

Exploring the efficacy of Catchment Sensitive Farming advice and examining ways of improving its delivery through the lens of credibility, relevance and legitimacy

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Abstract

Poor water quality is a major challenge facing English watercourses, with most currently failing to achieve 'healthy' status according to the European Union's Water Framework Directive. Advice delivery is one of several approaches used in the effort to reduce the contributions of diffuse water pollution from agriculture (DWPA) to the problem. The main objective of this doctoral study was to explore how effective farmers and advisors believe DWPA advice is for encouraging farmers to engage, with particular attention paid to Catchment Sensitive Farming (CSF), a government-funded advisory initiative. Research is then undertaken to identify how DWPA advice could be improved, for example by disseminating more 'hard' evidence relating to whether farmers' practices likely make significant contributions to water quality problems or by producing and disseminating informative video content.

The objectives of the study were met by conducting a mixed-methods study consisting of an online questionnaire survey, telephone interviews, and focus groups. The views of over 300 farmers and almost 70 advisors from across England were gathered. The study was framed and analysed using an existing framework, CRELE, which consists of three attributes: credibility, relevance, and legitimacy. The triangulated findings deriving from the resulting empirical data led to the revelation that CRELE needed iterating when interpreting the results. Firstly, an additional component, accessibility, is added to the framework due to a need to ensure farmers can access DWPA advice with ease. Secondly, this research provides further confirmation that the efficacy of DWPA advice is being impeded by underlying structures and realities such as resource constraints placed on wider government bodies, excessive bureaucracy when applying for grant funding, and a perceived lack of enforcement and inspections associated with water quality regulations. These underlying structures and realities added a second dimension to the existing CRELE framework. The resulting novel framework was named 'CREALITY'.

Policy recommendations are made throughout this research. If implemented, these recommendations may increase farmer engagement with CSF and other sources of DWPA advice, thus increasing the likelihood that this advice will contribute to water quality improvements.

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Last but not least, Deliveroo: thank you for keeping me fed during times of despair.

Dedication

This thesis is dedicated to my wonderful grandad, Brian Porter, whom we sadly lost before I was able to finish my doctoral studies. You are forever missed.

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Abbreviations

ADAS	Agricultural and Development Advisory Service
AHDB	Agriculture and Horticulture Development Board
CAP	Common Agricultural Policy
CFE	Championing the Farmed Environment
CPRE	Campaign to Protect Rural England
CRELE	Credibility, Relevance, and Legitimacy
CREALITY	Credibility, Relevance, Accessibility, Legitimacy, and underlying structures and Realities
CS	Countryside Stewardship
CSF	Catchment Sensitive Farming
CSFO	Catchment Sensitive Farming Officer
Defra	Department for Environment, Food and Rural Affairs
DWPA	Diffuse Water Pollution from Agriculture
EA¹	The Environment Agency
FWAG	Farming and Wildlife Advisory Group
NFRW	New Farming Rules for Water
NFU	Nitrate Vulnerable Zone
NVZ	National Farmers Union
RPA	Rural Payments Agency
SSAFO	Storing Silage, Slurry and Agricultural Fuel Oil (legislation)
SSSI	Site of Special Scientific Interest
WFD	Water Framework Directive

¹ As referred to by farmer and advisor participants (see chapters 4-8)

Chapter 1

Introducing advice as a key approach for reducing the contributions of agricultural practices to diffuse water pollution

This doctoral study is concerned with exploring the efficacy of farm advice surrounding diffuse water pollution from agriculture (DWPA) for encouraging farmer² engagement³, with particular attention paid to a government-funded initiative, Catchment Sensitive Farming (CSF). This introductory chapter will begin by providing a problem statement before justifying the need for this research by identifying research gaps in existing literature. Setting the scene for this study will consist of an overview of the water quality problem in England, an outline of how DWPA contributes to poor water quality, and an examination of the mechanisms used to reduce DWPA with a focus on advice provisioning. The aims and objectives of this research are stated in section 1.6. Finally, this introductory chapter closes by presenting an overview of how this thesis is structured.

1.1. Problem statement

At present, very few watercourses in England are designated as 'healthy' according to the Water Framework Directive (WFD, 2000/60/EC) (Environment Agency, 2020). The lack of tangible improvements in water quality across England in recent years implies that decadal efforts to tackle the problem, including advice delivery, may not be achieving their full potential. Advice is a resource-demanding approach. It is, therefore, essential to continuously evaluate its efficacy and explore ways of improving its delivery, particularly where it is publicly funded.

² 'Farmers' are defined here as encompassing all land managers and owners or tenants who manage agricultural land

³ Engagement, in the context of this thesis, refers to whether a farmer seeks out or accepts advice. This may not necessarily involve practice uptake or behaviour change; this may simply be an initial interaction with an advisor.

The Environment Agency part-funded this study. As such, it was important for the researcher to consider their evidence needs in conjunction with the research gaps identified whilst examining existing literature. A conception meeting with the agency led to the emergence of several key questions which they hoped this research would answer. These questions related to willingness of farmers to pay towards CSF advice and a general understanding of farmer and advisor perceptions towards the initiative.

Upon examining existing literature and considering the needs of the Environment Agency, the overall research question for this study is:

How effective do farmers and advisors believe DWPA advice (including that delivered by Catchment Sensitive Farming) is for encouraging farmers to engage, and how could it be improved?

Catchment Sensitive Farming (CSF) is the main government-led initiative in England, the main remit of which is delivering advice relating to DWPA (see section 1.3). It was, therefore, the focus of this study.

A key term within the above research question is 'effective'. In this context, this is defined as whether farmers engage with advisors in the first place, and whether they find it useful. By efficacy, this study does not necessarily refer to practice or behaviour change; here, advice is seen as effective where it meets the CRELE thresholds during delivery. Practice and behaviour change take time, intuition, and reflection, often require learning, are generally influenced by several factors alongside advice, and are sometimes hard to measure (Nuthall & Old, 2018). It was not, therefore, deemed fair to classify advice as being effective only when it leads to easily identifiable change.

The conceptual framework operationalised during this study to frame and analyse the findings consists of three attributes: credibility, relevance, and legitimacy (CRELE) (Cash *et al.*, 2002, 2003) (chapter 2). This framework is used as a basis for investigating the research question outlined above. Upon critically evaluating its applicability in the context of this research, the framework is later iterated to fully explain the findings of this research (chapter 9).

The following sections set the scene for this research and in turn, justify why the above research question was a pertinent line of inquiry. Specific research

questions arising from an extensive literature review are introduced in section 1.6.

1.2. DWPA: a challenging problem for water quality in England

Clean freshwater is crucial for human survival and has many functions integral to the environment, society, culture, and the economy. There are, therefore, ambitious targets to achieve healthy waters, with the aim of all waterbodies in England and Wales being classed as 'healthy' by 2027 (UK Government, 2017, see regulation 13). It is, however, looking increasingly unlikely that these targets will be met; 0%⁴ and 14% of waterbodies in England are currently classed as chemically and ecologically healthy, respectively (Environment Agency, 2020).

The focus of this highly empirical study is on DWPA, one of the many sources of water quality problems. The use of 'point' and 'diffuse' (or 'non-point') pollution, a widely used classification, is adopted here to differentiate between how pollutants are mobilised from different sources and delivered to watercourses. While a single, easily identifiable source causes point source water pollution (e.g., farmyards), DWPA is characterised by a cumulative contribution of pollutants, typically from several distributed sources. It is difficult to identify and apportion the sources of diffuse water pollution due to the complexities of the source-receptor-delivery continuum and the oftentimes relatively small contributions of individual sources which cannot often be confirmed reliably using available field techniques. The impacts of DWPA can prove detrimental at the catchment scale (NOAA, 2019). This challenge, alongside the multi-actor nature of catchment-scale issues, has led to some commentators referring to diffuse water pollution as a 'wicked' problem⁵ (e.g., Smith & Porter, 2010; Patterson *et al.*, 2013).

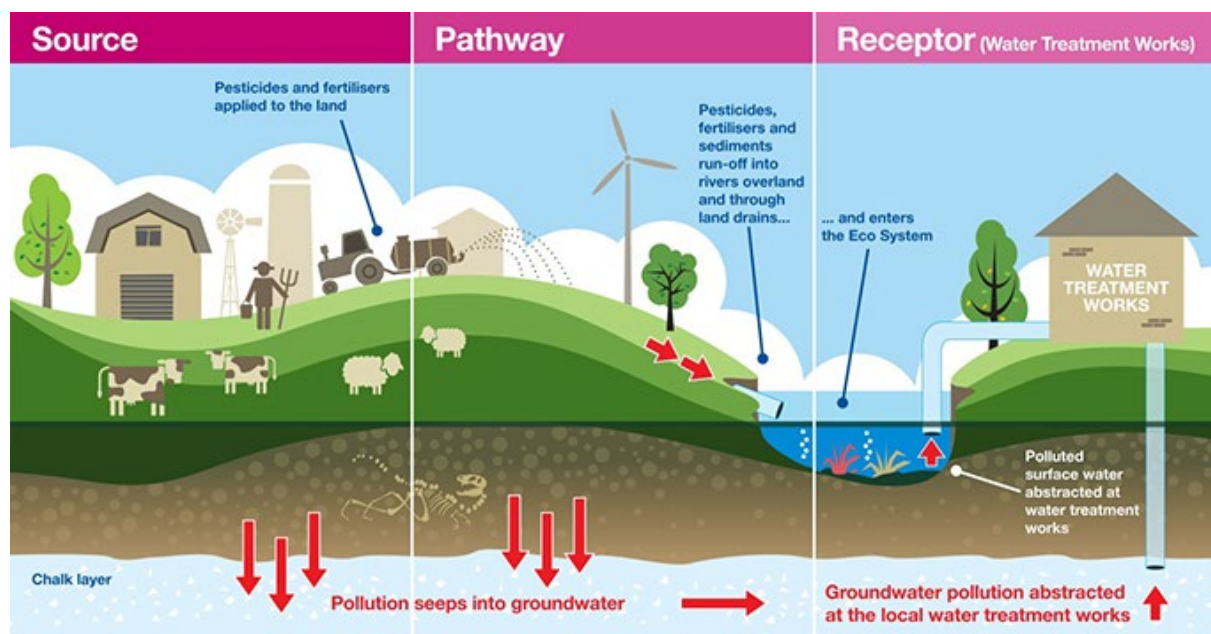
Several studies have identified agriculture as contributing significantly to 'excess' loadings of several nutrients and pollutants to freshwater environments (Johnes & Burt, 1991; Heathwaite *et al.*, 1996; Carpenter *et al.*, 1998; Houses of Parliament, 2014; Zhang *et al.*, 2014). The pollutants delivered by DWPA include nitrate (N), phosphorus (P), sediment (S), faecal indicator organisms (FIOs),

⁴ It should be noted that an entire waterbody will fail to be deemed 'chemically' healthy where it is above the EU levels for just a single pollutant.

⁵ A 'wicked' problem is, in the context of diffuse water pollution, characterised as being '*multi-actor, multi-scalar, dynamic, uncertain, and unclear*' (Patterson *et al.*, 2013).

pesticides (e.g., Metaldehyde⁶, Glyphosate⁷), and emerging contaminants (e.g., pharmaceuticals, microplastics). Agriculture has been identified as contributing to ~81% of total nitrogen (N), 31% of total phosphorus (P), and 72% of sediment loadings in UK rivers, with agricultural contributions dominating in 53% of waterbodies across England and Wales (Zhang *et al.*, 2014). Figure 1.1 provides a simple overview of the source-receptor-delivery cascade of these pollutants.

Figure 1.1. The source-pathway-receptor cascade that leads to pollutants such as pesticides and fertilisers entering watercourses, some groundwaters, and water treatment works. Diagram derived from Affinity Water (2020).



Agriculture in England has, on the whole, become increasingly intensive, with much modern agriculture relying on heavy machinery and high levels of inputs due to ongoing pressure to maximise yields. This intensification occurred largely in response to policy changes, including the introduction of the 1947 Agriculture Act after the end of WWII (1945) and the adoption of the EU-led Common Agricultural Policy (CAP) in 1973 (Burton, 1998; Gray, 2000, p43; Boardman *et al.*, 2003a; see section 1.3.1 for an overview), alongside fluctuating market prices. In addition to these policies which encouraged intensification, innovations such as chemical inputs including fertilisers and pesticides alongside improved crop

⁶ Metaldehyde is a slug pellet relied upon by many farmers across England

⁷ Glyphosate (also called 'Round-Up') is the most relied upon herbicide used by farmers (European Commission, 2021).

varieties and livestock breeding allowed farmers to increase their yields after WWII (Ritchie & Rose, 2019). Whilst cereal (comprising oats, wheat, and barley) yields in the UK were, on average, 3.1 tonnes per hectare in 1961 (Ritchie & Rose, 2019), they reached 6.2 tonnes per hectare in 2020 (Defra, 2020a).

Several environmental repercussions have arisen as a result of this agricultural intensification. These include the widespread degradation and erosion of soils, increases in greenhouse gas emissions, and biodiversity loss (see Stoate *et al.*, 2001; Firbank *et al.*, 2007; BEIS, 2021). In addition, water quality, the challenge focused on in the present study, has worsened across most of England in recent years (see section 1.2). These water quality problems are, in part, due to an increased land to water connectivity within catchments, a key factor that accelerates the delivery of pollutants to watercourses. For example, in an effort to boost productivity, significant alterations to natural hydrological processes (e.g., artificial field drainage; see Foster *et al.*, 2002) have been made across England and increased reliance on the use of heavy machinery has led to pervasive soil compaction. In addition, inappropriate usage of marginal land and increased usage of on-farm impermeable pathways such as roads has increased runoff risk (Collins *et al.*, 2010; Evans, 2012). These repercussions, amongst others, have become increasingly recognised in policy since the 1990s. Since then, policymakers have focused on achieving environmental improvements rather than productivity alone. For example, Countryside Stewardship, set up in 1991, pays farmers to 'protect and enhance the natural environment' (Rural Payments Agency, 2020a), whilst the upcoming Environmental Land Management (ELM) scheme will pay farmers to deliver public goods, most of which enhance the environment (Defra, 2020).

Despite these efforts, DWPA remains a challenge in England. The Environment Agency (2014) estimated that 33% of the known rivers not achieving 'good' status failed due to DWPA in England and Wales. This is of concern because it is financially costly; the maximum damage costs to the water environment in England and Wales are £523 M yr⁻¹ from agriculturally derived 'excess'⁸ sediment alone (Collins & Zhang, 2016). In addition, poor water quality has repercussions

⁸ Excess sediment occurs where there is more sediment loss in a unit area than would be expected. This can be measured by comparing losses against estimated background rates as defined by Foster *et al.* (2011) (see also Collins *et al.*, 2016b; 2021).

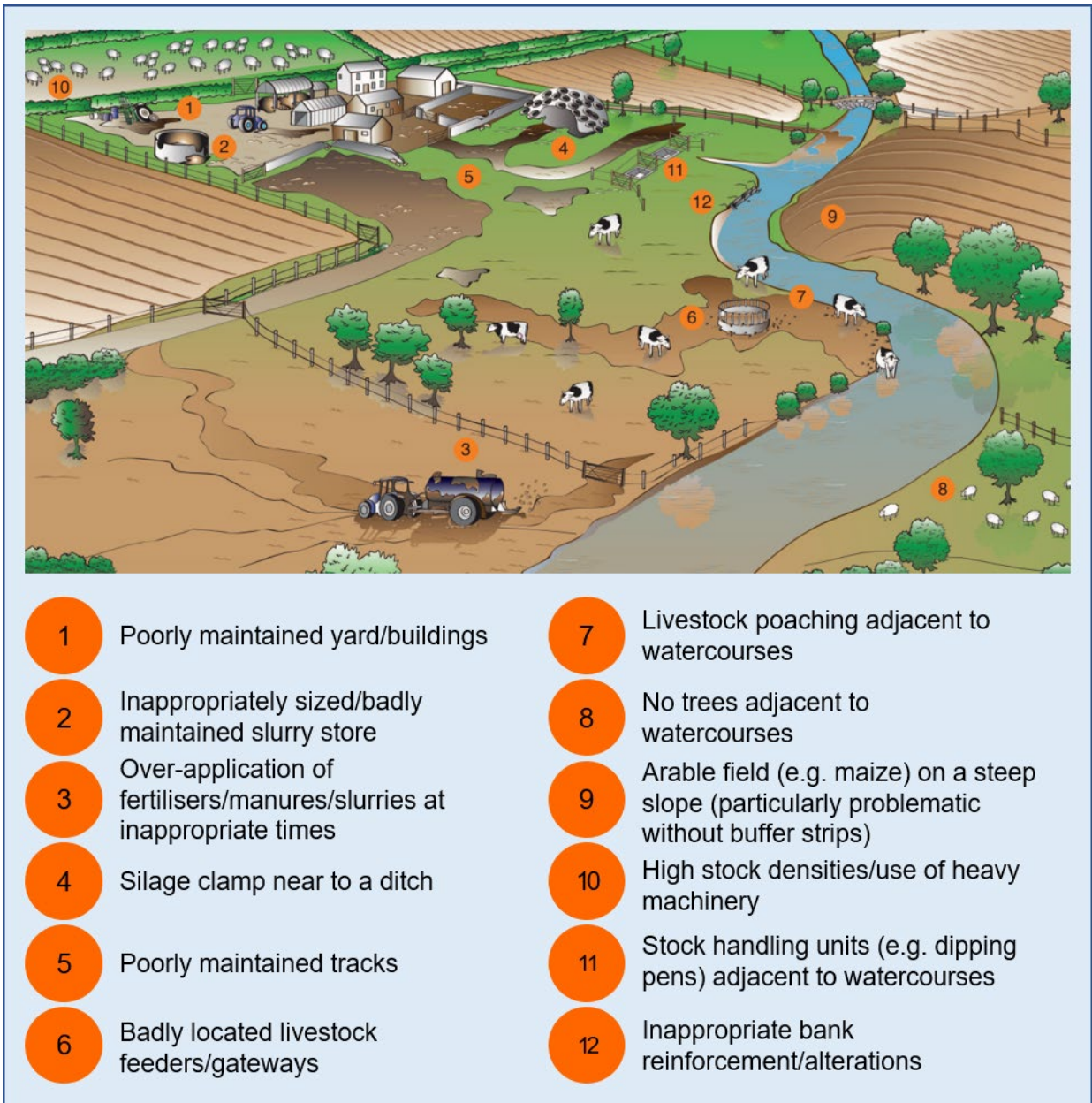
for the environment and several industries and services, including water supply, fisheries, air quality, hazard risk (flooding/erosion), and climate regulation (Environment Agency, 2014).

1.2.1. Agricultural practices which contribute to DWPA

Figure 1.2 provides an overview of some of the agricultural management practices which can contribute to DWPA. Livestock systems can result in excessive runoff due to soil compaction caused by intensively grazed or overstocked pastures (Foster & Walling, 1994; Bilotta *et al.*, 2007) and poorly managed outwintering (Pietola *et al.*, 2005; McGechan *et al.*, 2017). In addition, manures and fertilisers are over-applied or poorly timed in some livestock systems (e.g., applied during wet weather) (Preedy *et al.*, 2001); an estimated 20% of DWPA was previously accounted for by manure management, most of which derives from poor spreading methods and timing (Defra, 2013a). Widespread problems associated with slurry storage and management exacerbate this issue (Defra, 2013a); 20-50% of farmers in England were previously identified as having inadequate slurry storage as defined by Nitrate Vulnerable Zone (NVZ) standards and rules surrounding storing silage, slurry, and agricultural fuel oil (Defra, 2013a; see section 1.3.2 for further information). This insufficient storage is mostly a result of on-farm expansion and intensification, compounded by financial constraints (Defra, 2013a).

Arable systems also contribute to DWPA. This can occur through adopting conventional tillage, inappropriate crop rotations, and year-round activity on-farm due to continuous cropping. In addition, planting winter cereals drilled during autumn can expose topsoil to heavy rain, thus resulting in increased erosion risk (see Boardman *et al.*, 2003a, b), whilst over-application or poorly timed applications of agrichemicals (including various fertilisers, pesticides, and fungicides) can lead to excess nutrient losses to watercourses.

Figure 1.2. Some of the farm management practices which can contribute to DWPA (diagram adapted from Eden Rivers Trust, 2011).



