-the-loss-of-farms-matter/>. Accessed 27/07/22
- Cradock-Henry NA, Blackett P, Hall M, Johnstone P, Teixeira E, Wreford A (2020) Climate adaptation pathways for agriculture: insights from a participatory process. *Environ Sci Policy* 107:66–79. <https://doi.org/10.1016/j.envsci.2020.02.020>
- Curry LA, Nembhard IM, Bradley EH (2009) Qualitative and mixed methods provide unique contributions to outcomes research. *Circulation* 119(10):1442–1452
- DairyUK (Producer) (2023) The UK Dairy Industry. <https://www.dairyuk.org/the-uk-dairy-industry/>. Accessed 05 Mar 2024
- DEFRA (2016) Agricultural labour in England and the UK farm structure survey. Retrieved from Gov.UK. <https://www.gov.uk/government/statistics/farm-labour-profiles-from-the-england-and-uk-farm-structure-survey>. Accessed 27/07/22
- DEFRA (2019) Farming statistics final crop areas, yields, livestock populations and agricultural workforce. Retrieved from Gov.UK. <https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs>. Accessed 27/07/22
- DEFRA (2020a) Defra statistics: agricultural facts England regional profiles. Retrieved from Gov.UK. <https://www.gov.uk/government/statistics/agricultural-facts-england-regional-profiles>. Accessed 27/07/22
- DEFRA (2020b) Farm business income by type of farm. Retrieved from Gov.UK. <https://www.gov.uk/government/statistics/farm-business-income>. Accessed 27/07/22
- DEFRA (2020c) The path to sustainable farming: an agricultural transition plan 2021 to 2024. Retrieved from Gov.UK. <https://www.gov.uk/government/publications/agricultural-transition-plan-2021-to-2024>. Accessed 27/07/22
- DEFRA (2021) Agriculture in the United Kingdom 2019. Gov.UK [online]. <https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2019>. Accessed 27 July 2022
- Gilbert N, Stoneman P (2015) *Researching social life*. Sage Publishing, London
- Giles J (2020) Policy Push & Commercial Pull-What's changing UK farming and food? *Int J Agric Manag* 9:12–15
- Grant W (2016) The challenges facing UK farmers from Brexit. *Euro-Choices* 15(2):11–16. <https://doi.org/10.1111/1746-692X.12127>
- Harkness C, Areal FJ, Semenov MA, Senapati N, Shield IF, Bishop J (2021) Stability of farm income: the role of agricultural diversity and agri-environment scheme payments. *Agric Syst* 187:103009. <https://doi.org/10.1016/j.agsy.2020.103009>
- Hounsome B, Edwards RT, Edwards-Jones G (2006) A note on the effect of farmer mental health on adoption: the case of agri-environment schemes. *Agric Syst* 91(3):229–241. <https://doi.org/10.1016/j.agsy.2006.09.001>
- Hurley P, Lyon J, Hall J, Little R, Tsouvalis J, White V, Rose DC (2022) Co-designing the environmental land management scheme in England: the why, who and how of engaging 'harder to reach' stakeholders. *People Nat* 4(3):744–757
- Janker J, Mann S, Rist S (2019) Social sustainability in agriculture—a system-based framework. *J Rural Stud* 65:32–42. <https://doi.org/10.1016/j.jrurstud.2018.12.010>
- Kelle U (2006) Combining qualitative and quantitative methods in research practice: purposes and advantages. *Qual Res Psychol* 3(4):293–311
- Knox JW (2020) The challenges of developing an irrigation strategy for UK agriculture and horticulture in 2020: industry and research priorities. *CAB Rev Perspect Agric Vet Sci Nutr Nat Resour*. <https://doi.org/10.1079/pavsnr.202015050>
- Malhi GS, Kaur M, Kaushik P (2021) Impact of climate change on agriculture and its mitigation strategies: a review. *Sustainability* 13(3):1318. <https://doi.org/10.3390/su13031318>
- Marr EJ, Howley P (2019) The accidental environmentalists: factors affecting farmers' adoption of pro-environmental activities in England and Ontario. *J Rural Stud* 68:100–111. <https://doi.org/10.1016/j.jrurstud.2019.01.013>
- McElwee P, Turnout E, Chiroleu-Assouline M, Clapp J, Isenhour C, Jackson T et al (2020) Ensuring a post-COVID economic agenda tackles global biodiversity loss. *One Earth* 3(4):448–461. <https://doi.org/10.1016/j.oneear.2020.09.011>
- Menary J, Collier R, Seers K (2019) Innovation in the UK fresh produce sector: Identifying systemic problems and the move towards systemic facilitation. *Agric Syst* 176:102675. <https://doi.org/10.1016/j.agsy.2019.102675>
- Miles MB, Huberman AM (1994) *Qualitative data analysis: an expanded sourcebook*. SAGE, London
- Moss ED, Evans DM, Atkins JP (2021) Investigating the impacts of climate change on ecosystem services in UK agro-ecosystems: an application of the DPSIR framework. *Land Use Policy* 105:105394. <https://doi.org/10.1016/j.landusepol.2021.105394>