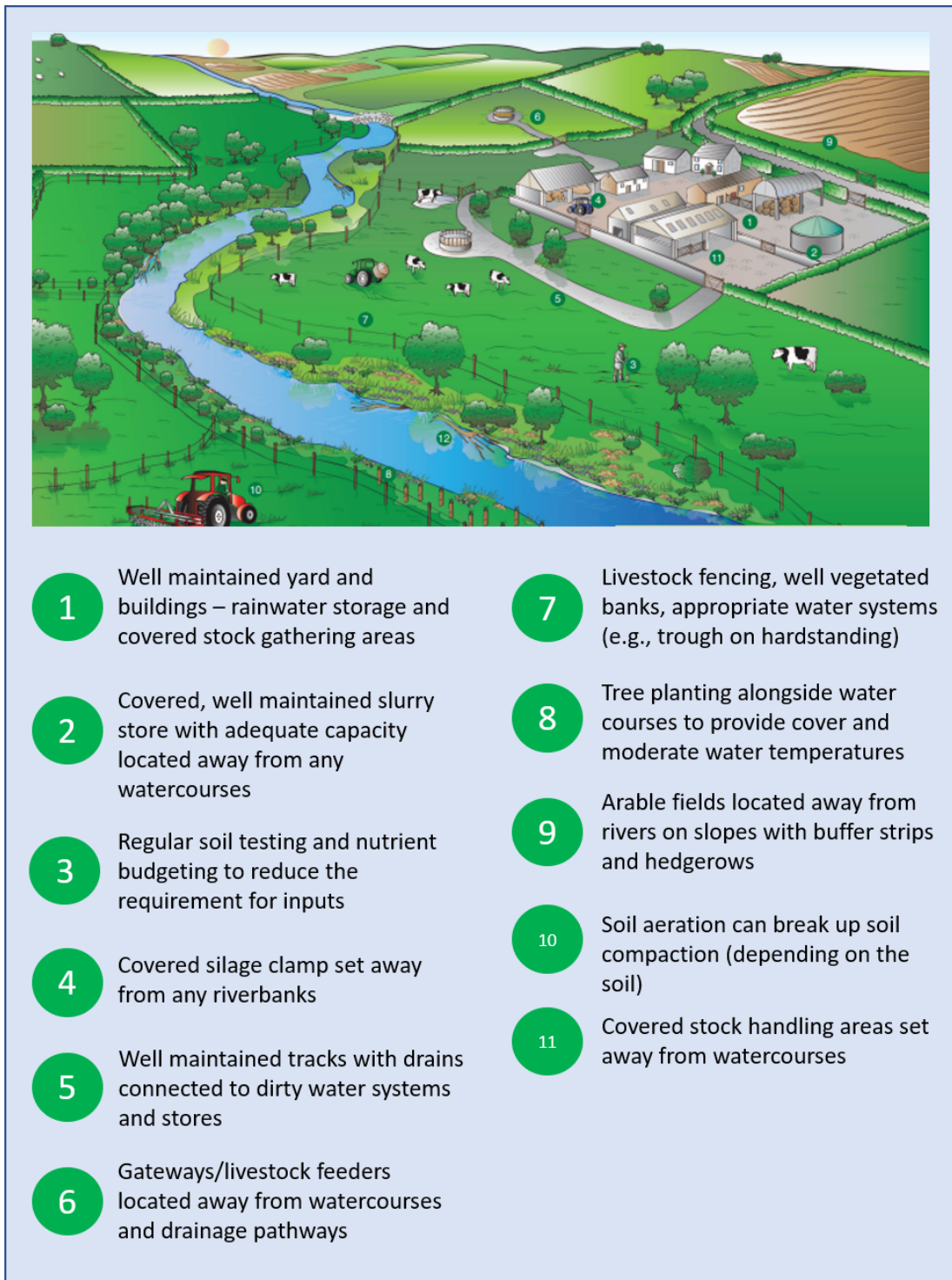
1.2.2. Potential on-farm mitigation measures for reducing the contributions of DWPA

There are several ways in which farmers can reduce their contributions to DWPA, some of which are presented in figure 1.3. These practices include adopting minimum or no-tillage⁹ (depending on the soil type), reducing trafficking (through using lighter machinery, controlled trafficking, and adjusting tyre pressures), and growing crops that are suitable for the land (e.g., not growing late harvest crops such as maize on steeply sloping or light soils). Where soils are less compacted, runoff risk will be reduced due to the resulting increased capacity of the soil to absorb and retain water.

Many of the measures for reducing DWPA offer potential co-benefits (or 'win-wins') for farmers. These win-wins may include financial benefits due to cost savings or increased profit, or increased efficiency due to, for example, reduced time burdens. Examples of these 'win-wins' include incorporating cover crops into a rotation, which may provide refuge for nesting skylarks whilst reducing compaction and therefore runoff. In addition, installing adequate slurry storage increases the ability of farmers to time their slurry applications, thus maximising its efficacy whilst minimising runoff (Smallshire *et al.*, 2004; Inman, 2005). Next, establishing grass margins can control cleavers, reducing the need for chemical herbicides (Smallshire *et al.*, 2004). Where barren brome is grown, there is also a reduced need for herbicides; this can save farmers £38.9-48.8/ha through reduced chemical fertiliser usage (Buckley & Carney, 2013). These 'win-win' scenarios can, however, be difficult to 'sell' to farmers due to the heterogeneity of farms. This heterogeneity means that these benefits cannot be guaranteed, increasing the perceived risk to farmers when considering making changes.

⁹ As opposed to ploughing, which can result in increased soil compaction, thus increasing the risk of excess runoff (Cranfield University, 2001).

Figure 1.3. Some of the approaches which can reduce DWPA. Number 12 (woody debris barriers) was excluded as they are more functional for providing natural flood management rather than improving water quality. Diagram adapted from Eden Rivers Trust (2011).



1.3. Policy mechanisms for reducing DWPA

Several policy-based approaches are used to reduce DWPA, many of which encourage farmers to adopt some of the measures and practices outlined in section 1.1.2. These approaches may either be voluntary or regulatory. As pointed out by Mills *et al.* (2018), however, regulation alone is not the only approach likely to encourage farmers to act environmentally. For example, providing advice that presents evidence of the problem and understands the heterogeneity of farmers is also likely to encourage pro-environmental behaviour. Multiple approaches are, therefore, used in combination within England to reduce DWPA, operating at varying spatial scales. These approaches include regulatory instruments, financial incentives, assurance schemes, and advice provisioning.

The following section provides a brief overview of the mechanisms used for reducing DWPA, beginning with EU-level instruments and ending with national-scale approaches. Particular attention will be given to advice delivery, the focus of this research.

1.3.1. European-wide regulations and directives for improving water quality

The UK is currently in a transition period after voting to leave the European Union (EU) in 2016 (UK Government, 2016). At the time of writing, England continues to comply with EU agricultural policies. The EU directives upon which many of England's national-level policies for reducing DWPA derive are, therefore, outlined here, not least because they are likely to influence the development of post-Brexit agricultural policy.

Common Agricultural Policy (CAP)

CAP is the main overarching agricultural policy instrument used at EU level to address the environmental impacts of farming, and consists of several policy measures, including farm payments. There have been several iterations of CAP, with recent changes placing more emphasis on the environment (see timeline, European Commission, 2020). The Basic Payment Scheme (BPS), introduced in 2015, is the current model used to provide farmers with financial support under CAP and provides farmers and landowners with area-based payments (European

Commission, 2016). Land occupiers are only entitled to BPS where they adhere to cross-compliance rules. These cross-compliance rules consist of both statutory management requirements and Good Agricultural and Environmental Conditions, several of which refer to water quality. A greening payment was recently introduced to CAP, making 30% of payments conditional on farmers being compliant with environmental rules in addition to cross-compliance (OECD, 2017). Cross-compliance is designed to stipulate the minimum expectations of farmers regarding good practices for environmental protection.

The Water Framework Directive (WFD)

The EU's WFD (2000/60/EC) sets the context for water quality policy in England. The directive expects member states to reach specific targets towards achieving healthy watercourses by 2027. Furthermore, member states are required to establish river basin management plans, of which there are currently eight across England (European Commission, 2019a). These plans must provide accounts of how the aims of each river basin will be achieved on time, cost-effectively and proportionately. These plans are reassessed on a 6-year cycle (see Voulvoulis *et al.*, 2017 for a review of the first WFD cycle).

Several directives surrounding water quality existed before the establishment of the WFD, including the Drinking Water Directive (80/778/EEC) and the Nitrates Directive (91/676/EEC). These directives are brought together by the WFD, allowing a more coherent approach for improving water quality. The more recently introduced Groundwater Directive (2006/118/EEC) fits into the WFD strategic framework by setting standards for improving groundwater quality and listing recommended measures that can reduce pollutant inputs into groundwater (European Commission, 2019b).

1.3.2. National regulations in England for improving water quality

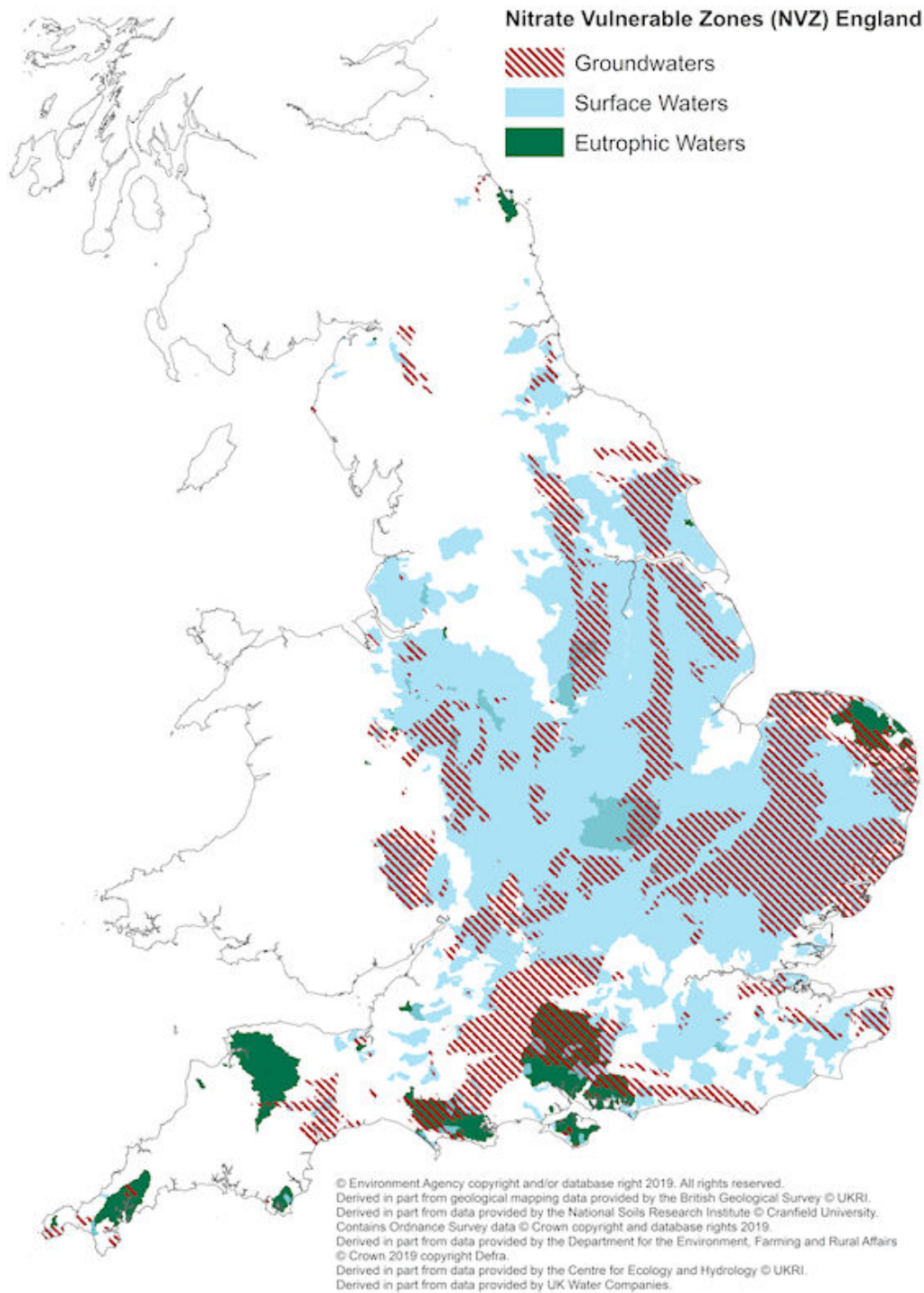
A set of national regulations exist in England which aim to increase compliance with the EU-level directives and regulations outlined in section 1.2.1. These include specific rules for farmers placed within designated Nitrate Vulnerable Zones (NVZs) (Defra, 2018a, b), regulations surrounding storing silage, slurry,

and agricultural fuel oil (SSAFO) (Defra, 2018c), and more recently, the new farming rules for water (NFRW) (Defra, 2017, 2018d).

Nitrate Vulnerable Zones (NVZs)

NVZs were introduced in 1996 in response to the Nitrates Directive (see section 1.2.1). Around 55% of land in England is designated as being within an NVZ, with groundwaters, surface waters, and eutrophic waters included (Defra, 2018a; see figure 1.4). Landowners within NVZs are bound to comply with action programme rules relating to the use of nitrogenous fertilisers and storing organic manure (see Defra, 2018b, 2019a, respectively). These NVZ rules are enshrined in cross-compliance; thus, farmers must adhere if they claim BPS or Countryside Stewardship payments (see below) (Defra, 2018a). NVZs have, according to Kay *et al.*, (2012), resulted in little improvement in water quality. It was found that agricultural stewardship at catchment scale is unlikely to be successful where financial rewards or regulatory pressures are insufficient (Kay *et al.*, 2012).

Figure 1.4. Nitrate Vulnerable Zone designations in England. Map taken from the UK Soil Observatory (2021).



Rules for Storing Silage, Slurry and Agricultural Fuel oil (SSAFO)

Farmers and landowners in England must adhere to SSAFO regulations if they store silage, slurry, or agricultural fuel oil. There are general rules which cover all three of these substances alongside individual rules for each. These rules require farmers to ensure their storage has an estimated lifespan of at least 20 years and is located at a minimum of 10 metres away from watercourses or the coast (Defra, 2018d). Stores that were installed before 1991 are, however, exempt from the rules unless structural changes have been made (Defra, 2018d). The specific rules for each substance covered by SSAFO are available on the dedicated Defra website (Defra, 2018d).

The New Farming Rules for Water (NFRW)

The NFRW were launched in April 2018 to reduce agricultural contributions to DWPA. The rules aim to reduce the delivery of excess manures, agrichemicals, and sediment to watercourses. These rules apply to landowners who use or store manures or fertiliser, plant or harvest crops, manage their soils (e.g., through tillage and ploughing), or have livestock (see Defra, 2018c). In addition, they apply to those within NVZs and those who receive financial support from BPS, CS, or environmental stewardship. In combination, these factors mean that the vast majority of English farmers and agricultural landowners must comply with these statutory rules.

There are eight rules in total, five of which concern fertiliser and manure management, while the remainder focus on soil management (see Defra, 2018c, figure 1.5). These rules are managed by the Environment Agency, who have adopted an advice-led approach to collaborate with farmers before resorting to enforcement where necessary (Defra, 2017).

Figure 1.5. Summary of the eight new farming rules for water (derived from Defra, 2017, 2018c).

1 Planning use of manures and fertilisers

- Plan in advance each application of organic manures and manufactured fertilisers to meet but not exceed soil and crop nutrient needs
- Your planning must take into account soil testing for pH, nitrogen (N), phosphorus (P), potassium (K) and magnesium (Mg). Nitrogen levels can be determined by assessing soil nitrogen supply instead of soil testing

2 Organic manures must not be stored on land:

- within **10 metres** of inland freshwaters or coastal waters
- where there is significant risk of pollution entering inland freshwaters or coastal waters
- within **50 metres** of a spring, well or borehole

3 Organic manures or manufactured fertilisers must not be applied:

- if the soil is waterlogged, flooded, or snow-covered
- if the soil has been frozen
- if there is significant risk of causing pollution

4 Organic manures must not be applied:

- within **10 metres** of any inland freshwaters or coastal waters
- within **50 metres** of a spring, well or borehole

5 Manufactured fertiliser must not be applied:

- within **2 metres** of inland freshwaters or coastal waters

6 You must take all reasonable precautions to prevent significant soil erosion and runoff from:

- the application of organic manure and manufactured fertiliser
- cultivation practices & harvesting
- poaching by livestock

7 Protecting against soil erosion by livestock

- Any land within **5 metres** of inland freshwaters and coastal waters must be protected from significant soil erosion by preventing poaching by livestock

8 Livestock feeders must not be positioned:

- within **10 metres** of any inland freshwaters or coastal waters
- within **50 metres** of a spring, well or borehole
- where there is significant risk of pollution

1.3.3. Support schemes and financial incentives which contribute to improving water quality in England

Countryside Stewardship (CS)

Countryside Stewardship (CS) is the main Agri-Environment Scheme (AES) currently offered in England and is managed by the Rural Payments Agency (RPA) on Defra's behalf. Natural England also delivers advice relating to CS, mainly through CSF (see section 1.4.). CS is part of the CAP system in England, thus will be replaced during the post-Brexit transition. Its replacement, the Environmental Land Management scheme (ELM), will consist of three sub-schemes encouraging environmental land management, all of which will be rolled out by 2024 (Defra & RPA, 2021). Farmers are being encouraged to continue applying to CS during this transition period to maintain good environmental management and to ensure they retain a stable income as BPS payments are lowered as the UK leaves the EU, thus it is important to provide an overview here.

CS is constituted by two pillars: mid-tier and higher tier, both of which contribute to achieving the goals of Defra's 25-year environment plan (HM Government, 2018). While mid-tier is the simplest AES available, the higher tier is more demanding and is open to landowners within priority sites, including Sites of Special Scientific Interest (SSSIs), common land, and woodlands.

The main priorities of mid-tier CS are to improve biodiversity and water quality. Farmers are offered several options for achieving these goals (Rural Payments Agency, 2020a, b). Mid-tier stewardship also has a specific water quality grant, with farmers in CS high priority water quality areas able to apply for capital item agreements, often with the support of their local CSF officer (see section 1.4). There are two types of grants provided under mid-tier CS: 5-year agreements where annual payments are made or capital item grants (Rural Payments Agency, 2020a, b). There are also two approaches farmers can take: mid-tier or the wildlife offers. The wildlife offers grants are non-competitive, while mid-tier is competitive and contains water quality-related measures. There are, however, some measures for improving water quality, which cannot be applied for under CS by farmers who have already committed to these options as part of the BPS (e.g., winter cover cropping, buffering in-field ponds/ditches on arable land) (Rural Payments Agency, 2020a).

Higher tier CS has the same main priorities as mid-tier (biodiversity and water quality) but is more ambitious and is only offered to sites deemed critical to the environment and woodland habitats (Rural Payments Agency, 2020b, c). Farmers who have higher tier agreements are, however, able to access a broader range of grants and are given more flexibility. Again, most agreements are for five years (with a few options available for 10-20 years), and the scheme is competitive.

The Countryside Stewardship Facilitation Fund

The CS facilitation fund started in 2015 and enables land managers to collaborate to achieve landscape-scale improvements, including in water quality. Funding is provided to enable these landowners to adopt a collective approach, thus achieving connectivity between measures. There are now at least 98 CSFF groups consisting of over 3500 members across England (Fera & ADAS, 2020). Several of the existing CSFF groups have water quality improvement as a main priority, including the Crookhurst and Stockdalewatch Catchment Farmers groups in Cumbria and the Whiston Brook catchment group, in South Yorkshire (CS facilitation fund, 2017). These groups both work with CSF, the primary advisory entity being studied during this project, to identify appropriate landscape-scale measures to implement (CS facilitation fund, 2017). This appears to be a successful programme, with Fera and ADAs' 2020 evaluation suggesting that members of CS facilitation funds and AES' are more likely to achieve environmentally positive outcomes than those in AES' alone.

1.3.4. Advice provisioning surrounding DWPA in England: a local scale intervention

Advice provisioning at a local scale is crucial for encouraging farmers to uptake the measures introduced in section 1.2.2 (UKWRIP, 2011). The significant challenges resulting from DWPA make it necessary to ensure that the instruments used to reduce the contributions of DWPA, including advice delivery, are as effective as possible. As this research focuses on the efficacy of DWPA advice, this section will introduce why this approach is a key part of the effort for reducing DWPA. Section 1.4 will provide a detailed overview of CSF, the main initiative studied during this research.

Advisors have been conceptualised in various ways: as disseminators (Rogers, 1995), influencers of policy and drivers of farmer behaviour change (Long and van de Ploeg, 1989), agents of the state itself (Vanclay & Lawrence, 1994), field-based deliverers of agri-environmental policies (Cooper, 1999; Juntti and Potter, 2002), purveyors of expert knowledge (Burgess *et al.*, 2000), technical experts (Tsouvalis *et al.*, 2000) and commercially motivated agri-business salespeople (Hawkins, 1991; Lyon, 1996). Advisors are defined here as '*those who provide information and support to farmers to encourage and enable them to reduce their contributions to DWPA by equipping them with evidence of the problem, recommendations on how to reduce their contributions, and access to grant funding.*'

There are several ways to deliver advice: through 1:1 on-farm visits, group meetings, farm walks, cluster groups, online, and via the telephone. Studies have, for many years, found that farmers find 1:1 on-farm visits the most useful and effective mode of advice delivery (Jones *et al.*, 1987; Eldon, 1988; Fearne, 1990; Cox *et al.*, 1990; Angell *et al.*, 1997; Morris & Lobley, 2006; Dwyer *et al.*, 2007; Blackstock *et al.*, 2010; Winter & Lobley, 2014; Inman *et al.*, 2018; Environment Agency, 2019a). As a result, these visits are often the delivery mechanism most frequently sought by farmers (Coleman *et al.*, 2010).

Despite a move away from top-down advisory approaches, farmer-advisor relations remain a central part of knowledge exchange (Ingram & Morris, 2007; Thomas *et al.*, 2020) surrounding DWPA through fostering productive dialogue through raising awareness, assisting farmers with funding applications, and encouraging measure uptake and practice change (Morris, 2006). Farmer-farmer and group-based learning has also become increasingly important in the last 20 years (Röling & Wagemakers, 2000; Garforth *et al.*, 2003a). For example, farmer discussion can promote information exchange, practice change, collaboration, and the enhancement of certain skills such as problem-solving (Hennessy & Heanue, 2012; Hansen, 2015). However, Dooley (2020) found that social learning does not always result from informal group discussion meetings. This may, in part, be because whilst farmers may enjoy attending group meetings and being part of a community, they may not necessarily wish to lose the autonomy they hold when managing their farms (Blackstock *et al.*, 2006). Some farmers may also be reluctant to share information with peers due to the increasingly






competitive and individualistic nature of farming (Emery, 2015) which has increased farmers' tendency to farm autonomously as 'one's own boss' (see Stock & Forney, 2014). On-farm advice for individual farms is, therefore, needed alongside group interactions to provide these farmers with technical and practical insights that they may not take on from their peers. Environmental advice is of particular importance as many of the group interactions described above tend to focus on productivity, farm business management, and succession rather than on improving environmental health.

Table 1.1 provides an overview of the entities which provide DWPA advice in England and the scope of this delivery. As shown in Table 1.1, the advisory system is vertically and horizontally fragmented and characterised by several entities attempting to engage with farmers (Winter *et al.*, 2000; Garforth *et al.*, 2003a; Smallshire *et al.*, 2004; Vrain, 2015; Baird *et al.*, 2016; Vrain & Lovett, 2016). This fragmented AKIS¹⁰ can lead to confusion as to where to gain advice from (Lobley & Butler, 2007) alongside time wastage due to duplication, wasteful competition between organisations, geographical unevenness, contradictory advice, ignored advice, message fatigue, gaps in advice, difficulty measuring effectiveness, and limited coordination (Centre for Rural Studies, 1990; Winter *et al.*, 2000; Dwyer *et al.*, 2007; Vrain, 2015), with farmers finding the unregulated nature of the AKIS frustrating (Curry *et al.*, 2012). Vrain (2015) reports that 64% of farm advisors have had farmers claiming that they'd received different DWPA advice from separate sources, while 40% of farmers claimed to have received some conflicting advice (Vrain & Lovett, 2016). It was, therefore, deemed essential to explore the views of farmers and advisors towards these alternative sources of advice to CSF to allow the researcher to make recommendations for the initiative itself by learning from other advisory efforts.

¹⁰AKIS = Agricultural Knowledge and Innovation (or 'Information') System, an umbrella term covering the knowledge exchange between multiple actors within agriculture. A key component of the AKIS is agricultural advice.

Table 1.1. The entities that provide at least some DWPA advice to farmers in England and the approaches used to deliver this advice.

Entity that provides DWPA advice	Approaches used for advice delivery
Government-led organisations/initiatives	
	<p>1:1 on-farm visits, farmer events, assistance with applying for CS water quality capital items grants (see section 1.4).</p>
	<p>On-farm advice and online information to assist farmers with becoming fully compliant with legislation</p>
Non-governmental organisations (NGOs)	
	<p>FWAG provides independent environmental 1:1 farm advice and delivers farm events, mostly surrounding Countryside Stewardship. Some regional FWAG groups are part of catchment partnerships, including in Somerset and the Upper Thames</p>
	<p>The Rivers Trust consists of several local trusts which provide varying levels of on-farm advice and training for improving water quality alongside holding farm events surrounding water management</p>
	<p>Formed partnerships with regional water companies (e.g., Severn Trent water) and CSF to provide farmers with funding and advice in priority catchments</p>
	<p>Innovation for Agriculture (IfA) is a consortium of several English Agricultural Societies and is supported by various trusts and foundations including the Elizabeth Creak Charitable Trust and the Prince's Countryside Fund. They deliver workshops, farm walks, and demonstrations to disseminate practical information and research to farmers</p>
	<p>Championing the Farmed Environment (CFE) is a partnership of agricultural, environmental and governmental bodies (including Defra, the Agricultural Industries Confederation, the Game and Wildlife Conservation Trust, and the NFU amongst others). The CFE prevents water pollution by working in partnership with Tried & Tested and the Voluntary Initiative (see below) to deliver best practice advice</p>
	<p>The Tried & Tested Professional nutrient management group provides practical toolkits for improving nutrient management planning, including when to apply manure. These tools help farmers to develop nutrient management plans for minimising their contributions to DWPA.</p>
	<p>The Soil and Water management centre (SWMC), based at Harper Adams University, is a centralised source of water management expertise that holds workshops and demonstration projects and delivers various guides.</p>

 The Voluntary Initiative	The Voluntary Initiative is an industry-led programme that promotes integrated pest management to reduce pesticide use. They have a network of 'champion' farmers and advisors which help to encourage practice change and help to ensure messaging is simple between key actors.
Levy boards	
 AGRICULTURE & HORTICULTURE DEVELOPMENT BOARD	The AHDB is a statutory levy board funded by farmers and landowners. It undertakes and disseminates research, produces information sheets, and holds informative farm events for its members
Regional water companies	
 a YTL company	Various regional water companies have begun delivering on-farm events and on-farm advice alongside grants for reaching their water quality targets, often for specific pollutants (e.g., Metaldehyde, nitrates)
Private businesses	
	A commercialised advisory entity that provides paid-for on-farm advice, carries out some applied research, and hosts farm events
Farmers unions	
	Publish diffuse water pollution guidance on their website and have a limited presence at some farmer events

Prager *et al.* (2017) evaluated agricultural advisory services and identified the following criteria for successful advice, many of which are supported by other research:

1. **Organisations should draw on diverse knowledge services** (see also Benson & Jafry, 2013)
2. **Organisations should cooperate to bridge knowledge gaps** (see also Garforth *et al.*, 2003a; Benson & Jafry, 2013; Klerkx & Proctor, 2013)
3. **There should be a stable (or growing) workforce** (see also Swanson & Rajalahti, 2010; Sutherland *et al.*, 2013)
4. **Extension agents should receive regular training** (see also Garforth *et al.*, 2003a; Labarthe & Laurent, 2013)
5. **Organisations should be flexible and able to adapt to rapidly changing demands** (see also Leeuwis, 2004; Labarthe & Laurent, 2013)
6. **All relevant topics should be covered** (see also Birner *et al.*, 2009)
7. **All client groups should be covered** (see also Birner *et al.*, 2009)

8. **Diverse methods should be used while delivering extension** (see also Leeuwis 2004)

According to Prager *et al.* (2017), most of the criteria may be being met in the English advisory system. For example, it was found that many organisations did have a stable workforce, thus meeting criteria 3. Prager *et al.* (2017) did not, however, investigate how long advisors remained in-post in each advisory entity. Farmers build trust and rapport over time (Cox *et al.*, 1990; Countryside Agency, 2002; Vrain, 2015); thus, individual advisors' longevity is likely of importance to the efficacy of advice delivery. In addition, it was found that minority farmers (part-time farmers, females, and young farmers) are often neglected by advisory entities, indicating a failure to meet criteria 7 (Prager *et al.*, 2017).

Certain advisory entities are more likely to foster trust than others; Gorman *et al.* (2019) found that farmers in Ireland were more likely to trust advisors themselves if they trusted the entity from which they derived. For example, Garforth (2015) found that livestock health advice was sometimes rejected simply due to advice deriving from an untrusted organisation. Trust is often, therefore, decided by proxy. Where an entity is trusted, farmers were then found to be affected by the first impression given by an advisor and their personalities, accessibility, technical and practical knowledge, agricultural experience, age, communication skills, and their reputation within the farming community (Gorman *et al.*, 2019).

The following section introduces CSF, an advisory initiative that provides extensive DWPA advice across England.

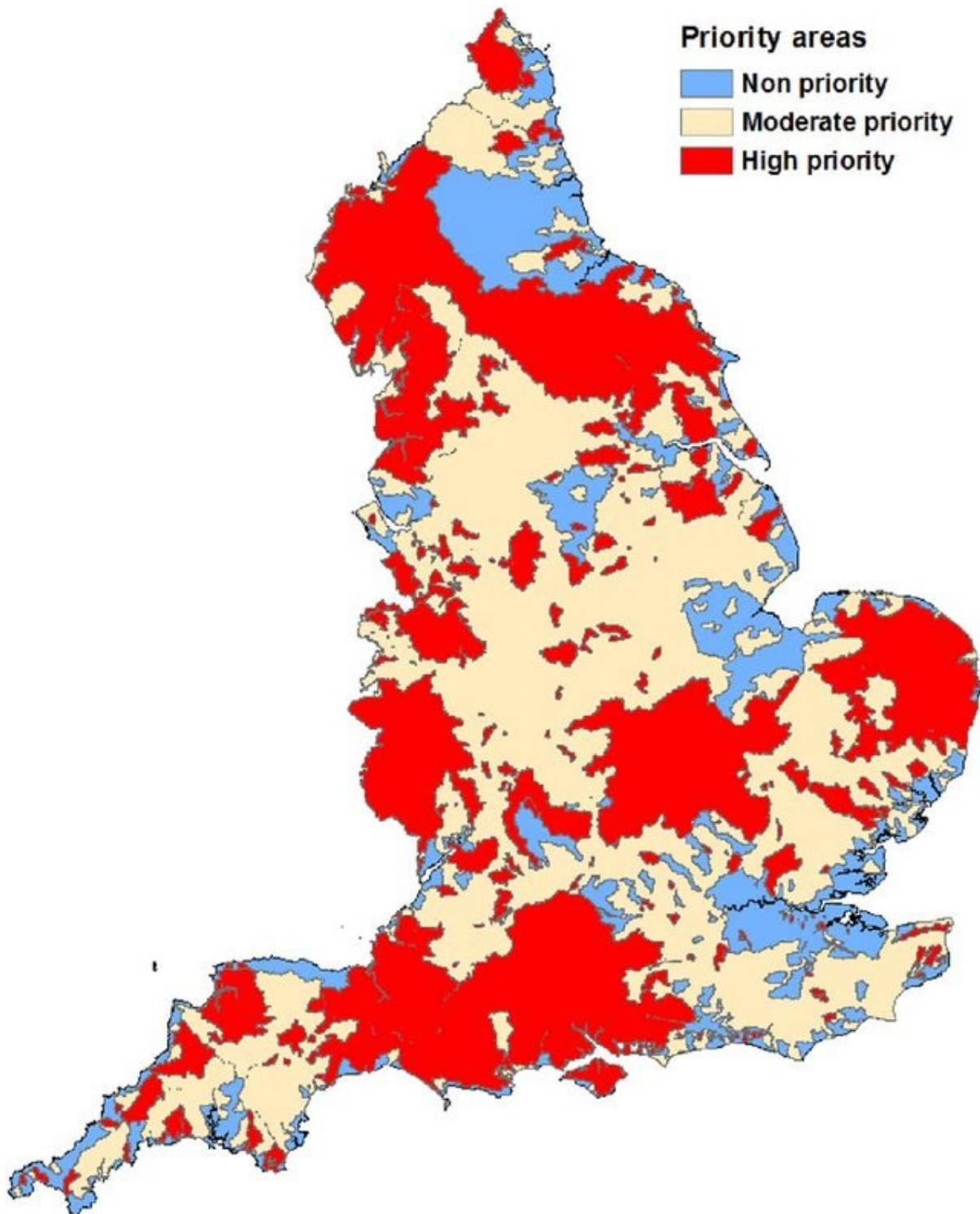
1.4. **Introducing CSF: An advice-led initiative for reducing DWPA**

CSF, established in December 2005, is an initiative delivered by Natural England and the Environment Agency across England (Environment Agency, 2019a). CSF was initiated in response to the EU's WFD targets to reduce DWPA and has the goal of achieving both WFD and SSSI objectives (Natural England, 2020a). Air quality was recently introduced to the CSF agenda, enabling the initiative to contribute to more aspects of the 25-year environment plan and the National Emissions Ceilings directive (2016/2284/EU, European Environment Agency, 2016; HM government, 2018).

Since 2016, the aims of CSF have been reached through delivering free advice to farmers within designated CS high priority areas for water (see Defra, 2020d; figure 1.6). There are currently 79 established CSF catchments across England, covering ~35% of England. Before 2016, CSF was delivered within CSF priority catchments, many of which overlap with the new CS priority areas.

By 2018, 19,776 farm holdings had engaged with the initiative, covering 34% of the farmed area within England (Environment Agency, 2019a). According to the CSF evaluation report, 76,700 pollution mitigation measures have been implemented on CSF-engaged farms, constituting an estimated 59.6% of advised measures (Environment Agency, 2019a). Between 2007-2014, this equates to >£172m of improvements, which were match-funded by farmers (£84m) (Environment Agency, 2019a) through capital grant provisioning under the CS water quality capital items grant scheme and previously, through the CSF grant scheme (see section 1.4.1).

Figure 1.6. CS water quality priority areas; CSF primarily focuses its delivery on high priority areas, delivers some advice within moderate priority areas, and does not target farmers in non-priority areas. Figure obtained from Zhang *et al.* (2017).



Other advisory entities contribute to CSF to varying extents, with some national partnerships and smaller, short-term collaborative projects. National level partners support CSF by collaborating with on-farm events, and in many cases, by providing expert speakers and matching funding to share best practice recommendations with farmers. An overview of the entities which have formed national partnerships with CSF is provided in table 1.2.

Various regional water companies have also begun collaborating with CSF by holding joint farm events, co-funding CSF Officers (CSFOs), delivering jointly produced advisory products and delivering specialist advice to farmers (UK Government, 2019). In addition, there are some ongoing short-term projects between CSF and other entities, including the Rivers Trusts, FWAG, and Universities. For example, CSF is currently undertaking a trial into cover crops for reducing DWPA in collaboration with FWAG, farmers, agronomists, and South East Water (Environment Agency, 2019a).

Table 1.2. National partnerships between CSF and several agricultural entities (information derived from the UK Government, 2019).

Entity which has a national partnership with CSF	Nature of the partnership
Agriculture and Horticulture Development Board (AHDB)	Information and advice, e.g., on slurry management (see AHDB, 2020a)
Championing the Farmed Environment¹¹ (CFE)	Events that provide DWPA advice
Innovation for Agriculture (IfA)	'Learning from the land' video series (see IfA, 2018) and hosting events on behalf of CSF
Professional Nutrient Management Group (Tried & Tested)	'Tried and Tested': advice and resources to enable farmers to improve their nutrient management planning (see Tried and Tested, 2020)
The Rivers Trusts (since 2009)	'PINPOINT' – training and advisory resources and events surrounding DWPA (see Rivers Trusts, 2020)
Soil and Water Management Centre	Events that provide DWPA advice
The Voluntary Initiative	Responsible use of pesticides advice (see Voluntary Initiative, 2020)

Catchment-level partnerships between CSF and local partners also exist and are often characterised by these partners covering the costs of having a CSFO in the catchment. The local partners and their catchments are:

1. Rivers Nene & Welland catchment: The Environment Agency
2. Isle of Wight: IoW AONB, the Environment Agency, Hampshire and IoW Wildlife Trust
3. River Nidd: Nidderdale AONB and Yorkshire Water
4. Yorkshire Dales: Yorkshire Dales National Park Authority
5. River Loddon: Affinity Water

¹¹ CFE was previously 'Campaign' for the farmed environment but was relaunched during 2019.

6. Hertfordshire: The Environment Agency

There are also instances where CSF tenders for external advisory entities to deliver advice and support on behalf of the initiative, for example, by hiring specialist advisors from private entities such as ADAS (Environment Agency, 2011, p. 17).

1.4.1. The role of CSF in facilitating the CS water capital items only grant

CSF underwent substantial re-organisation during 2015 to become aligned with the new CS scheme, with CSF capital grants replaced by agreements under CS, mostly within mid-tier CS and under CSF water capital grants. Catchments were also reallocated based upon whether they are within high or medium priority CS catchments (see Figure 1.6), which meant that many farmers who did not previously receive CSF support can now seek advice and apply for grants.

As introduced above, farmers in a water quality CS priority area can apply for a water quality capital items grant under mid-tier stewardship. They are more likely to obtain funding where they have support from their CSFO. These capital-based agreements can last for two years if applied for as a standalone agreement with a maximum of £10,000 towards items for improving water quality. Alternatively, they can constitute part of a 5-year mid-tier agreement, whereby the grant is not limited to £10,000 and subjected to a value for money assessment. Options available under the CS water quality capital items grant include fencing to keep livestock away from watercourses, concrete yard renewal, installation of piped culverts in ditches, relocation of sheep dips and pens, farmyard roofing, gateway resurfacing, slurry store covers, cross drains, and sediment ponds and traps (see RPA & Natural England, 2020 for a comprehensive list).

1.4.2. Existing studies into the efficacy of CSF advice delivery

Evaluation of CSF has been an ongoing task since the establishment of the initiative. The most recent annual CSF evaluation report investigated how effective CSF was up until 2018 and claimed that CSF had made 'significant' progress in delivering its objectives (Environment Agency, 2019a). The report found that CSF advice delivery is well-received by farmers, with 93% of CSF-engaged farmers believing their CSFO had a good understanding of DWPA, 89%

believing that their CSFO understood the needs of their farm, and 87% stating that the advice they received was practical. Moreover, 95% of CSF-engaged farmers claimed to trust their CSFO (Environment Agency, 2019a); this aligns with the findings of Thomas *et al.* (2020), who found that farmers were generally receptive to listening to CSFOs, even where they did not change their practices as a result.

Many CSF-engaged farmers have interacted with the initiative on three or more occasions (53%) (Environment Agency, 2019a). This repeat engagement is positive in one sense as it is likely to result in stronger relationships and may encourage farmer uptake of measures (Environment Agency, 2019a). However, this may also indicate that CSFOs are repeatedly engaging with already 'engaged' farmers rather than reaching the unengaged farmers who may be more prone to contributing to DWPA.

The report also claimed that CSF delivery had resulted in fewer pollution incidents in priority areas while incident rates are increasing in the regions which are not prioritised by the initiative, thus leading to the claim that the initiative is a success. As explained above, however, other advisory entities and policy measures may contribute to reductions in pollution incidents in these priority areas; thus, it is difficult to quantify precisely how much of this impact was due to the CSF initiative alone.

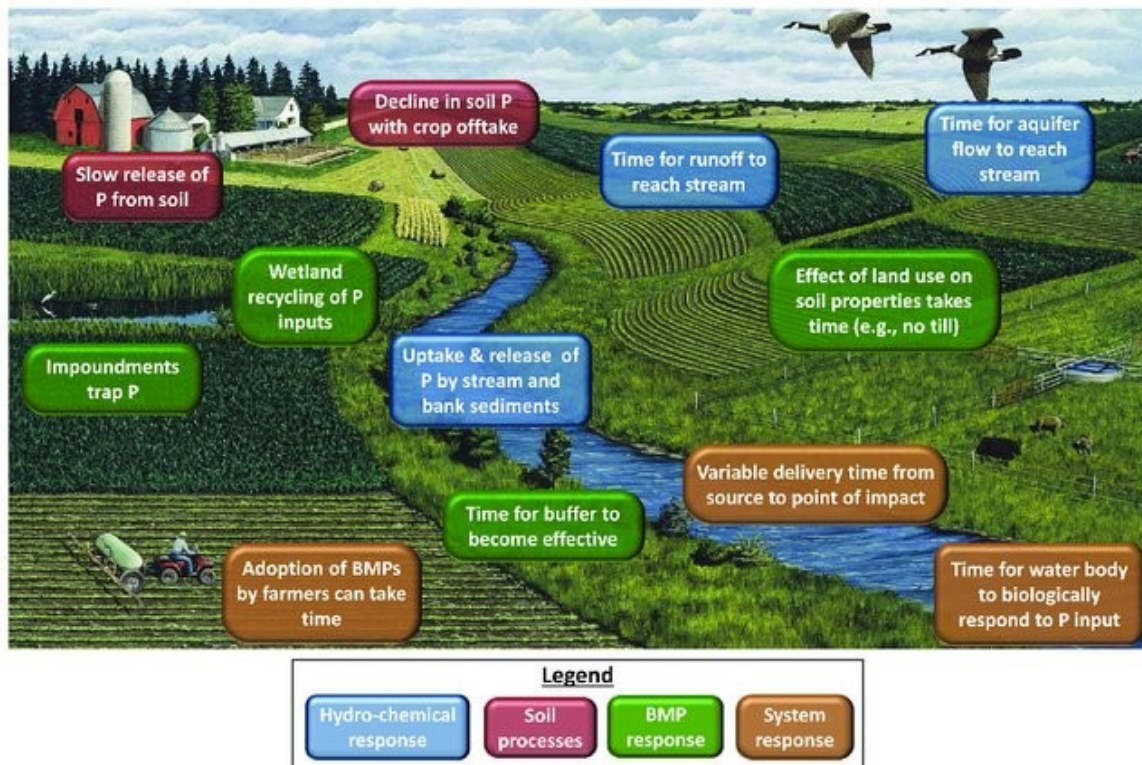
A study was undertaken to determine what motivates and impedes farmer engagement with the uptake of measures for reducing their contributions to DWPA to improve CSF's efficacy (Fish, 2014). Common sentiments affecting farmer engagement with CSF included being unconvinced by the aims of the initiative, lacking the necessary resources to uptake measures, a perception that CSF's aims are incompatible with business priorities, fears of involvement from other untrusted authorities, and concerns relating to bureaucracy (Fish, 2014). Furthermore, Vrain & Lovett (2019) found that farmers who didn't engage with CSF suggested this was due to a lack of continuity and repetitive provisioning. This scepticism is compounded by the cumulative effects of DWPA, which lead to extrication by farmers of their responsibilities. While an individual farm's practices may contribute relatively inconsequentially, farms across a landscape interact and produce significant inputs to watercourses (Fish, 2014).

Water quality improvements resulting from CSF delivery

Some literature, largely commissioned by the Environment Agency, claims that CSF has led to reductions in overall pesticide levels within four long-term monitored catchments. From the baseline data gathered nine years ago, pesticide reductions of 37.8% were found in these catchments, despite significant variation (Environment Agency, 2019b). Besides, the number of pollution incidents inside the CS water quality priority areas within which CSF operates versus outside these boundaries has frequently become lower in recent years (2010, 2015, 2016, 2018) (Environment Agency, 2019c), suggesting that the initiative has led to a reduction in pollution incidents. Moreover, Davey *et al.* (2020) evaluated CSF's effectiveness for improving water quality, finding a lag of >2 years after an intervention occurs before there are reductions in suspended solids and orthophosphate. It was, however, estimated that CSF has led to a reduction in SS by, on average, 4.4% in 44 target catchments and OP levels by an average of 13% in 17 target catchments. The water quality implications to unit reductions in P loadings was, however, uncertain, and there was significant variation between results between sites ($p < 0.001$ for SS) (Davey *et al.*, 2020). There was little change in overall application rates of fertilisers between 2012/13 to 2018/19, indicating that input reductions may not yet be occurring on a widespread basis (Defra, 2020).