- NFU (Producer) (2023) UK lamb – what do the sales figures show? <https://www.nfuonline.com/updates-and-information/uk-lamb-what-do-the-sales-figures-show/>. Accessed 5 Mar 2024
- Norton LR (2016) Is it time for a socio-ecological revolution in agriculture? *Agric Ecosyst Environ* 235:13–16. <https://doi.org/10.1016/j.agee.2016.10.007>
- Ortiz-Bobea A, Ault TR, Carrillo CM, Chambers RG, Lobell DB (2021) Anthropogenic climate change has slowed global agricultural productivity growth. *Nat Clim Chang* 11(4):306–312. <https://doi.org/10.1038/s41558-021-01000-1>
- Osborne R, Evans N (2019) Friend or foe? UK farmers' relationships with the weather. *J Rural Stud* 72:205–215. <https://doi.org/10.1016/j.jrurstud.2019.10.028>
- Pannell DJ, Marshall GR, Barr N, Curtis A, Vanclay F, Wilkinson R (2006) Understanding and promoting adoption of conservation practices by rural landholders. *Aust J Exp Agric* 46(11):1407–1424. <https://doi.org/10.1071/EA05037>
- Patton MQ (1990) *Qualitative evaluation and research methods*. SAGE Publications Inc., London
- Pereira L, Karpouzoglou T, Doshi S, Frantzeskaki N (2015) Organising a safe space for navigating social-ecological transformations to sustainability. *Int J Environ Res Public Health* 12(6):6027–6044
- Rasul G (2021) Twin challenges of COVID-19 pandemic and climate change for agriculture and food security in South Asia. *Environ Challenges* 2:100027. <https://doi.org/10.1016/j.envc.2021.100027>
- Reed MS, Vella S, Challies E, de Vente J, Frewer L, Hohenwallner-Ries D et al (2018) A theory of participation: what makes stakeholder and public engagement in environmental management work? *Restor Ecol* 26(S1):S7–S17. <https://doi.org/10.1111/rec.12541>
- Saldana J (2013) *Coding manual for qualitative analysis*. SAGE, London
- Segan DB, Murray KA, Watson JEM (2016) A global assessment of current and future biodiversity vulnerability to habitat loss-climate

- change interactions. *Glob Ecol Conserv* 5:12–21. <https://doi.org/10.1016/j.gecco.2015.11.002>
- Steger C, Klein JA, Reid RS, Lavorel S, Tucker C, Hopping KA et al (2021) Science with society: evidence-based guidance for best practices in environmental transdisciplinary work. *Glob Environ Chang* 68:102240. <https://doi.org/10.1016/j.gloenvcha.2021.102240>
- Talley JL, Schneider J, Lindquist E (2016) A simplified approach to stakeholder engagement in natural resource management the five-feature framework. *Ecol Soc*. <https://doi.org/10.5751/ES-08830-210438>
- Terry G, Hayfield N, Clarke V, Braun V (2017) Thematic analysis. In: Willig C, Stainton Rogers W (eds) *The SAGE handbook of qualitative research in psychology*, 2nd edn. SAGE, London, pp 17–37
- Trewern J, Chenoweth J, Christie I, Keller E, Halevy S (2021) Are UK retailers well placed to deliver ‘less and better’ meat and dairy to consumers? *Sustain Prod Consump* 28:154–163
- Turnhout E, Metzger T, Wyborn C, Klenk N, Louder E (2020) The politics of co-production: participation, power, and transformation. *Curr Opin Environ Sustain* 42:15–21. <https://doi.org/10.1016/j.cosust.2019.11.009>
- Vanhuyse F, Bailey A, Tranter R (2021) Management practices and the financial performance of farms. *Agric Financ Rev* 81(3):415–429. <https://doi.org/10.1108/AFR-08-2020-0126>
- Vigani M, Dwyer J (2020) Profitability and efficiency of high nature value marginal farming in England. *J Agric Econ* 71(2):439–464. <https://doi.org/10.1111/1477-9552.12351>
- Williams J, Alter T, Shrivastava P (2018) Systemic governance of sustainable agriculture: implementing sustainable development goals and climate-friendly farming. *Outlook Agric* 47(3):192–195. <https://doi.org/10.1177/0030727018795907>
- Wreford A, Topp CFE (2020) Impacts of climate change on livestock and possible adaptations: a case study of the United Kingdom. *Agric Syst* 178:102737. <https://doi.org/10.1016/j.agsy.2019.102737>
- Wyborn C, Datta A, Montana J, Ryan M, Leith P, Chaffin B et al (2019) Co-producing sustainability: reordering the governance of science, policy, and practice. *Annu Rev Environ Resour* 44(1):319–346. <https://doi.org/10.1146/annurev-environ-101718-033103>
- Yoshida S, Yagi H, Garrod G (2020) Determinants of farm diversification: entrepreneurship, marketing capability and family management. *J Small Bus Entrep* 32(6):607–633. <https://doi.org/10.1080/08276331.2019.1607676>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.