Farmers may not perceive the problem as 'solved' without evidence of water quality improvement. It is, however, difficult to know the extent to which CSF has resulted in water quality improvements. This challenge exists due to the presence of efforts by other advisory entities relating to DWPA and legislation for improving water quality (e.g., NVZs, new farming rules for water). Besides, engaging with advice is unlikely to result in immediate water quality improvement due to the complexity of the source-pathway-receptor cascade and the long lags typically observed between measure uptake and water quality improvement (Van Meter & Basu, 2016; Meals *et al.*, 2010), in part due to the long residence times of certain nutrients and variation in how quickly the pollutants travel towards, and along, watercourses (e.g., Nitrogen: Grimvall *et al.*, 2000; Kim *et al.*, 2020; Phosphorus: Sharpley *et al.*, 2013, see figure 1.7).

Figure 1.7. Conceptual diagram showing the processes which affect the legacy of P delivery to watercourses. BMP = best management practices. Figure derived from Sharpley *et al.*, (2013).



In addition, there is a growing realisation that large scale hydroclimatic variability dictates the results of water quality monitoring. For example, when monitoring is carried out when the North Atlantic Oscillation is strongly positive, results will typically be more negative than when it is weak (Mellander *et al.*, 2018). These lags, alongside the diffuse nature of DWPA, makes it difficult to achieve or measure tangible water quality improvements. Therefore, water quality improvements are multi-factorial, and CSF alone cannot, therefore, be held solely responsible for improving water quality. Besides, as explained briefly above, it can be difficult to measure whether water quality improvements have been achieved without integrated indicators.

1.5. The potential of alternative approaches of advice delivery for increasing the efficacy of DWPA advice

Exploring alternative ways of providing advice is becoming increasingly important due to the resource-demanding nature of 1:1 advice (Coleman *et al.*, 2010), particularly as the UK has recently entered its first recession since 2009 due to

the Covid-19 pandemic (The Guardian, 2020). Moreover, the over-reliance on written content (e.g., farm reports) as outputs from 1:1 advisory visits may not necessarily be being used to their full potential by farmers.

The median age of registered farm holders has increased in recent years and was 60 in 2016 according to Defra (2019b). This estimated average age is, however, misleading as it is calculated based on a survey response from a single registered member of each farming household who may not necessarily be in charge of the farm. Regardless, several gradual changes in the farmed landscape may be expected in coming years, including further amalgamation of farms and the introduction of more 'young' farmers and new entrants to the farming arena as older farmers are succeeded. Some of these farmers are likely to have different advice requirements to their older counterparts, thus advice must evolve to satisfy both existing farmers and those who are in the process of taking over the management of farm businesses.

Simultaneously to this turnover of farmers, broadband coverage across England is increasing (Defra, 2020b), with just 1% of English farmers lacking an internet connection. This, therefore, increases the potential of disseminating information and advice online; Butler & Lobley (2012) found that 74% of internet-using farmers were aged >56. It is, therefore, vital that DWPA advisors are equipped for these future circumstances if they are to maintain or increase farmer engagement. In response, this study will explore the extent to which farmers are currently inclined to use social media, watch video content, and engage with 'hard' evidence surrounding the likely contributions of their practices to DWPA when seeking advice.

1.5.1. The potential of 'hard' evidence for increasing farmer engagement with DWPA advice

Advisors are often expected to translate and disseminate 'hard'¹² evidence in a way which is perceived as credible by farmers. A key barrier facing farmers seeking information and advisors when accessing information to translate and

¹² This study uses the term 'hard' evidence throughout and allowed farmers and advisors to interpret this as they wished. It was, however, expected that participants would automatically associate this term with 'scientific' evidence deriving from academic studies and water quality monitoring.

disseminate is that much research is published in peer-reviewed journals. Many journals remain paywalled despite efforts to increase open-access publishing. In addition, peer-reviewed articles are often written using obscure language that farmers and advisors lack time to interpret and struggle to translate accurately. Efforts are, however, being made to alleviate this challenge. For example, the national Demonstration Test Catchment (DTC) project, which aimed to deliver robust evidence surrounding how to control DWPA, produced user-friendly information leaflets and factsheets to allow non-scientists to understand the methods and findings of the various consortia (DTC, 2020).

CSFOs are provided with a CSF evidence prospectus, which highlights several evidence-based tools and resources they can use when delivering advice (CSF, 2017). The extent to which these tools are used by advisors or seen as useful has not been investigated previously; thus, this study will identify the key requirements advisors and farmers have of evidence if it is to become a useful advisory tool. Moreover, many of these tools work at a landscape- or catchment-scale (e.g., water quality evidence tool) and thus may not be perceived as proving whether individual farmers' practices are likely contributing to DWPA. Some of these tools may not have been advertised to other advisory entities; thus, it was also essential to determine whether these entities are using different tools or lack evidence that CSFOs have access to.

Farmers' knowledge is typically based on localised, experiential understanding, with some reliance on scientific understanding (Riley, 2008; Oliver *et al.*, 2012). Evidence that is perceived as being at an inappropriate scale or irrelevant to an individual farmer may not, therefore, lead to positive engagement with advisors attempting to disseminate this information. Some studies have found some evidence that current approaches used for disseminating evidence may lack relevance. For example, a recent study into whom farmers trust when gaining information about new soil practices found that farmers are frustrated by 'traditional' experts, particularly agricultural scientists from academic and government institutions, largely due to a belief that they do not consider their needs (Rust *et al.*, 2020). Instead, many farmers appear to be using digital sources and their peers for advice, suggesting that traditional 'experts' may be losing credibility (Rust *et al.*, 2020).

There is, however, little existing research into how farmers respond to the prospect of being shown 'hard' evidence that their practices likely contribute to DWPA by their advisors. This study, therefore, aimed to explore farmers' perceptions of this and to determine whether the provision of more evidence surrounding the likely contributions of their practices to DWPA may increase the relevance of seeking advice. It was hypothesised that the provision of 'hard' evidence surrounding the likelihood of farmers' practices making a significant contribution to DWPA may offer advisors an opportunity to reinforce the importance of engaging with CSF and other advice. This provision of hard evidence could increase the initiative's relevance by helping farmers understand why it is important that they uptake measures for reducing DWPA.

1.5.2. The potential of video content for providing credible DWPA information and advice

'A picture is worth a thousand words' is an oft-quoted phrase and implies that videos, a visual mode of dissemination, may offer a powerful tool for farm advisors. Videos are becoming increasingly relied upon by farm advisors due to the increasing recognition that visual tools are highly impactful for farmers (Van Mele, 2011). Moreover, by sharing key concepts and encouraging experimentation, videos have already been found to provide an effective way of encouraging farmers to obtain knowledge, innovate, and adopt social learning and new practices in both developed (Stone *et al.*, 2012; PLAID project, 2019) and developing (Wanvoeke *et al.*, 2009; van Campenhout *et al.*, 2017; Singh *et al.*, 2018) countries. The potential of video content for providing DWPA advice in conjunction with existing methods is introduced within this section. When exploring existing literature surrounding the use of videos within agriculture, the publication year was limited to >2009 due to the technological progress made in recent years.

Videos on a vast number of topics are hugely popular worldwide; YouTube is now the second largest search engine globally (PLAID project, 2019, p6), with 'YouTube it' used as a verb for seeking out informative videos (Henry *et al.*, 2018). Some evidence suggests that this includes farmers, with videos proving a popular way to seek agricultural information (PLAID project, 2019). Videos can, in some cases, avoid the need for having an experienced advisor present (Bentley *et al.*,

2014; Maredia *et al.*, 2017). Farmers may not, however, be willing to seek videos out themselves; thus, advisors would likely still need to be involved in sharing these videos (Van Mele, 2011).

Where they are distributed effectively, large audiences can view videos, including those living in rural areas. Therefore, videos have the potential to offer a cost-effective approach for disseminating information and advice due to a reduced need for advisors to travel long distances (Vasilaky *et al.*, 2018). Videos are often also easy to access by farmers at home. They can be shown on various online platforms (e.g., YouTube, Vimeo, Facebook, Twitter) or shared through DVD copies where internet access is limited. Live videos can also be broadcast on platforms including Skype, Zoom, Teams, and Facebook to enable farmers who were unable to attend events to watch selected sessions virtually (e.g., the Oxford Farming Conferences) (Burbi & Hartless Rose, 2016).

A recent study in Scotland suggested that dyslexia within rural communities may be higher than in the general population (NFU, 2015), where around 10% of people in the UK have dyslexia (NHS, 2018). Whilst the intelligence of those with dyslexia is unaffected, those with dyslexia often prefer audio-visual modes of information delivery over written content (NHS, 2018). Videos may, therefore, offer an inclusive approach for providing farmers with advice and information.

Van Mele (2011) found that 78% of surveyed extensionists used video to train farmers, while half of these respondents also watch videos to gain new information to disseminate to farmers. Bello Bravo *et al.* (2020) found that videos shown to farmers in Mozambique led to 97.9% and 89% knowledge retention and solution adoption, respectively by its farmer audience, which is at least as high as achieved from traditional advice delivery. It is, however, important to note the different context in which this study was undertaken; future research should, therefore, explore the impacts of video content in developed countries where videos are less of a 'novelty.'

Existing videos relating to DWPA

In the context of water quality-related broadcasts, the Rivers Trust post recordings of their conferences online. At the same time, the CSF partnership has its own YouTube channel with a range of videos available to farmers (CSF

Partnership, 2018). It is, however, unclear as to the extent to which these videos are shared, with most videos on the CSF channel having <2000 views. Innovation for Agriculture (see table 1.1) has also created a series of videos aimed at water quality, entitled 'learning from the land' (IfA, 2018). Most of these videos have under 1000 views since being uploaded in 2018. In addition, many of these views may not be farmer-derived, with advisors, students, and the general public also likely to watch these videos. Videos may, nonetheless, offer an emerging way for advisory entities to engage with farmers, particularly if they are shared more widely. Little is, however, known about how likely farmers in England are to engage with this mode of delivery.

1.6. Research aims and objectives

Advice provisioning is a fundamental approach used to encourage farmers to reduce their contributions to DWPA. Thus, it is essential to explore its efficacy and seek ways of ensuring farmers continue to engage with it under future circumstances.

This research critically examines the efficacy of DWPA advice in England according to both farmers and advisors, where effective advice is defined as being accessible, credible, relevant, and legitimate. There is then an exploration into potential ways of maintaining or increasing its efficacy through expanding the use of alternative ways of delivering advice and information.

Given the fragmented nature of DWPA advice, it was deemed important to explore whether the advice being delivered by CSF and other entities are perceived as effective by both farmers and advisors themselves. Against this context, a mixed-methods research approach was adopted across England between 2017-2018. The views of both farmers and farm advisors from various advisory entities, including CSF, were explored due to the recognition that these actors were likely to have different ideas of what constitutes successful DWPA advice and how it could be improved in the future.

The recently added remit of improving air quality to CSF was not within the scope of this research due to the complexities anticipated to arise in comparison with exploring DWPA alone. Moreover, as the remit of tackling air quality was added

to the CSF agenda relatively recently, it was felt that it would be premature to investigate its efficacy.

The overall research question and objectives of this thesis are:

Overall research question: How effective is DWPA advice delivery according to farmers and advisors, and how could it be improved to ensure it is a success under future circumstances?

Research objectives

- Gather, analyse, and interpret extensive quantitative and qualitative data exploring farmers' and advisors' perceptions of the CSF initiative and other sources of DWPA advice by adopting a mixed methods research approach
- Use the conceptual framework, 'CRELE,' which comprises of three attributes: credibility, relevance, and legitimacy as a basis for investigating the research objectives while critically evaluating its applicability in the context of this research
- Determine whether additional approaches to DWPA advice delivery in conjunction with existing approaches (e.g., 1:1 advice and farm events) have the potential to increase the efficacy of DWPA advice
- Explore whether farmers and advisors believe that the translation and dissemination of 'hard' evidence surrounding the likely contributions of farming practices to DWPA may increase their engagement with DWPA advice
- Make policy recommendations for ways of improving the efficacy of DWPA advice based on both farmers and advisors' views

1.7. Structure of this thesis

This introductory chapter has presented the concept of DWPA as a challenging issue in England before examining the approaches used for reducing its contributions to water quality issues. Particular attention was given to advice delivery from CSF, the primary entity of interest within this research, due to its nature as a government-funded initiative. The research objectives and aims of the study were then introduced.

This study is based on a highly empirical mixed methods research approach consisting of an online questionnaire survey of farmers (n = 221), telephone interviews of both farmers (n = 60) and advisors (n = 50), and focus groups of farmers (n = 4) and advisors (n = 3). The thesis itself is structured as follows:

Chapter 2 provides a conceptual framing for this research, which posits that farmers are more likely to engage with DWPA advice where it is perceived as credible, relevant, and legitimate.

Chapter 3 justifies the use of a mixed-methods research approach for fulfilling the research objectives of this study.

Chapters 4-8 constitute the empirical chapters of this research. Results from an online questionnaire survey of farmers (chapter 4), farmer telephone interviews (chapter 5), farmer focus groups (chapter 6), advisor telephone interviews (chapter 7), and advisory focus groups (chapter 8) are presented.

Chapter 9 begins by iterating the CRELE framework by reconstructing it based on the empirical findings of this study. The data from all methods are then triangulated and interpreted through the lens of this new framework.

Chapter 10 summarises the main results of this study. Recommendations for policymakers and future investigations are made.

Chapter 2

A framework for exploring the efficacy of DWPA advice: credibility, relevance and legitimacy

Upon reviewing existing literature surrounding DWPA advice and identifying research objectives in the preceding chapter, it became necessary to situate these objectives within a conceptual framework. The framework presented in this chapter provides a basis for designing the research methodology, data collection, and analysis and interpretation of the results by arguing that the attributes of credibility, relevance, and legitimacy are critical determinants for exploring the efficacy of DWPA advice in terms of engagement and delivery.

This chapter consists of six sections. The first introduces the conceptual framework, 'CRELE' (comprising three components - 'credibility, relevance, and legitimacy') (Cash *et al.*, 2002, 2003). Definitions are provided for each of the CRELE attributes and the concepts of thresholds, complementarities, and tensions are introduced. The second section identifies the factors which affect farmer behaviour and may, therefore, feed into whether DWPA advice is perceived as CRELE. The third section provides an in-depth exploration into the behavioural factors which affect farmers' willingness to engage with DWPA advice, including attitudes, habits, and norms, through the lens of CRELE. The fourth section explores the factors which affect a farmers' perceived and real ability to engage with and implement DWPA advice, again whilst exploring how they relate to CRELE. The fifth section explores how the nature and structure of DWPA advice may affect whether farmers see it as CRELE. Finally, a detailed conceptual map is constructed to demonstrate how CRELE enabled this new research to be designed, analysed, and interpreted.

2.1. Introducing the Credibility, Relevance, and Legitimacy (CRELE) framework for assessing the efficacy of DWPA advice

This research explores the efficacy of advice delivery surrounding DWPA and ways of improving its delivery. The term *efficacy* was considered key when exploring how to conceptualise this study. Efficacy is defined as '*The ability to produce the intended result*' (Cambridge Dictionary, 2020). In the context of farming advice for DWPA, this relates to whether farmers engage with advice, implement measures or change practice as a result, and ultimately, whether this advice results in water quality improvements. In order to achieve efficacy, it was expected that advice would have to be perceived as credible.

Sligo & Massey (2007) studied how dairy farmers in New Zealand use information and create knowledge within local areas. When interpreting their findings, a metaphorical 'sieve' was used to explain how farmers sift information through a fine mesh consisting of credibility and trust to determine whether this information is relevant, against a backdrop of financial and environmental risk. It was found that certain individuals (e.g., vets) were well trusted by these farmers, in part due to familiarity and expertise, which fosters trust (Sligo & Massey, 2007). Moreover, these farmers had access to several sources of information, with individuals choosing which ones to use from these options, often based on their perceived expertise (Sligo & Massey, 2007). Farmers also scanned the environment by keeping updated with what their neighbours and other dairy farmers are doing (Sligo & Massey, 2007).

The terms 'credibility' (which includes 'trust'), 'and 'relevance' are clearly relevant in the context of DWPA advice. These components have also been recognised as important by other researchers. Matson *et al.* (2016, p.109) argue that '*potential users [of information] are more likely to trust new knowledge (and therefore may be more likely to act on it) when from their perspective, it meets three criteria: credibility, relevance, and legitimacy*'. This study revealed a potential third component: legitimacy. A literature search was, therefore, conducted using these terms as it was theorised that these elements might offer a suitable lens for studying the efficacy of DWPA advice.

Whilst conducting this literature review, which used search terms such as ‘farmer’ and ‘behaviour’ alongside ‘credibility’, ‘trust’, ‘relevance’ and ‘legitimacy’, a paper that operationalises a framework consisting of these components was identified (Ingram *et al.*, 2016). This framework consists of three components: credibility, salience (relevance¹³), and legitimacy, and was used by Ingram *et al.* (2016) to explore ways of communicating information about soil carbon to farmers. Further research revealed that this framework is often referred to as ‘CRELE’. CRELE¹⁴, originally proposed by Cash *et al.*, (2002, 2003), was developed by building upon boundaries research (see Jasanoff 1987, 1990; Gieryn 1983, 1995, Guston, 2001). CRELE has been used widely in recent years, primarily by researchers exploring the interface between science and policy (e.g., Tuinstra *et al.*, 2006; Cook *et al.*, 2013; Sarkki *et al.*, 2014, 2015; Heink *et al.*, 2015; Dunn & Laing, 2017) and for designing environmental and ecosystem assessments (Lucas *et al.*, 2010; Posner *et al.*, 2016; Wright *et al.*, 2017; van Oudenhoven *et al.*, 2018).

2.1.1. Defining credibility, relevance and legitimacy

This section defines each CRELE attribute before providing illustrative examples. As posited by Cash *et al.* (2002) it is important to recognise different groups of stakeholders may define the CRELE components slightly differently. In response, it was hypothesised that where advisors believe DWPA advice from their entity is ‘CRELE’, this does not necessarily mean it is perceived as such by farmers themselves. In addition, it is important to note that none of the CRELE attributes are mutually exclusive and that they are expected to change over time, with an alteration to one attribute affecting the other aspects of CRELE (Cash *et al.*, 2002).

In the context of this research, credibility is defined as whether DWPA advice delivery is perceived as ‘*plausible, accurate, valid and of high quality*’ (Ingram & Mills, 2014). Credibility is an essential attribute within CRELE because ‘*the higher the source credibility, the higher the persuasion factor will be*’ (Blackstock *et al.*, 2010, p. 5632). This indicates that farmers may be more likely to be persuaded to engage with and act on advice where they perceive it as credible. Under a

¹³ Cash *et al.* (2002, 2003) used the term ‘salience’ rather than ‘relevance’ when proposing the framework. Similarly to Sarkki *et al.* (2015), this thesis uses ‘relevance’ instead due to it being a more widely understood term, thus making the framework accessible to a wider audience.

¹⁴Please note: The framework is referred to as ‘CRELE’ throughout this thesis due to the decision to use the term ‘relevance’ instead of ‘salience’ used by Cash *et al.* (2002, 2003) and Cash & Belloy (2020).

broad conceptual lens, trust and social capital¹⁵ were considered critical aspects of credibility due to the importance placed on these attributes across literature relating to agricultural advice (trust: Carolan, 2006a; Sligo & Massey, 2007; Sutherland *et al.*, 2013; social capital: Mathijs; 2003; Fisher, 2013).

Several factors were expected to affect whether farmers would perceive DWPA advice as credible. These factors include whether advice aligns with existing beliefs and social norms, whether the entity from which the advice derives is trusted, how long an advisor has been in-post, the agricultural experience/knowledge of an advisor, and the level of complexity of advisory messages. The extent of uncertainty (Ingram *et al.*, 2016) and transparency surrounding scientific uncertainty (Steingrover *et al.*, 2010) and scientific authority and plausibility (Ingram & Mills, 2014) were also expected to affect credibility.

Relevance, within the context of this research, refers to how salient DWPA advice is perceived by individual farmers, with different farmers likely to hold different interests (Ingram *et al.*, 2016). As stated by Dwyer *et al.* (2007), the relevance of advice is a crucial aspect for ensuring it resonates with farmers. The researcher, based on previous research findings, expected that the relevance of DWPA advice would be affected by timing, context, scope, and need (Ingram *et al.*, 2016). It should also be noted that whether DWPA advice is perceived as relevant is unlikely to be decided by a single farmer as many farming enterprises consist of several stakeholders, including other family members, farm managers and contractors.

It was hypothesised that the relevance of advice would be as important as its credibility due to the number of factors expected to affect it (table 2.2). Based on the behavioural factors outlined in table 2.1, some of the levers predicted to affect the relevance of engaging with DWPA advice, alongside agency, include personal attitudes, risk of enforcement, risk of reputational damage, and opportunities to obtain grant funding. Even where an advisor recommends entirely credible measures (e.g., installing larger slurry storage), they will, most likely, be ignored if they lack relevance to their clients (e.g., because the farmer lacks the financial capital to implement the measure). Many farmers may also

¹⁵ Social capital encompasses the idea that social bonds and social norms are important for encouraging productive activities. There are four key aspects of social capital: 1) trust between people; 2) reciprocity; 3) common rules and norms; 4) connectedness, networks and groups (Pretty & Hall, 2001). Farmers with high social capital may be hypothesised to be those most listened to and respected by other farmers.

perceive CSF and other DWPA advice as irrelevant unless there are clear links to how the uptake of measures or practice change for reducing DWPA may result in business benefits. It was thus hypothesised that undervaluing relevance and relying upon credibility alone would not result in effective advice delivery.

Lastly, this study defines legitimacy as referring to '*the extent to which knowledge production has been respectful of the divergent values and beliefs of stakeholders, unbiased in its conduct and fair in its treatment of opposing views and interests*' (Ingram *et al.*, 2016, p. 118). This means that DWPA advice should be inclusive and empower its clients if it is to be seen as legitimate. The researcher here interprets this as referring largely to fairness and empowerment. In terms of empowerment, advice was expected to be seen as legitimate where farmers have been involved in the creation of the knowledge which is transferred during advice delivery. For example, Sumane *et al.* (2018) stated that where a farmers' expertise has not been considered, this may affect the legitimacy (and relevance) of advice. Meanwhile, in terms of fairness, advice was expected to reach the legitimacy threshold where farmers feel their engagement is fair.

2.1.2. Why is CRELE an appropriate framework for this study?

This section will justify the use of CRELE by explaining why other frameworks were not selected and examining how it has been mobilised in previous studies.

Whilst conceptualising this study, two alternative conceptual frameworks were considered: protection motivation theory (Rogers, 1975, 1983) and the theory of planned behaviour (Ajzen, 1991). Protection motivation theory postulates that fear will motivate behaviour and attitude change. There are three components to this: 1) the magnitude of risk; 2) the likelihood that the event they fear will occur, and 3) the ability of the person to protect themselves (Rogers, 1975, 1983). In the context of this research, farmers were hypothesised to fear prosecution due to their contributions to DWPA. They may, therefore, be more inclined to seek advice where they are aware of a risk of prosecution and that there is a strong likelihood of this happening (e.g., through inspections), and that they know they can prevent being prosecuted by acting to reduce DWPA. Advice delivered by CSF and other entities may be able to address point 3 by helping farmers to reduce their contributions. However, the ongoing lack of prosecutions relating to DWPA (The Guardian, 2021) means that points 1 and 2 are largely unmet. This

led to the recognition that protection motivation theory was unlikely to be a sufficient framework for this research as it cannot be used to explain why farmers engage with DWPA advice; as points 1 and 2 are not met, it was hypothesised that fear was not the reason for farmers engaging with DWPA advice. Instead, CRELE appeared to better explain why farmers may or may not decide to engage.

The theory of planned behaviour (Ajzen, 1991) was also considered for framing this study. This framing ultimately posits that decisions and actions are based on reason, with people considering various factors whilst they decide whether to act. The framework is used to explore intentions to perform behaviours and posits that this can be predicted by attitudes towards the behaviour, norms, and perceived behavioural control. However, this framework does not explicitly consider the relevance of performing a behaviour (in this case, engaging with DWPA advice) and was not, therefore, used to frame this research. This is because it was immediately clear from reading literature such as Ingram et al (2016) that farmers are likely to act where it appears relevant to do so, for example, by providing them with business benefits or enabling them to avoid prosecution. In addition, the theory of planned behaviour has been adopted by many agricultural social science studies; Sok et al (2020) recently identified 124 papers on farmer behaviour which use this framing since 2000. As a result, the researcher was inclined to use an alternative framework, CRELE, to examine whether this could offer an alternative way of framing the study. In addition, as the research enquiry became clear, it became evident that the aim of the present study was not to examine farmer behaviour per se; instead, it focuses on farmer engagement with advice which may, eventually, result in behaviour change.

Wang et al (2019) combined both the theory of planned behaviour and protection motivation theory to explore farmers' environmental behaviour surrounding DWPA in China as they recognised that fear (protection motivation theory), attitudes, and norms (theory of planned behaviour) affect farmer behaviour. This was, however, deemed a rather complex framework (see figure 1, Wang et al, 2019) and each of these components could be explored through the lens of the CRELE attributes. For example, norms were expected to affect the credibility and relevance of advice, whilst preconceived attitudes were expected to have particular implications for relevance.

Whilst CRELE was originally applied to the knowledge-action interface between scientists and policymakers, the framework is flexible and lends itself to other contexts, including an exploration of the efficacy of DWPA advice. The appropriateness of CRELE for this study is, in part, because other authors studying water and soil within a farming context have already applied CRELE successfully (e.g., Ingram *et al.*, 2016 (see above), Thomas *et al.*, 2020).

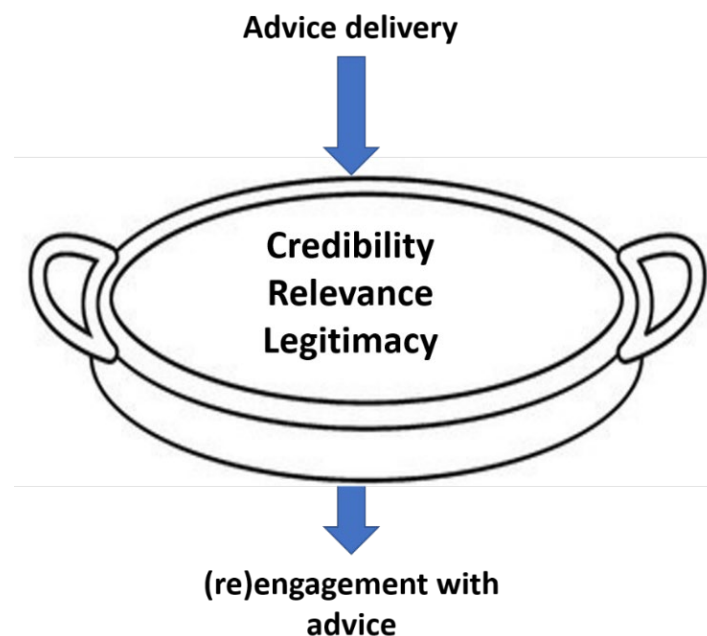
Ingram *et al.* (2016) operationalised CRELE by engaging with stakeholders through interviews and workshops whilst recognising that scientific evidence may provide credible information, that incorporating crop productivity in messaging would increase the relevance of soil carbon information, and that using an iterative approach would result in increased perceived legitimacy. During analysis, the emergent narratives were scrutinised through the lens of the three components, with credibility and relevance emerging strongly in the data. As a result, dimensions of CRELE were identified in relation to soil carbon information (see figure 2, Ingram *et al.*, 2016). The study concluded that it is important to consider how stakeholders assess these attributes.

Thomas *et al.* (2020) used CRELE to explore how different knowledges are utilised and shared in different contexts whilst engaging with the CSF initiative. It was found that farmers were unsure about why regulations such as the new farming rules for water (section 1.3.1) have been established and had a lack of comprehensive knowledge surrounding rivers. As a result of these knowledge gaps faced by farmers, they saw the advice given by CSFOs as relevant. This suggests that farmers will be more likely to perceive advice as relevant where relayed messages contain information farmers don't already possess. In addition, they found that where an advisor considers a farmers' specific context when sharing knowledge, they are more likely to be perceived as credible and legitimate. It was also found that the longevity and practical experience of CSFOs affects their credibility. Again, it was expected that these factors would arise in the current study as it is well known that longstanding, trusted advisors are those who are listened to by farmers. The OECD (2015, p8) also referred to CRELE indirectly, positing that farmers require credible, relevant, and up-to-date advice when being encouraged to uptake green growth measures.

CRELE is used in this study to examine the interfaces between farmers and advisors and to explore how these attributes affect the likelihood of farmers

engaging with advice. Figure 2.1 provides a preliminary concept map of CRELE in the context of this research, using Sligo & Massey's idea of adopting a 'metaphorical sieve' to visualise the framework. This study will seek to test the hypothesis that the efficacy of DWPA advice will only be maximised where the CRELE attributes are met for both farmers and advisors, the key actors within the context of DWPA advice.

Figure 2.1. Preliminary concept map based on CRELE (Cash *et al.*, 2003, 2004), whereby advice/information delivery is sifted by farmers based on whether they perceive it as credible, relevant and legitimate. Where these three attributes are met, it is expected that farmers will (re)engage with advice.



2.1.3. Thresholds, complementarities, and tensions between the CRELE attributes

Several limitations challenge the applicability of CRELE under certain contexts, mainly within the science-policy interface where the framework has been applied most often. The following section will briefly explore these issues before demonstrating that it remains an applicable preliminary framework for this study.

The primary limitations surrounding CRELE include counteracting effects, interactions between each CRELE component, and the trade-offs which exist

when attempting to meet the thresholds of CRELE (see Lusiana *et al.*, 2011; Ginger, 2014; Van Voorn *et al.*, 2016). In addition, there is an incidental risk of the CRELE attributes being met but then lost suddenly as a result of an interaction with someone who is untrusted (see Schut *et al.*, 2013). In the context of this research, it was hypothesised that this might be an outcome where a long-term, trusted farm advisor is replaced by an unknown advisor new to the catchment.

When operationalising the CRELE framework, it is important to recognise the existence of requisite thresholds for each component (Cash *et al.*, 2002). As stated by Cash *et al.* (2002, p6), '*knowledge production systems that engender perceptions that fall below one of them [the CRELE attributes] are likely to be ineffective*'. The CRELE thresholds are likely dynamic and change over time (Cash *et al.*, 2002). For example, during financially challenging or busy times for farmers, the relevance threshold is likely to be higher than during times when they are in a better position to engage with or implement DWPA advice. The point here is that these thresholds exist but are abstract and changeable.

An example of these thresholds in the context of DWPA advice would be where credibility and legitimacy have been sufficiently met (e.g., through delivering believable information) but are undermined due to insufficient relevance – where the threshold for one attribute is met, it is hypothesised that this will not result in decision making. Meanwhile, the efficacy of DWPA advice is hypothesised as increasing where these thresholds are met. When thinking about the credibility of advice, the threshold for advice being seen as credible by farmers has likely increased due to the rise of information overload in recent years (Bawden & Robinson, 2020) and the associated difficulties with finding the 'right' information (Holton & Chyi, 2012). This constant stream of information is likely to increase the likelihood of farmers deciding whether advice is credible by proxy, based on whether it confirms their own or their peers' existing beliefs, and whether it comes from a trusted source. The credibility threshold has, therefore, likely increased.

As posited by Cash *et al.* (2002), the attributes of CRELE are often dependent on each other, resulting in both complementarities and tensions. Whilst complementarities occur where dependencies have a positive effect on each other, tensions occur where they harm each other.

Complementarities within CRELE exist when attempts to increase one attribute also increases another. For example, providing advice based on local evidence is clearly likely to increase both credibility and relevance. Thomas (2020) found that where advisors pay attention to individual farmers' specific circumstances, both the credibility and legitimacy of that advice was significantly enhanced. Another example of a complementarity within CRELE would be where efforts to increase legitimacy increase credibility and relevance because using a more inclusive approach to advice (e.g., by paying due attention to farmers' existing knowledge) will naturally result in these other attributes being better met.

Tensions, in the context of CRELE, are the opposite of complementarities and occur when an increase in one attribute acts negatively on another (Cash *et al.*, 2002, 2003; see Cook *et al.*, 2013, Sarkki *et al.*, 2014). For example, an effort to increase the legitimacy of DWPA advice by involving more farmers in deciding upon which measures are appropriate may reduce credibility due to the less scientifically rigorous approach.

When aiming to maximise the efficacy of advice, it is important to balance trade-offs so that no one attribute is left unachieved. Trade-offs between the CRELE attributes occur where a deficiency in one undermines another attribute; for example, where DWPA advice is not seen as credible due to the advisor lacking longevity in a catchment, their advice may, as a result, be seen as lacking relevance. There is, however, no formula for managing these trade-offs as they inevitably vary depending on the issue (Cash *et al.*, 2002). Regardless, it remains important to be aware that these trade-offs exist when applying the CRELE framework (Cash *et al.*, 2002).

Ingram & Mills (2014) found that even where scientific evidence reaches a consensus, thus resulting in credibility, this evidence may still be ignored where it is not deemed relevant to farming practices and farm businesses. For example, it was found that soil carbon management was of low priority to farmers due to a lack of tangible business benefits relating to carbon management despite evidence surrounding practices for managing carbon being seen as credible (Ingram & Mills, 2014; Ingram *et al.*, 2016).

The following section defines and unpacks each CRELE attribute separately whilst situating each component within the wider context of this new research.

We will then explore how these attributes interact through complementarities and tensions.

2.1.4. The potential implications of emerging stressors within the knowledge-action landscape for the applicability of CRELE

The knowledge-action landscape has changed somewhat since Cash *et al.*, (2002, 2003) developed the CRELE framework. Cash & Belloy (2020) identified four critical stressors which may be affecting the dynamics of the knowledge-action landscape and how boundary objects and organisations are utilised:

1. Increased recognition of the importance of linking local and global knowledge
2. A push to prioritise equitability
3. The emergence of a digital world
4. A general loss of trust in science (mainly due to the emergence of the 'post-truth' movement)

Cash & Belloy (2020) then went on to discuss how these stressors may affect the applicability of CRELE.

Firstly, the importance of 'local' knowledge has been increasingly recognised in recent years, with several studies recommending that farmers should be more involved in identifying ways of increasing the sustainability and resilience of agriculture. For example, Sumane *et al.* (2018) found that farmers rely on informal knowledge and that local farming knowledge is often undervalued despite its importance for sustainability and resilience. It may, therefore, be hypothesised that farmers will find advice more credible and relevant where it incorporates informal knowledge. CRELE remains relevant even where these multi-scale approaches become relied upon more, as achieving these attributes is likely to be vital at each scale for resulting in trust (Cash & Belloy, 2020). Besides, Cash & Belloy (2020) contend that increased efforts to link knowledge and information at different scales will increase its ability to reach the CRELE thresholds.

Secondly, there has been an increased focus on solving issues relating to equity in recent years (Cash & Belloy, 2020). In many cases, inequity is important when considering sustainability; those who are economically or otherwise vulnerable are often those at the greatest risk of being negatively affected by environmental

change. In the case of agriculture, it may be assumed that many farmers who are already under inequitable circumstances contribute to further inequity due to an inability to adapt to environmental pressures. This is relevant in the context of English farming, where many farmers are struggling to make a profit. Inequity within farming also likely exists in terms of technologies, the internet, and digital tools (as found in North America by Bronson, 2019). This inequity makes the provision of DWPA advice using several approaches (i.e., maintaining 1:1 advice and group discussions alongside video content) crucial. It is also hypothesised that some of the inequity faced by many farmers may be overcome where advisors include disadvantaged and marginalised farmers in advice delivery, thus increasing the perceived legitimacy of the advice. In addition, it is hypothesised that where there are financial reasons to engage with DWPA advice, this is likely to increase the relevance of DWPA advice for farmers facing inequity.

The third dynamic which may affect the applicability of CRELE under current circumstances is the rapid expansion of technology (in this context, referred to as 'agriculture 4.0'). This expansion means that advice and information have become freely available via the internet, social media platforms, and apps. There are several implications of this expansion for the CRELE framework. Some aspects of this transition can make advice and information more accessible and credible due to dissemination being cheaper and more widespread. In addition, legitimacy can be increased through there being increased transparency about how information is generated (Cash & Belloy, 2020). The transition towards more technology can, however, also decrease transparency or exacerbate inequalities, for example, by excluding non-internet users. Regardless, Cash & Belloy (2020) argue that *'as radical as the digital revolution has been, there is no a priori reason to assume that the CRELE framework is not an effective lens through which to understand how knowledge and action interact in a digital world'*. This move towards a digital world may not, therefore, necessarily increase the likelihood of advice and information reaching the CRELE thresholds but also does not negate it from being a legitimate conceptual framework for exploring the efficacy of information disseminated through digital means.

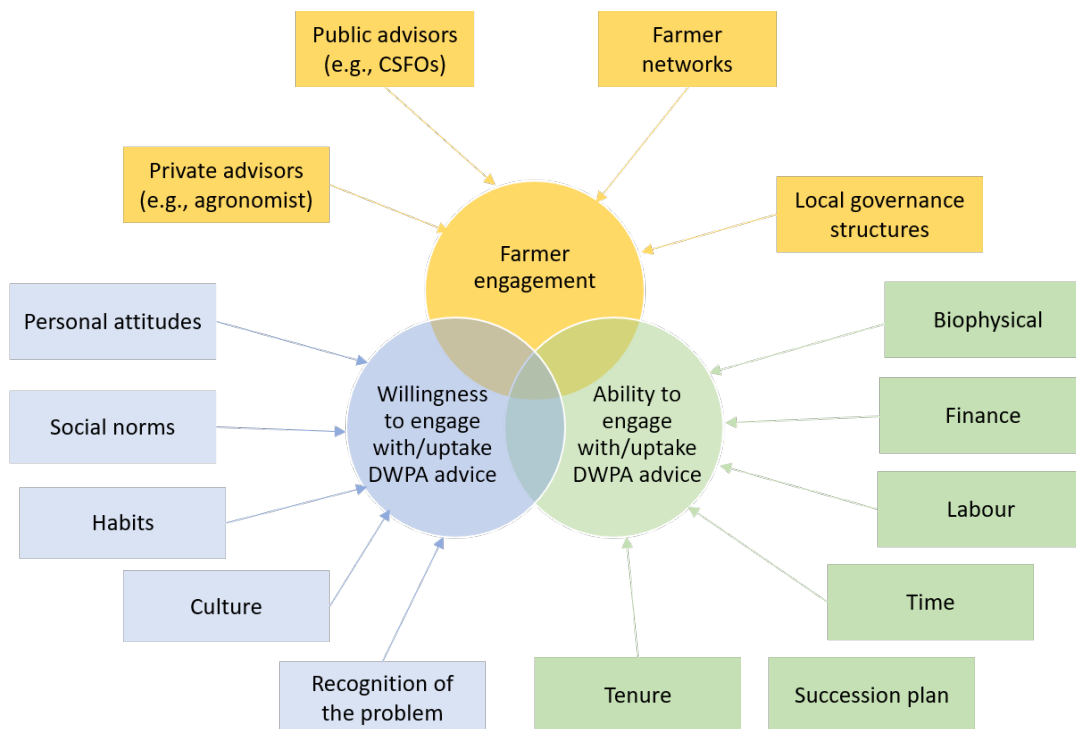
The fourth and final stressor, which Cash & Bellor (2020) identified as having implications for CRELE, is the current move towards a so-called 'post-truth' world. This 'post-truth' world is characterised by the credibility of science itself rather

than just individual scientific studies being questioned due to the current political context (see Nichols, 2017 for a general overview and Rust *et al.*, 2020 in the context of agriculture). This move towards 'post-truth' may be occurring, to an extent, within the agricultural landscape; a recent study by Rust *et al.* (2020) found that farmers are becoming frustrated by experts. This transition has implications for the applicability of CRELE. For example, whereas credibility was initially conceptualised as being governed mostly by norms, it is unclear whether advice or information which is scientifically derived will continue to affect whether people will engage with or uptake advice and information under a 'post-truth' world (Cash & Bellor, 2020).

The following section will introduce the myriad of factors that affect farmer behaviour. It is hypothesised that these factors will be key when assessing whether DWPA advice reaches the CRELE thresholds. An overview of how each behavioural factor relates to the framework is then provided in section 2.3.

2.2. Identifying the factors affecting farmer behaviour and how they are understood in the context of CRELE

It would be naïve to assume that providing DWPA advice alone will automatically result in engagement or uptake of recommended measures. This is because many farmers may lack the agency or inclination to change their practices, behaviours, and attitudes. The idea that understanding and influencing farmer behaviour is critical for encouraging them to implement measures for reducing DWPA is well established (Dwyer *et al.*, 2007; Blackstock *et al.*, 2010; Martin-Ortega & Holstead, 2013; Vrain *et al.*, 2014; Novo *et al.*, 2015; Inman *et al.*, 2018; Okumah *et al.*, 2018). As explained by Dwyer *et al.* (2007), three key themes affect the relationship between advice and behaviour: engaging with farmers, farmers' perceived ability to respond to advice, and whether a farmer is willing to engage with advice or change their behaviour. As shown in figure 2.2, this is not, however, a linear relationship. It is hypothesised that many of these factors will affect farmer engagement and uptake of DWPA advice. This is evidenced through the recognition of many of these factors by Fish (2014) when exploring the barriers and motivators surrounding farmer engagement with CSF advice.



In terms of research directly exploring the factors affecting farmer behaviour surrounding DWPA, Inman *et al.* (2018) undertook a study comprising a baseline survey, an in-depth attitudinal survey, and several group discussions. The results revealed that the same broad factors affect farmer behaviour surrounding DWPA as more general environmental behaviour: identity, behavioural beliefs, agency, networks and relationships, and social norms.

Table 2.1. provides an overview of these factors. The following categories are used for these factors:

1. Personal, social and situational characteristics of the farmer and their household
2. Physical farm factors affecting farmers' capacity to engage with/implement advice
3. Farm, farming system and business factors affecting a farmers' capacity to engage with/implement advice
4. Nature and quality of the scheme, practice or innovation (DWPA advice)
5. Policy environment

The categories above were created based on several studies. These include Wynn *et al.* (2001), who used similar categories when exploring the willingness to participate in environmental schemes in Scotland, Prokopy *et al.* (2008), who

reviewed the literature surrounding the determinants which affect agricultural best management practice in the US and found that adoption is affected by capacity, attitudes, awareness and farm characteristics, and Giovanopoulou et al., (2011), who successfully adopted these categories when modelling farmer participation in AES for reducing nitrate pollution in Greece. These all findings support a stance proposed almost 50 years ago by Gasson (1973), who posited that financial considerations are not the only reason for farmers deciding to act in a particular way (e.g., whether to engage with DWPA advice).

Many of the personal factors listed in table 2.1 interact and should not be considered in isolation (Mills *et al.*, 2013). For example, age and succession are usually interdependent. Further factors which have been shown to interact during decision making include farm structure, farmer attitudes and the design of the scheme (in the case of this study, CSF) (Davies & Hodge, 2007). Whilst many of the studies featured explored measure uptake or engagement with wider environmental advice, the factors identified as important are useful for exploring why farmers act in the way they do. It can thus be hypothesised that these factors will affect farmer engagement with DWPA advice.

Table 2.1. Factors influencing farmer behaviour surrounding environmental practices according to existing literature both surrounding DWPA and wider environmental challenges. Whilst categories 1-3 are internal to farmers, categories 4-5 are external.

Determinants of farmer behaviour	Specific factors affecting farmer behaviour	References relating to DWPA	References relating to environmental behaviour in general
1. Personal, social and situational characteristics of the farmer and their household			
<i>Willingness to engage or uptake environmental behaviour (e.g., DWPA advice)</i>			
Personal attitudes	Affected by farmers' instrumental, social, expressive, and intrinsic goals	Fish (2014) Inman <i>et al.</i> (2018)	Gasson (1973) Beedell & Rehman (2000) Dwyer <i>et al.</i> (2007) Ahnström <i>et al.</i> (2009) Prokopy <i>et al.</i> (2008) Giovanopoulou <i>et al.</i> (2011) Mills <i>et al.</i> (2013) Daxini <i>et al.</i> (2018)
Farming culture	Heterogeneity within sub-groups of farmers	Blackstock <i>et al.</i> (2010) Inman <i>et al.</i> (2018)	Dwyer <i>et al.</i> (2007)
Social norms	Image in the community, what other farmers are doing	Inman <i>et al.</i> (2018)	Bamberg & Moser (2007) Ahnström <i>et al.</i> (2009) Lokhorst <i>et al.</i> (2011) De Snoo <i>et al.</i> (2013) Van Dijk <i>et al.</i> (2015) Daxini <i>et al.</i> (2018)
Habits	Tendency to continue under 'business as usual' behaviour	Fish (2014)	
Recognition of the problem	External nature of DWPA, placing blame on other sources	Macgregor & Warren (2006) Dwyer <i>et al.</i> (2007 ¹⁶)	
<i>Perceived or real capacity (agency) to engage with or uptake advice</i>			
Educational background	Extent of environmental knowledge, level of formal education	Oliver <i>et al.</i> (2009)	Prokopy <i>et al.</i> (2008) Giovanopoulou <i>et al.</i> (2011)
Age-related factors	Age of the main decision-making farmer, succession status (Whether considering retirement, presence/absence of a natural successor)		Age: Wilson (1996) Giovanopoulou <i>et al.</i> (2011) Daxini <i>et al.</i> (2018) Succession: Potter & Lobleby (1992;1996)
Time constraints	Lack of farm labour, workloads	Inman <i>et al.</i> (2018)	Withers (2007) Dwyer <i>et al.</i> (2007) Mills <i>et al.</i> (2013)
Weather conditions	Increase in extreme weather events	Inman <i>et al.</i> (2018)	
2. Physical farm factors affecting farmers' capacity to engage with/uptake advice			

¹⁶ Dwyer *et al.* (2007) relayed this finding whilst analysing one of the five case studies conducted in this wider report into farmer behaviour change.

Geographical features of the farm	Topography, soil type and composition, climate		Wilson & Hart (2001) (biogeographical conditions) Dwyer <i>et al.</i> (2007)
Characteristics of the farm	Farm type, farm size		Farm type: Wilson & Hart (2000) Farm size: Wilson & Hart (2000) Vanslebrouck <i>et al.</i> (2002) Prokopy <i>et al.</i> (2008) Ahnström <i>et al.</i> (2009)
Existing infrastructure	Farmers with existing infrastructure may be more likely to engage with advice than those who need to make an investment ¹⁷		Dwyer <i>et al.</i> (2007)
3. Farm, farming system and business factors affecting a farmers' capacity to engage with/uptake advice			
Financial circumstances	Dependency on farm income	Inman <i>et al.</i> , (2018)	Kabii & Horwitz (2006) Dwyer <i>et al.</i> (2007)
Business needs and priorities	Business planning	Fish (2014)	Mills <i>et al.</i> (2013)
Tenure and land ownership	Precarity, type of contract, relationship with landlord	Inman <i>et al.</i> (2018)	Wilson & Hart (2000) Kabii & Horwitz (2006) Dwyer <i>et al.</i> (2007) Mills <i>et al.</i> (2013)
4. Nature and quality of the scheme, practice or innovation (DWPA advice)			
Aims of the initiative	Farmers are less likely to engage where they are unconvinced by the aims of the initiative (or in this case, of an advisor)	Fish (2014)	
Messaging approach	Use of specific recommendations, impartiality, fear-based messages		Floyd <i>et al.</i> (2000) House of Commons (2005) Dwyer <i>et al.</i> (2007)
Transparency and plausibility of evidence used	Explaining scientific uncertainty when disseminating evidence		Steingrover <i>et al.</i> (2010) Ingram & Mills (2014) Ingram <i>et al.</i> (2016)
Requirements of the farmer	Extent of change required, access to training, complexity, logistics, financial costs, administrative burdens	Fish (2014) Inman <i>et al.</i> (2018)	
Perceived quality of the advisor	Longevity, use of local evidence, trusted, listening skills, adaptability, negotiation skills, mutual respect	Vrain (2015) Thomas <i>et al.</i> (2020)	Dwyer <i>et al.</i> (2007) Sutherland <i>et al.</i> (2013)
Financial incentives	Availability of a grant or AES scheme	Inman <i>et al.</i> , (2018)	Dwyer <i>et al.</i> (2007)
Perceived co-benefits of uptake of	e.g., Financial benefits, increased		Mills <i>et al.</i> (2013)

¹⁷ Even with grant funding, e.g., a CS water quality capital items grant, investing in capital items generally requires some investment by the farmer (see section 1.4.1)

recommended measures	wildlife, cover for game birds, tourism		
Power imbalances	e.g., too much interference from government authorities	Blackstock <i>et al.</i> (2010); Fish (2014)	
Confirmation bias	Extent to which the advice aligns with pre-existing views		Rust et al (2020)
5. Policy environment			
Politics		Blackstock <i>et al.</i> (2010)	
Presence of regulations	Fear of prosecution; where enforcement is lacking, it is hypothesised that farmers may be less likely to engage with advice about regulations (e.g., the new farming rules for water).	Vrain (2015)	OECD (2004) Fuentes (2006)
Pressure from existing agricultural policy (see section 1.3)	Effect of regulations and legislation on how farmers respond to DWPA.	Ward <i>et al.</i> (1998) – SSAFO (see section 1.3.2) and the 1989 Water Act ¹⁸ Barnes <i>et al.</i> (2011) – NVZs (see section 1.3.2)	Ward and Lowe (1994) – Environmental Protection Act ¹⁹

The following sections will demonstrate how many of the reasons for farmers being disengaged with CSF (as outlined by Fish, 2014) alongside broader factors that affect farmer behaviour (Dwyer *et al.*, 2007) can be understood through the lens of CRELE. Table 2.2 provides an overview of the behavioural factors introduced in table 2.1 and indicates which of the CRELE attributes each factor is most likely to affect. This enabled the researcher to mobilise the CRELE framework whilst interpreting the qualitative results of the study as many of the topics expected to arise had already been considered in the context of the framework. A detailed explanation of each factor introduced in table 2.2 is provided in section 2.3.

¹⁸ The UK Water Act (1989) was an amendment to an earlier Water Act (1978). Whereas the previous act involved 10 regional authorities handling pollution control, the 1989 act introduced a new National Rivers Authority (NRA) which was to be a single entity for improving water quality whilst reducing public spend (Ofwat, 2021). As a result, the 10 regional authorities became private water companies which were to focus on water supply and sewage treatment rather than on pollution. The NRA, however, only lasted for 7 years. In the present day, the role played by the NRA is now played by the Environment Agency. In addition, water companies are now beginning to play a role in DWPA advice (see table 1.1).

¹⁹ The Environmental Act (1990) made provision for reducing water pollution and provided a framework for future regulation (UK Government, 2018b). Parts of the act have been repealed since it was enacted but several of its principles are included in current environmental legislation.

Table 2.2. Factors affecting farmer behaviour and the hypothesised CRELE attributes they may affect.

Factor affecting behaviour	CRELE attribute(s)
Willingness to engage or uptake DWPA advice	
Farming culture	Credibility, Relevance
Personal attitudes	Credibility, Relevance
Social norms	Credibility
Policy environment (e.g., presence of regulations, likelihood of enforcement)	Relevance, legitimacy
Perceived or real capacity (agency) to engage with or uptake advice	
Farm type	Relevance
Farm size	Relevance
Tenure and land ownership	Relevance
Educational background	Relevance
Age of the main decision-making farmer	Relevance
Succession status	Relevance
Time constraints	Relevance
Existing infrastructure	Relevance
Financial circumstances	Relevance
Business needs	Relevance
Nature and quality of the scheme, practice or innovation (DWPA advice)	
Aims of the initiative	Credibility, relevance
Advice delivery	Credibility, relevance, legitimacy
Transparency and plausibility of evidence used	Legitimacy
Requirements of the farmer	Relevance
Perceived quality of the advisor	Credibility, relevance
Negotiation skills of the advisor	Relevance
Financial incentives	Relevance
Perceived co-benefits of uptake of recommended measures	Relevance
Power imbalances	Legitimacy
Extent to which advice aligns with pre-existing views	Credibility, relevance

2.3. Willingness to engage with or uptake advice

2.3.1. Personal attitudes and farmer behaviour

As stated by Ajzen (1991), an influential behavioural scientist, attitudes are a fundamental aspect of behaviour. Attitudes are the result of beliefs, goals, and values and are characterised as being self-conscious and relating to specific

issues or circumstances (Fish, 2014). In other words, they are the '*bridge between world views and behaviour*' (Fish, 2014). They are, therefore, important for informing whether people will act in a certain way (e.g., by engaging with DWPA advice).

Gasson (1973) categorised the key factors which influence farmers' attitudes and identified four sets of goals: instrumental, social, expressive, and intrinsic. The factors which affect each of these goals are presented in table 2.3. These goals have been explored in the context of CSF by Fish (2014), who found that some farmers perceive CSF as conflicting with their instrumental goals (i.e., profit maximisation) and to their intrinsic goals to farm however they wish. Personal attitudes alone do not, however, predict whether a farmer is likely to engage with DWPA advice. For example, Fish (2014) suggested that some farmers may engage with CSF but continue to exhibit scepticism towards the severity of DWPA (Fish, 2014).

Table 2.3. The values which affect farmer attitudes. Adapted from Fish (2014) and based on research conducted by Gasson (1973).

Type of goal/value	Factors affecting farmer attitudes
Instrumental	Making maximum income
	Making a satisfactory income
	Safeguarding future income
	Business expansion
	Working conditions
Social	Gaining recognition as a farmer
	Sense of belonging in the farming community
	Continuing traditions
	Cooperating with other members of the farm business
	Maintaining good relationships
Expressive	Pride of ownership
	Self-respect
	Creativity and originality
	Achievement of objectives, personal growth
Intrinsic	Enjoyment
	Preference for an outdoor life
	Valuing hard work
	Independence
	Control in several situations

Attitudes are often influenced by confirmation bias, a phenomenon whereby people tend to seek out or engage with information which aligns with their existing beliefs or expectations. (Nickerson, 1998). Farmers may, therefore, be less likely to see advice as credible where it conflicts with their existing views (Wynne, 1996), with experts more likely to be trusted where they appear to hold similar values and interests to them. It was, therefore, hypothesised that advisors who provide information which aligns with a farmers' existing views and experiences may be more readily perceived as credible by farmers than those offering advice that contradicts a farmers' pre-existing beliefs.

Farmers' attitudes and beliefs were also expected to influence whether DWPA advice reaches the relevance threshold. Oliver *et al.* (2009) argued that a vital first step in encouraging farmers to mitigate their contributions to DWPA is to raise their awareness about the problem. Macgregor & Warren (2006) found that farmers in Scotland felt frustration towards NVZ rules due to the perception that the rules lack relevance, in part because they believed they already manage their nutrients appropriately. This study hypothesises that where farmers are convinced that the problem exists and that they can do something about it, the relevance of seeking advice is likely to increase.

Certain farm characteristics may affect relevance due to this perceived lack of responsibility for the problem. Dwyer *et al.* (2007) found that many farmers (incorrectly) believe that smaller holdings do not contribute to DWPA, placing blame on larger farmers instead. As a result, smaller farmers may be less likely to hold attitudes that encourage acting to reduce DWPA due to a belief that their farms do not hold responsibility for the problem. This is due to the often 'invisible' and 'off-farm' nature of DWPA. This can make it challenging to persuade farmers to change as many may be unlikely to consider remediating off-farm issues unless their productivity is unaffected (Macgregor & Warren, 2006) or where they are forced to do so by legislation.

Financial incentives are likely to result in farmers being more likely to engage with and implement DWPA advice. However, as pointed out by Dwyer *et al.* (2007), this may not always result in attitudinal change; thus, uptake driven solely by financial gain is unlikely to lead to long-term change.

2.3.2. Social norms

Farmers, like all people, are influenced by social norms to some extent. This means they are generally predisposed to act in a way that conforms with societal demands and expectations (Burton, 2004). Several actors may contribute to a farmers' belief of social norms, including the public, environmental NGOs, supply chain entities, and other farmers (Inman *et al.*, 2018). There are two key types of norms: descriptive and subjective. Descriptive norms are where people are influenced by the behaviour of others. For example, Kuhfuss *et al.* (2016) found that offering a collective bonus to persuade farmers to sign AES contracts led to a change in social norms, whereby farmers became more likely to expect their peers to participate in the scheme. These findings align with the view that farmers are affected by descriptive norms, thus are more likely to act pro-environmentally when their neighbours are doing so. Subjective norms, meanwhile, exist where farmers believe they will receive approval from their peers in response to a behaviour. Hypothetically, a similar approach could be used for encouraging uptake of DWPA advice; where farmers are told that their peers have engaged, this may encourage them to do so too.

It was hypothesised that engaging with DWPA advice may be perceived as more relevant to farmers where it aligns with social norms; for example, where they know that their peers are also engaging. For example, Daxini *et al.* (2018) found that farmers were more likely to translate soil analysis results into practice where they were under social pressure. As stated by Daxini *et al.*, this was likely, in part, due to a motivation to act in a socially desirable way due to a fear of further regulation and penalties. This reasoning is backed up by other studies; Powell *et al.* (2012) found that many farmers became involved in the 'Campaign for the Farmed Environment', an environmental campaign due to social pressure and to avoid regulation. For example, the Voluntary Initiative have previously encouraged voluntary action by explaining to farmers that voluntary action may reduce the risk of regulations surrounding pesticide applications being introduced (House of Commons, 2005). Barnes *et al.* (2013), however, found that farmers outside of NVZs in Scotland were more likely to adopt water quality measures voluntarily than those within NVZs. This confirms the view shared by Mills *et al.* (2018) that regulation alone may not be sufficient for achieving the relevance threshold.

As identified by Inman *et al.* (2018), social norms appear to have little influence on farmer behaviour surrounding water quality. This is likely to have a negative effect on the relevance of seeking DWPA advice as it does not appear to be an activity which farmers tell their peers about when seeking approval. It is, however, hypothesised that advice which is considered credible by the wider farming community may be more likely to become embedded in social norms, thus increasing the likelihood of behaviour change (i.e., an increased willingness to engage with advice). A key finding from Inman *et al.*'s (2018) study into farmer behaviour surrounding DWPA was that a strong social norm, whereby farmers believe that '*earning a living from the environment is in some way a less noble occupation than being a producer of food*', persists amongst many farmers. In addition, it was found that those farmers who have acted to reduce DWPA did not tend to use this to seek recognition from their peers; just 24% of respondents stated that they would adopt measures to impress other farmers. In addition, farmers did not appear to feel pressure from their peers to reduce soil compaction, a key issue in farming that contributes to DWPA.

Programmes such as the Demonstration Test Catchment project (DTC, 2020) have, however, attempted to help farmers understand the sources and scale of DWPA issues. Approaches such as this may encourage farmers to think differently about their roles; in turn, this could result in a gradual change in social norms as more farmers recognise the importance of acting to improve water quality (Inman *et al.*, 2018). Group discussions are also a useful approach for reframing social norms as it raises the visibility of the behaviour of peers (Barnes *et al.*, 2013). In the context of encouraging farmers to learn about DWPA, locally organised group discussions are likely to offer a strong framework for learning (Inman *et al.*, 2018).

2.3.3. Habits and farming cultures

Individuals tend to behave in default ways, in part due to routine and tradition. At the individual level, these default, repeated behaviours are known as 'habits', whilst at a wider scale, they can be referred to as 'culture' (Dolan *et al.*, 2010). These behaviours are difficult to change at either scale due to the likelihood that whether a 'habit' is 'good' or 'bad' will not necessarily affect their behaviour. For example, regardless of a farmer understanding the risk of certain activities

contributing to DWPA, they may remain unlikely to change if they have always conducted these activities.

When thinking about how culture affects behaviour, it is important to recognise that farmers are not a single cultural group (Morris & Evans, 2004). Blackstock *et al.* (2010) state that it is important to understand these groups to build an understanding of how 'good' and 'best' farming practices should be framed when attempting to persuade farmers to reduce their contributions to DWPA. As stated by Morris & Evans (2004), farmers within different cultural subcultures will differ in their views of what makes farming behaviour "good, best, and proper". Whilst some farmers may be reclusive, isolated or traditional and thus less likely to seek advice, others may be innovative (Dwyer *et al.*, 2007). They will, therefore, have varying ideas of what 'good' farming looks like (Dwyer *et al.*, 2007). For example, Lowe *et al.* (1994) found that farmers held different views about DWPA depending on their cultural group. One of the case studies carried out by Blackstock (2007) explored how farmers respond to advice surrounding manures and slurry to minimise DWPA. It was found that their responses were affected by their social networks (cultures).

2.4. Farmers' perceived capacity to engage with or uptake DWPA advice

Several factors can affect a farmers' real or perceived ability to engage with or implement DWPA advice. Where farmers do not have the agency to act on advice due to the factors introduced in table 2.1, it was hypothesised that they may not perceive engaging with it as relevant (see also Blackstock *et al.*, 2010).

Where a farmer's financial circumstances are less than ideal, it was hypothesised that they will be unlikely to perceive seeking DWPA advice as relevant unless it leads to immediately tangible financial benefits. This is because where farmers cannot afford to uptake measures with high capital costs, they are unlikely to perceive related advice as worthy of engagement. Farm incomes are unreliable and fluctuate year on year, in part due to extreme weather events (*ibid*), volatile market forces, and sector-specific pressures such as the loss of oilseed rape to flea beetle (Lundin, 2020). This volatility is illustrated by the 7% drop in farming incomes between 2017/2018 and 2018/2019 (Defra, 2019c). Engaging with

advice is, therefore, unlikely to be perceived as relevant where a farmers' business needs are not considered (Fish, 2014).

Smaller farms are, in general, at greater risk of being in poverty or socially excluded than bigger farms (Bertolini, 2008, 2019). Wilson & Hart (2000) found that smaller farms often have less flexibility in decision making and lower financial stability in the context of AES schemes. Wilson & Hart (2000) explored the factors affecting farmer uptake of AES and found that certain farm types were more likely to be enrolled in AES'. Extensive grassland farmers participated in schemes due to them working well for their systems, whilst many arable farmers were not enrolled for financial reasons. It may, therefore, be expected that farmers from different sectors may be more likely to see DWPA advice as relevant.

Inman et al. (2018) found that time constraints were a key reason for farmers not trying to mitigate DWPA. Time is a key constraint affecting whether farmers can change (Dwyer *et al.*, 2007). As a result, farmers prioritise their time and where DWPA advice is not deemed relevant, it may be hypothesised that they are less likely to spend time engaging with it. It was, therefore, hypothesised, that the busiest farmers may see DWPA advice as lacking relevance due to having other tasks at hand which they may see as more important (e.g., to maintain profitability). Time availability may vary depending on farm sizes; Dwyer *et al.* (2007) found that some larger²⁰ farmers were more able to engage with advice than smaller farmers, in part due to having staff available to oversee the farm whilst they are otherwise engaged.

A farmers' level of formal education was, in a previous study, found to be somewhat associated with whether a farmer will manage their land and livestock for environmental protection (Oliver *et al.*, 2009). Tenure may also affect whether farmers engage with or uptake DWPA advice. This is, in part, because tenant farmers face an additional layer of complexity due to needing to negotiate many on-farm changes with their landlords. Similarly, this study hypothesises that tenant farmers with complex contracts may be less likely to perceive DWPA advice as relevant than landowning farmers due to their varying levels of decision-making power and/or due to short-term tenancies. Where farmers are

²⁰ Note: The hectareage of these 'larger' farmers was not quantified by Dwyer *et al.* (2007) so should be interpreted arbitrarily.

planning their retirement, they may also perceive seeking out 'new' information as lacking relevance. Farmers without a natural successor often extensify their farming systems as they get older (Potter & Lobley, 1996). It is hypothesised that they may perceive their extensified farms as not contributing to DWPA; advice on this topic may lack relevance as a result.

2.5. Exploring the likely impacts of the nature and perceived quality of DWPA advice on farmer behaviour change

Farmers are unlikely to engage with CSF if they are unconvinced by the aims of the initiative (Fish, 2014). This has clear, direct implications for credibility and relevance. In addition to the factors already raised in previous sections, Fish (2014), who explored the factors affecting farmer engagement with CSF, found that farmers fear interference from authorities; this is likely to have a clear impact on the legitimacy and relevance of seeking advice. In addition, it was found that unengaged farmers are often characterised by being concerned about the potential administrative burdens involved in engaging with CSF (Fish, 2014). Again, this is likely to have profound implications on the relevance of seeking advice, particularly as many farmers are too time-constrained to engage with advice, or indeed, uptake recommended measures for improving water quality (Withers, 2007; p51).

Whether advice meets the CRELE attributes is expected to be affected by the approach used by advisors. For example, a consensus has been reached amongst academics that top-down advice (or 'knowledge transfer') is no longer appropriate in many cases (Vanclay, 1992; Röling & Jiggins, 1994; Pretty, 1995; Buttel, 2001; see section 2.5). This study expected that traditional knowledge transfer was unlikely to be seen as relevant or legitimate by most farmers under current circumstances, where they fulfil several roles. It was also expected that knowledge transfer would be unlikely to be perceived as relevant where farmers have not been asked what their requirements of advice are. Besides, much knowledge disseminated by advisors derives from farmers' experiences; a knowledge transfer approach which fails to acknowledge the role of farmers' knowledge is likely to affect the legitimacy of advice.

A central challenge expected to affect whether DWPA advice achieves the CRELE thresholds is ensuring that advisors translate and deliver information using terminology which farmers will understand and engage with (Cash *et al.*, 2002). Echoing O'Keefe (2002), it is assumed that the higher the complexity of a message and the amount of risk involved when implementing measures recommended by advisors, the higher the credibility needs to be to encourage farmers to engage with DWPA advice. Moreover, Rust *et al.* (2020) found that farmers were more likely to trust other farmers when learning about soil practices, but were less trusting of traditional 'experts'. This may, in part, be due to a failure by experts to communicate with farmers in a way which they perceive as meeting the CRELE thresholds.

Knowledge exchange has, therefore, been encouraged as an alternative communication strategy to top-down delivery, whereby farmers are seen as experts in their own right due to their experiential, locally derived knowledge (Blackstock *et al.*, 2010). This recognition that top-down delivery may not be effective has required a paradigm shift towards sharing knowledge through social encounters (Vanclay, 1992; Röling & Jiggins, 1994; Pretty, 1995). The use of knowledge exchange has, in many cases, been proven successful under several contexts under the umbrella of encouraging farmers to uptake more sustainable practices (Cerf *et al.*, 2000; Ison & Russell, 2000; Röling & Wagemakers, 1998; Eshuis & Stuiver, 2005).

The extent to which farm advisors working to reduce DWPA have transferred towards knowledge exchange in practice is, however, relatively unclear. Black (2000) acknowledged that no single communication strategy (including knowledge transfer and exchange, 1:1 advice and formal training) is likely sufficient for resulting in advice uptake when used in isolation. Different farmers likely have differing needs, and some information is more appropriate for one approach over another. For example, when an advisor needs to tell farmers about a new water quality regulation, a knowledge transfer approach likely remains the most appropriate communication strategy. This has implications for CRELE and indicates that whether different strategies reach the thresholds of each component may depend on the individual farmer and the nature of the advice being delivered.

In addition to the communication approach used, the frequency of these encounters was hypothesised to impact upon whether DWPA advice meets the CRELE attributes. Cash *et al.* (2003) reflected on CRELE by carrying out various case studies, finding that knowledge was less likely to be mobilised where communication was infrequent. In the context of DWPA advice, it is well established that advisors are more likely to be trusted if they have built rapport and have a long-term relationship with their farmer clients (Environment Agency, 2019). The need for strong relationships between farmers and advisors is hypothesised to be highly pertinent to achieving the credibility threshold as trust is a significant factor contributing to whether the credibility threshold is reached.

Lobley *et al.* (2013) explored the merit of delivering practical training to farmers surrounding AES in lowland England and found that some positive outcomes were achieved. It is hypothesised that this is, in part, because this training was perceived as high quality, and therefore, credible. Many farmers may, however, decide whether the advice is credible 'by proxy' (Cash *et al.*, 2002) due to the significant impact of the source of advice and information (Carolan, 2006a). For example, where an advisor derives from an entity that has a low reputation, their advice may automatically lack credibility regardless of their expertise. Advisory sources which are perceived as short term appear to lack credibility and trust: *'I've been invited to talk to my CSFO by four different organisations, three of which I've never heard of, and I'm sure they're based in someone's garage'*. (Sutherland *et al.*, 2013). Meanwhile, those who believe a social network or source of advice is trustworthy will be more likely to perceive that advice as credible (Rust *et al.*, 2020b). Sutherland *et al.*, (2013) found that long-standing entities which provide advice, including the AHDB (see also Rust *et al.*, 2020a), FWAG and ADAS (see also Vanclay, 2004), are trusted by farmers due to the credibility built over time or because their information is seen as being "on the farmers' side".

According to Thomas (2020), farm advisors with agricultural experience are likely to instil trust from farmers, thus increasing their credibility and relevance. This aligns with research into Australian and Northern American farmers who were found to distrust experts who lack farming experience, regardless of the topic (Mauro *et al.*, 2009; Neufeld & Cinnamon, 2004; Palmer *et al.*, 2009). In addition, it was found that theoretical knowledge held by advisors is unlikely to result in

credibility unless this is delivered in conjunction with local information and a demonstration that the advisor is well-versed in agriculture (Thomas, 2020, p179). It was also expected that advice would be deemed credible where it is provided by long-term advisors who have a strong understanding of agriculture and regularly engage with their clients. Sutherland *et al.* (2013), for example, found that longevity increased the chances of an advisor influencing farmer behaviour, whilst Thomas (2020) found that interactions between farmers and CSFOs were increasingly productive as the relationship developed. Vrain (2015) studied CSF and found that farmers in her three study catchments were more likely to listen to CSFOs they had built a trusting relationship with.

It was hypothesised that the fragmented AKIS in England (as described in section 1.3.4) may become a source of credibility loss where the numerous providers of DWPA advice fail to collaborate, thus leading to information overload and/or farmers receiving conflicting or duplicated advice. The CRELE framework is pertinent here as information overload is a well-known issue under contemporary circumstances (Bawden & Robinson, 2020). This overload of information makes it difficult for actors to decipher which advice and information reach the CRELE thresholds, particularly as there has been a known increase in misinformation. As a result, farmers may become increasingly inclined to listen to information and advice which aligns with their existing views (Eppler & Mengis, 2004).

Determining whether delivered advice is relevant can take time whilst farmers spend time considering how it fits within their farms. Thomas *et al.* (2020) provided an example of this, finding that a farmer who attended a CSF event later translated what he'd learnt to his father, resulting in a discussion about whether this information was relevant. Moreover, who determines whether this advice is CRELE is likely to be dynamic; for example, due to a farmer allowing his successor to take more control of the farm or due to other familial issues/changes in tenure.

Thomas (2020) found that CSF-led events were essential to the success of the initiative as social interaction is crucial for learning and knowledge building (Tregear & Cooper, 2016). It was found that spaces which encourage interaction are vital as they enable farmers to meet new farmers and re-engage with existing contacts. She also found that whilst farmers may be increasingly autonomous (Riley *et al.*, 2018), this may not be the case when discussing water-related topics

due to the lack of competition which exists when talking about productivity or business-related subjects.

In the context of DWPA advice, whilst logical in terms of physical geography, delivery at catchment scale may not be effective in terms of considering the many farming cultures which may exist in a single catchment (Blackstock *et al.*, 2010). It is, therefore, hypothesised that the more flexible and tailored DWPA advice is, the more likely it is to be perceived as relevant by farmers from differing cultures. Farmers tend to be receptive towards locally derived information and knowledge as it is seen as having '*practical, personal and local relevance*' (Sumane *et al.*, 2018).

Farmers were also expected to perceive advice as lacking relevance where recommended measures are perceived as impractical or inflexible. For example, where a recommended grant scheme provides rigid expectations in terms of timings (i.e., a set date when a measure should be implemented by) but provides no exceptions based on the impacts of the weather on these timings, this advice and the scheme is likely to lack relevance to a farmer. In the context of DWPA advice, there are several specific examples where farmers are unlikely to perceive advice as relevant. For example, if an advisor suggests moving a gateway to reduce runoff but fails to consider how the farmer will then use the field for grazing livestock or suggests installing capital items such as slurry storage which the farmer cannot afford (even with grant funding), this advice is unlikely to be seen as relevant.

Farmers may not perceive an opportunity to improve water quality as enough of an incentive in itself. Thus, advice that offers potential win-win scenarios were expected to be highly relevant. Where there is a perceived opportunity to gain grant funding or financial advice, farmers were expected to be more likely to perceive engaging with advice due to the associated business benefits which makes engaging more relevant to their interests. In the case of the CS water quality capital grant, it does not require up-front payments and includes capital items which can offer co-benefits to the farm business alongside reducing DWPA. It does, however, also have a maximum value of £10,000, is competitive, requires approval by a CSFO, and is restricted to specific measures (Defra, 2020a). These factors may reduce the relevance of the grant (and, therefore, whether farmers will engage with CSF).

Certain advisory entities may not be perceived as legitimate by farmers due to their remits and goals. For example, where an entity is primarily focused on improving the environment, farmers may question its legitimacy as they may be concerned that these advisors may not consider the need of farmers to reach their business goals alongside reducing their contributions to DWPA.

When delivering advice, it is vital to note the importance of recognising the heterogeneity of agriculture; this makes it unlikely that any single approach for increasing the CRELE of advice will suit all farmers. It is, therefore, hypothesised that farmers will be complex in their behaviours and judgements when deciding whether they perceive information and advice as CRELE.

2.5.1. Understanding how farmer behaviour may affect the CRELE of 'hard' evidence relating to DWPA

It was hypothesised that advisors would need to translate and disseminate advice and 'hard' evidence in such a way that farmers perceive this information as meeting all three CRELE thresholds. This study will explore how farmers and advisors believe these thresholds could be met and whether farmers are open to being shown more of this evidence relating to DWPA.

Research conducted by the scientific community seeks to be rigorous, thus making its resulting data highly credible. A failure to place adequate importance on relevance is, however, a common downfall of studies (Price, 1965). As asserted by Cash *et al.* (2003) and Hughes *et al.* (2008), the scientific community, at times, identify and investigate research questions which do not apply to real-life situations, in part due to insufficient attention given to the needs of their target industry. Their outputs are, as a result, more likely to be deemed irrelevant by their non-scientific audiences. Where research has failed to reach the relevance threshold, some attempts to engage with farmers may be unsuccessful; Olde *et al.* (2018) carried out a literature review and found that papers surrounding sustainability assessment tools within agriculture tended to lack relevance to farm management. It was, therefore, hypothesised that some of the 'hard' evidence which DWPA advisors may use when delivering advice may lack relevance to farmers.

When considering the types of evidence farmers may wish to see whilst engaging with DWPA advice, it was acknowledged that many farmers may perceive

evidence other than that which is scientifically derived as credible. In addition, the author had heard farmers using the term ‘hard evidence’ in previous encounters so was aware that this is a phrase used in the farming community. This was, therefore, used for this study, with ‘hard evidence’ encompassing any evidence pertaining to water quality which farmers perceive as concrete, solid and robust. This was expected to include most evidence proving whether agriculture is contributing to DWPA. This may derive from extensive water quality monitoring carried out by scientists, citizen scientists, and advisory entities. As the reader will note when reading the empirical results of this thesis (chapter 4-9), it appears that most farmers and advisors automatically perceive the term ‘hard evidence’ as referring to that which derives from academia rather than from other sources.

How advice and information is produced and disseminated feeds directly into legitimacy (Cash *et al.*, 2002). When considering how hard evidence relating to DWPA could be disseminated by advisors, it was expected that a lack of consultation, participation and empowerment with stakeholders would likely result in a lack of relevance and legitimacy (Ingram & Mills, 2014).

2.5.2. Exploring how farmer behaviour may affect the CRELE of video content for delivering DWPA advice

Table 2.4 provides an overview of the factors previously identified as affecting farmer engagement with agricultural videos (largely on environmental practices) and predicts which of the CRELE attributes are likely to be affected. Similar themes were expected to arise in this study; however, it was hypothesised that videos relating to DWPA, rather than wider agricultural practices, may be perceived as less relevant to farmers for reasons discussed earlier in this chapter.

Table 2.4. Factors previously found to affect whether farmers will watch agricultural videos and the hypothesised CRELE attributes these factors likely relate to in the context of DWPA advice.

Factor	Hypothesised CRELE attribute(s)	References
Applicability in a local context	Credibility, Relevance	Rose <i>et al.</i> (2021) ⁸
Level of detail	Credibility, Relevance	PLAID project (2017) Bliss <i>et al.</i> (2019) Rose <i>et al.</i> (2021) ⁸

Video length	Relevance	Van Mele (2011) Thomas <i>et al.</i> (2018a) Bliss <i>et al.</i> (2019) Rose <i>et al.</i> (2021) ⁸
Video presenter	Credibility	Van Mele (2011) Rose <i>et al.</i> (2021) ⁸
Language used	Relevance	Fry & Thieme (2019) Rose <i>et al.</i> (2021) ⁸
Use of co-design	Credibility, Legitimacy	PLAID project (2017) Rose <i>et al.</i> (2021) ⁸
Inclusion of practical information	Credibility, Relevance	Fry & Thieme (2019) Rose <i>et al.</i> (2021) ⁸
Quality of the video and audio	Credibility, Relevance	PLAID project (2017, 2019)
Preference for audio-visual dissemination	Relevance	PLAID project (2017) Bliss <i>et al.</i> (2019) Bello-Bravo <i>et al.</i> (2020)
Ability to re-watch	Relevance	Rose <i>et al.</i> (2021) ⁸
Ease of locating videos	Relevance	PLAID project (2017, 2019) Rose <i>et al.</i> (2021) ⁸
Ability to share videos with peers	Relevance	Rose <i>et al.</i> (2021) ²¹
Internet connection	Relevance	Rose <i>et al.</i> (2021) ⁸
'E-readiness'	Relevance, legitimacy	Bentley & Van Mele (2011)

The empirical chapters of this thesis (4-8) will seek to explore which of these factors, through the lens of CRELE, remain important when considering the potential of videos for delivering DWPA information and advice.

2.6. Applying CRELE in the context of the research objectives

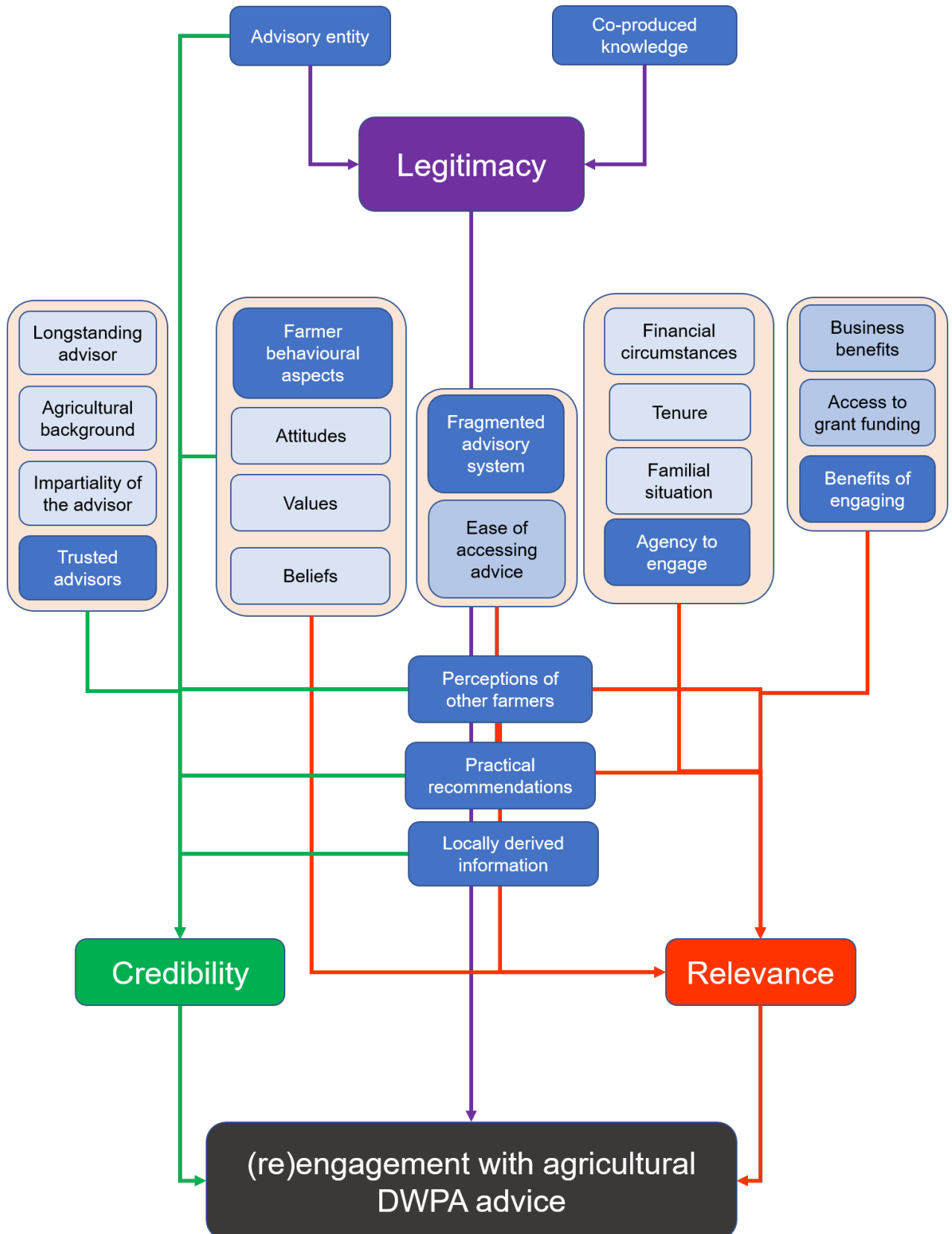
Applying CRELE to explore the efficacy of the interface between farmers and advisors rather than between scientists and policymakers is novel. If successful, this will offer an opportunity for future studies to operationalise the framework across several fields of study. This novel use of CRELE required an in-depth exploration into how farmers fit into the framework (as covered in section 2.3). It is expected that different farmers will have different ideas of what constitutes CRELE advice due to the heterogeneity of farming in England; farmers are characterised by having different attitudes and behaviours, with some prioritising productivity whilst others lean towards environmentalism.

Upon unpacking each attribute of CRELE and reflecting on how these can be used when thinking about farmers through exploring existing literature, a detailed

²¹ Please note: CAC was a co-author of this report.

conceptual framework for this research was constructed (figure 2.3). Legitimacy was expected to be the first 'hurdle' DWPA advice must overcome. This is because where farmers do not feel the advisory entity or individual advisor has considered their needs, they are expected to be unlikely to consider engaging with advice. Once the implicit threshold for legitimacy has been reached, it is then likely that factors relating to credibility and relevance will be considered in conjunction with one another. Many of the factors which affect one of these attributes are likely to affect another. For example, the perception of other farmers and the geographical basis of advisory information was expected to have implications for both credibility and relevance.

Figure 2.3. The preliminary conceptual framework, based upon CRELE, applied in this research. Purple lines represent topics expected to relate to the 'legitimacy' aspect of CRELE, green to credibility, and red to relevance. As explained in section 2.1.1, certain themes were expected to relate to multiple CRELE attributes; for example, the perceptions of other farmers was linked to all three components.



2.7. Conclusions

Based on an exploration into the factors affecting farmer behaviour, CRELE was the preliminary conceptual framework adopted for this research due to the applicability of its components when considering the potential efficacy of DWPA advice. This framing was expected to provide focus to the study and act as a 'sorting' tool during data analysis. The conceptual framework presented in this chapter remains unchanged from its original construction but, importantly, is used in a different context to previous studies. An opportunity to iterate CRELE was, however, anticipated due to the complex and dynamic nature of farming and agricultural advice (as explained above).

Previous studies have already proposed iterations to the CRELE framework as a result of their findings. For example, Sarkki *et al.* (2015) added 'iterativity' as an additional component, whilst van Oudenhoven *et al.* (2018) added 'feasibility'. These additions indicate that CRELE alone may not be fully able to explain social research findings. A constructivist approach was, therefore, adopted for this research, whereby it was assumed that conceptual framings are dynamic and likely to evolve. The reader will, upon reaching chapter 9, observe that the triangulated findings of this research led to the introduction of an additional component to CRELE, thus resulting in the proposal and application of a novel iteration to the original conceptual framework which is better able to explain the results of this study.

Chapter 3 will introduce the methods chosen for meeting the research objectives of this study (section 1.6).

Chapter 3

Introducing a mixed methods research approach for exploring the credibility, relevance, and legitimacy of DWPA advice

This chapter explains why a mixed methods research (MMR) approach was adopted to address this study's research objectives (section 1.6). Justification for adopting each method will be provided by reviewing the approaches used by similar studies and identifying ways of overcoming the challenges associated with gathering farmers' and advisors' views. Additional justification for the methods used here relate to practical considerations (e.g., costs and time constraints).

The protocols for the empirical methods carried out within this study mobilise CRELE in a subtle way; rather than using the attribute terms, questions were kept broad and simplistic to allow the CRELE attributes to emerge naturally. This meant that the resulting qualitative data could be analysed using the predefined definitions of each attribute (see section 2.1.1) rather than the definitions used by farmers and advisors, which were expected to vary. CRELE was, however, mobilised throughout the analysis and interpretation stages of the research. Qualitative data were coded using the lens of CRELE, with each topic assigned codes for each attribute. This enabled the researcher to identify gaps where CRELE did not fully explain the findings, thus leading to the development of an iterated framework (see chapter 9).

As aforementioned, farmers and advisors, the key actors within the context of DWPA advice, were anticipated to perceive the CRELE attributes differently (Cash *et al.*, 2002) and have different ideas of what constitutes effective DWPA advice. It was, therefore, recognised that gathering the views of both farmers and advisors was important when fully addressing the research objectives provided in section 1.6. The methods were planned so that these actors' views were gathered separately before triangulating them to identify divergences between what constitutes effective DWPA advice (see chapter 9).

Several challenges were anticipated to arise when gathering farmers' and advisors' views. For example, farmers are time-constrained and characterised by

working long hours (Farmers Weekly, 2018), thus minimising the time burden placed on participants was prioritised. Moreover, many farms are located in rural areas, resulting in high travel costs and potential safety risks for the researcher (Chiswell & Wheeler, 2016). Methods that would enable the researcher to gather farmers' views without expecting farmers to travel were, therefore, focused upon to prevent excluding farmers in remote areas. Advisors are also highly mobile, often covering relatively large areas (see Natural England, 2020b). Thus, a method that could be undertaken remotely was also deemed appropriate for gathering advisors' views from across England.

The approach used for this research needed to allow the researcher to build trust and rapport with participants. This is because many farmers find discussing potentially sensitive topics relating to DWPA challenging due to a lack of ownership and wariness discussing water pollution, in part due to recent public scrutiny (see Thomas *et al.*, 2019). Farmers and advisors were also expected to be reluctant to share their views in uncomfortable environments or where rapport has not been built. Methods and recruitment strategies were planned accordingly, seeking ways to foster trust and display impartiality wherever possible (see sections 4.1, 5.1, 6.1, 7.1, 8.1).

3.1. Mixed methods research

This study adopted a mixed-methods research (MMR) approach to address the research objectives introduced in section 1.6. MMR is defined here as: '*Research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative²² approaches or methods in a single study*' (Tashakkori & Creswell, 2007). A key benefit of adopting a MMR approach is that it allows the limitations of using a single approach to be offset. This is achieved by comparing and triangulating²³ the data

²² '*Qualitative research refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things. In contrast, quantitative research refers to counts and measures of things, the extents and distributions of our subject matter, for example, how many there are of something.*' (Lune & Berg, 2017, p12).

²³ Triangulation: '*The use of more than one method or source of data in the study of a social phenomenon so that findings may be cross-checked (Bryman, 2016, [p697])*', thus enabling more valid conclusions to be drawn (Greene, 2007; Tashakkori & Teddlie, 2008) and allowing the researcher to identify further research gaps (Teddlie & Tashakkori, 2010).

from each method (Johnson & Onwuegbuzie, 2004; Bryman, 2006; Creswell & Plano Clark, 2017a; Plano Clark & Ivankova, 2017). Besides, an MMR approach offers the opportunity to obtain richer findings than a single method could achieve (Teddlie & Tashakkori, 2010). An MMR approach (see section 3.1) consisting of qualitative and quantitative data was, therefore, deemed an appropriate way of addressing this study's objectives while overcoming the potential challenges introduced above. Besides, adopting MMR enabled prospective research participants to decide which method they would like to engage in.

The distinct benefits of gathering qualitative and quantitative data led to the decision to collect both types of data. Qualitative research is characterised by open questions with relatively small samples to gather in-depth data, thus building a deep understanding of how problems affect participants' realities. Meanwhile, quantitative methods focus on narrower questions, collect larger datasets, and measure data against other variables to gain general insights into an entire study population (Burrell & Gross, 2017). Assuming the requirements of statistical tests are fulfilled, quantitative approaches also allow the researcher to undertake statistical tests on variables and participant characteristics to identify significant associations (Burrell & Gross, 2017).

3.1.1. Existing agricultural social science studies which adopted mixed methods research

Several agricultural studies have used MMR (e.g., Davis *et al.*, 2007; Maye *et al.*, 2009; Wauters & Mathijs, 2012; Bijttebier *et al.*, 2014; Feola *et al.*, 2015; Tessier *et al.*, 2018; Coyne *et al.*, 2019), including some surrounding DWPA (e.g., Barnes *et al.*, 2009; Vrain, 2015; Inman *et al.*, 2018). Inman *et al.* (2018) used a MMR approach consisting of exploratory interviews with farmers followed by more in-depth qualitative telephone interviews and discussion groups in each study area. This study gathered full narratives surrounding whether farmers are likely to implement measures upon engaging with advice, incentives, and regulations. Barnes *et al.* (2009) used telephone interviews and workshops to gather in-depth insights into farmer attitudes surrounding NVZs in Scotland. Vrain (2015) undertook doctoral research to explore what influences farmers to adopt mitigation measures for reducing their contributions to DWPA. A similar MMR

approach was used in her study, which comprised a farmer baseline survey to gather initial insights followed by farm advisor interviews and in-depth farmer interviews to collect detailed qualitative data. In the context of CSF, annual surveys are undertaken to evaluate the initiative's efficacy in conjunction with qualitative telephone interviews to add detail (see Environment Agency, 2019 for an example). The successful use of a MMR research design by the studies described above indicates that this is an effective approach for gathering the views of farmers and other actors within the agricultural landscape.

The use of MMR is, however, relatively rare within studies explicitly relating to agricultural advice provisioning, with many studies adopting a single method to gather data, for example, through farmer interviews (e.g., Ingram *et al.*, 2008; Thomas *et al.*, 2020). As a result, these studies had to accept the limitations of using a single method; for example, while Thomas *et al.* (2020) gathered valuable insights into how farmers use the knowledge gained from interacting with CSF, the study was geographically restricted to the North-West of England. Whilst single methods such as interviews can gather both qualitative and quantitative data, they may not reach farmers with certain characteristics and are often geographically restricted to particular regions. The use of MMR for this thesis makes it a novel approach within the specific context of exploring the efficacy of DWPA advice, with the use of remote methods (see section 3.1.2) allowing the researcher to gather views from a wider area of England.

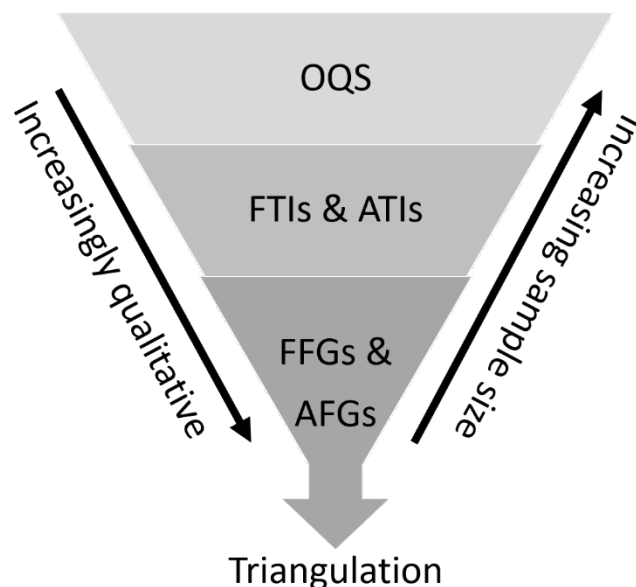
3.1.2. Introducing the methods used for this mixed methods research

A core principle of MMR is '*Methodological eclecticism*' (Hammersley, 1996; Yanchar & Williams, 2006), whereby researchers integrate the most appropriate methods for their study so they can answer the problem at hand (Teddlie & Tashakkori, 2010). Methodological eclecticism means that the researcher cannot merely seek to overcome one approach's limitations by adding another. Instead, each potential method's advantages and limitations were considered individually before considering how they may fit together into a cohesive study that was likely to provide an in-depth understanding of the extent to which CSF and other DWPA advice are perceived as CRELE by farmers and advisors.

This study comprised an online questionnaire survey (OQS), telephone interviews (FTIs) and focus groups²⁴ (FFG) of farmers, and telephone interviews (ATIs), and focus groups (AFGs) of advisors (see chapters 4-8). Farmers and advisors were studied separately due to their different roles and the need to reword the protocols for advisors to ensure the questions applied to them rather than to farmers. As recommended by Dwyer *et al.* (2007, p17), the findings from each method are triangulated in chapter 9 to compare quantitative data with the qualitative appraisal methods (i.e., telephone interviews and focus groups). This triangulation allows the identification of common and divergent themes between farmers and advisors and ensures a thorough exploration of the results collected using MMR.

Figure 3.1. provides an overview of this sequential MMR and demonstrates how the qualitative detail increased with each method.

Figure 3.1. Schematic diagram presenting the sequential MMR approach used for this study.

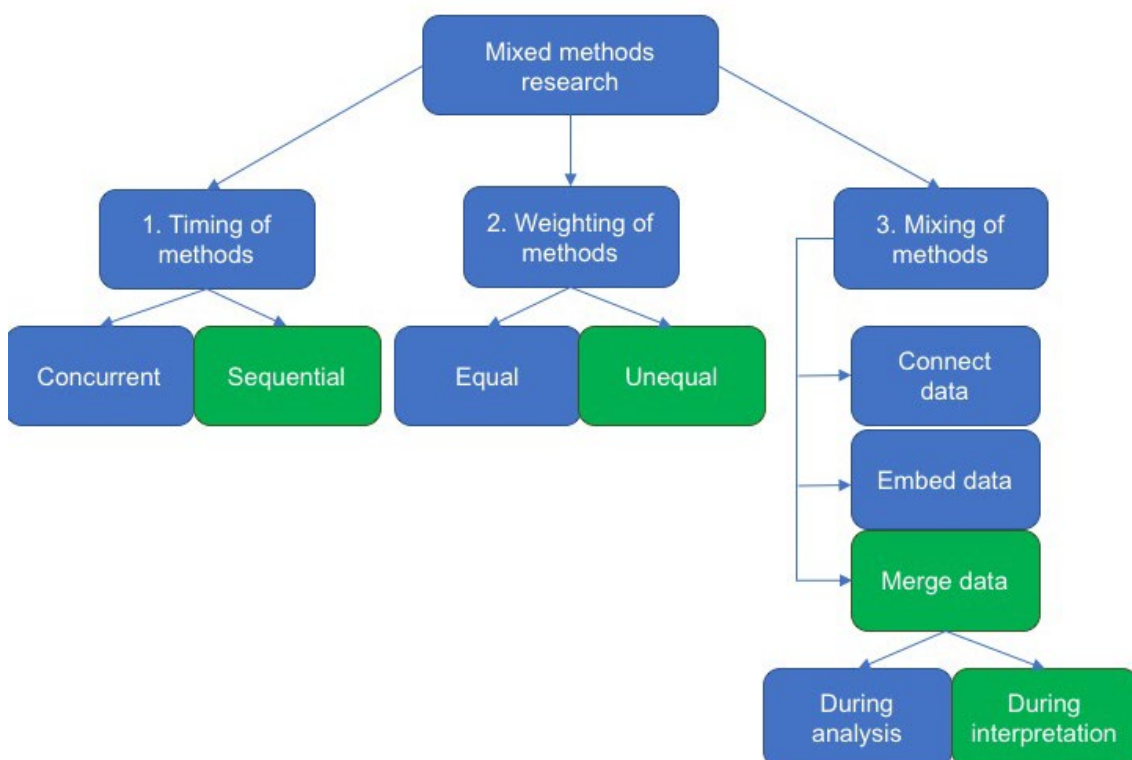


²⁴ FGs are defined as: *A one-off meeting of between four and eight individuals who are brought together to discuss a particular topic chosen by the researcher(s) who moderate or structure the discussion* (Bedford & Burgess, 2001). FGs are ‘focused’ in that they are a collective activity characterised by debating a pre-determined set of topics to reveal what participants think and why they have these views.

3.1.3. The practicalities of conducting mixed methods research

Figure 3.2 provides a decision tree illustrating how this MMR was carried out. The methods were carried out sequentially, whereby the OQS of farmers began first to identify any adjustments required for the FTI and FFG protocols before carrying these methods out. The ATIs also commenced before the AFGs to enable the AFG protocol to be adapted based on initial findings. All data were then triangulated during interpretation to confirm findings and identify divergences (see chapter 9 for full details). Unequal weighting was used when interpreting the triangulated results as some methods (the focus groups and telephone interviews) provided deeper and richer insights than others (i.e., the OQS), and thus were relied upon more heavily when constructing narratives (see chapter 9).

Figure 3.2. A decision tree for the MMR conducted during this study. Green = decision made (adapted from Creswell & Plano Clark, 2017b).



It was envisaged that attempting to conduct multiple methods together could become challenging to manage due to the need to simultaneously manage

several recruitment strategies and datasets. The scope of a doctoral research project is, however, relatively large and using a sequential approach made this methodology feasible due to the reduced need to carry out all methods simultaneously. Carrying out this MMR required the researcher to analyse and interpret both qualitative and quantitative data (Plano Clark & Ivankova, 2017). These skills were met due to my previous (mostly quantitative) research experience and by completing external training surrounding qualitative methods (e.g., moderating focus groups, Social Research Association, NVivo for intermediate users).

The following sections will justify the use of each method. Detailed overviews of each method are provided within the empirical chapters (OQS: chapter 4; FTIs: chapter 5; FFGs: chapter 6; ATIs: chapter 7; AFGs: chapter 8).

3.2. Justifying the use of an online questionnaire survey

Historically, many existing farmer surveys have been postal rather than online (Maye *et al.*, 2009; Chivers *et al.*, 2018; Alskaf *et al.*, 2019; Defra, 2019d). OQS' have, however, become increasingly prominent in recent years due to the growing accessibility of the internet and the availability of sophisticated browsers and software (Wright, 2005; Nathan, 2011). OQS' are a cost-effective approach for gathering the views of relatively large groups of people; Klein-Jöbstl *et al.* (2015) achieved a relatively large dataset ($n = 1287$) when they conducted an online survey of dairy farmers in Austria. The lack of face-to-face contact removes geographical barriers (Taylor, 2000; Yun & Trumbo, 2000) and travel costs (Llieva *et al.*, 2002). Moreover, OQS' are typically relatively short (Wright, 2005) and can be completed whenever and wherever it suits the participant (Toepoel, 2016; Queiros *et al.*, 2017), thus meeting the requirement to minimise the time burden on farmers. These surveys also minimise the time burden placed on researchers as data can be recorded and exported automatically (Wright, 2005), thus enabling the researcher to carry out other methods whilst an OQS is running (Llieva *et al.*, 2002).

OQS' do, however, exclude non-internet users (Toepoel, 2016). Digital divides persist in some rural communities in England due to a lack of internet connection or slow broadband (Philip *et al.*, 2017). Most farmers (98%) surveyed by Defra (n

= 7872), however, now have a broadband connection; just 1% have no internet connection at all. Moreover, 93% of surveyed farmers own an internet-enabled laptop, PC, smartphone, or tablet (Defra, 2020b). Some farmers (39%) do, however, have internet speeds of less than 10Mb (Defra, 2020b). In addition, even where the internet is accessible, however, some farmers may not use it due to a lack of computer skills, security fears (Defra, 2020b), inclination, or their age (Matthews *et al.*, 2019). Nevertheless, where an effective recruitment strategy is used, OQS' can gather relatively large datasets across broad geographical areas over a short period (Wright, 2005; Toepoel, 2016). An additional limitation of undertaking OQS' is the risk of inaccurate submissions and a lack of control over who takes part. For example, there was a risk that non-target participants (e.g., outside England, non-farmers) would respond. The researcher overcame this potential issue as much as possible by reviewing the accuracy of each submission (See section 4.1.3).

3.3. Justifying the use of telephone interviews

TIs place relatively low time burdens on both researchers and their participants during data collection due to the removal of travel times to remote farms or to visit advisors that span large areas (Novick, 2008; Bryman, 2016; p.202). This enabled the researcher to reach a large number of farmers and advisors across much of England without the travel costs (Shuy, 2003; Fielding & Thomas, 2008; Bryman, 2016; p.202) or safety concerns associated with in-person interviewing (Novick, 2008; Chiswell & Wheeler, 2016).

The lack of visual cues during TIs can, however, make conversations feel forced (e.g., through 'awkward' silences) (Shuy, 2003; Gillham, 2005). Rapport was built with farmer TI participants during this study as the majority were met face-to-face before the interviews (Rubin & Rubin, 2005, see section 5.1.1). Besides, most people are familiar with interacting over the telephone (Gillham, 2005); thus, conversations were expected to feel relatively natural. Previous studies of farmers in England have adopted TIs successfully. For example, Little *et al.* (2017) carried out TIs (n = 208) on dairy farmers alongside other supplementary methods, while Bowyer (2017) carried out farmer TIs to explore the potential of delivering a computerised life skills course to farmers.

The additional anonymity gained when engaging via telephone (Chapple, 1999) was expected to allow participants to feel relaxed, potentially resulting in the exudence of stronger opinions than may have been provided during face-to-face interactions (Novick, 2008; Bryman, 2016). Moreover, data loss due to a lack of visual cues was not expected to be of detriment to the topics covered during these TIs as other social cues remained (e.g., intonation), and most questions were not of a sensitive nature. Moreover, the use of FGs in conjunction with the TIs gathered data which does contain visual cues.

3.4. Justifying the use of focus groups

Focus groups (FGs), when moderated effectively, are characterised by detailed discussion. They were, therefore, expected to result in rich narratives by allowing conversations between participants to flow. Cyr (2019) outlined the advantages of FGs, which are associated with three interconnected characteristics of the approach:

1. *They are social in form: participants will be subjected to the social pressures present in the real world*
2. *Data is created through largely emic processes; data is collected from the perspective of the participant, with their viewpoints privileged through keeping topics relatively open to allow narratives deemed important by the participants to unfold*
3. *Data is produced at three different levels of analysis: individual, group, and interactive*

FGs are a popular research method due to their ability to explore complex behaviour while providing a rapid, cost-effective way of collecting data (Queiros *et al.*, 2017) as multiple respondents' views are captured in a single research encounter (Cyr, 2019). The synchronous nature of FGs enabled the researcher to identify subtle conflicts of opinion and observe emerging narratives within the group while providing the opportunity to seek clarification from participants (Queiros *et al.*, 2017).

Much value is placed on the group interactions which occur during FGs (Acocella, 2012). The largely emic nature of FGs can be empowering for participants as they have the freedom to respond however and whenever they wish (Stewart *et al.*,

2009; Liamputtong, 2011) while '*pondering, reflecting and listening*' to their peers' views and experiences (Krueger & Casey, 2015). Moreover, as FGs can result in well-articulated qualitative datasets as co-participants assist peers who are struggling to articulate an idea (Kitzinger, 1994). The complex interactions that occur during FGs do, however, require the researcher to possess the necessary skillset to facilitate and moderate FGs effectively; FGs are not situated under 'natural' settings as the researcher convenes the groups, and conversations would not have happened without the meeting. Conversation can, therefore, feel forced unless the facilitator is well versed in communicating with the study participants (Quieros *et al.*, 2017). The skills needed to overcome this potential source of bias were gained by attending a FG training workshop (delivered by the Social Research Association) before embarking on fieldwork.

FGs were a useful approach for achieving the rich qualitative data required for answering the research questions of this study, particularly surrounding the barriers and motivators to seeking CSF advice and whether farmers would like to be presented with alternative advice delivery mechanisms in conjunction with traditional 1:1 delivery. The FG results were merged with qualitative and quantitative data from the other methods carried out here during interpretation (figure 3.18), thus allowing the identification of intellectualisation while overcoming the limitations associated with FGs outlined above. Similarly to the telephone interviews, the AFGs were carried out with farmers (FFGs) and advisors (AFGs) separately to allow their narratives to flow separately, thus gathering rich data. This is because having both actors present in the same FG would have been inappropriate; both farmers and advisors may have been uncomfortable sharing their full views surrounding advice when the other actor was present. As an example, farmers may not have felt able to share negative views surrounding the advice they'd received if an advisor they knew was present in the AFG. There was a real likelihood of this occurring as farm advisors cover large geographical areas so may have met some of the farmers who attended the focus groups.

3.5. Quantitative data analysis for all methods

The number of participants gathered during the OQS allowed statistical analysis to be undertaken on the quantitative questions (see section 4.2.1 for further

detail). The significance level used for all quantitative statistics was 0.05. Meanwhile, basic percentages and counts are provided for quantitative data gathered from the methods with smaller numbers of participants (e.g., in the TIs and FGs).

3.6. Qualitative data analysis for all methods

The framework used for analysing qualitative data is provided in figure 3.3. Firstly, qualitative data were organised and formatted to separate individual speakers and topics automatically when imported into NVivo 12 plus. Content analysis was then undertaken to identify and categorise salient themes and compare and contrast answers from participants with different characteristics. Once coding was complete, themes were prioritized based on recommendations made by Krueger & Casey (2015, p147), including frequency, consistency, and emphasis placed on sentiments by the participants.

Some coded themes were quantified²⁵ to enable the researcher to place relative importance on particular narratives and to compare findings against quantitative data. There has been some debate between academics surrounding quantifying qualitative data, with epistemological commentators such as Guba and Lincoln (1994) contending that the approach is inappropriate due to the different assumptions followed by qualitative and quantitative research methods. Meanwhile, other authors support the use of quantifying qualitative data as part of successful MMR; according to Chi (2009) and Oleinik (2011), quantifying qualitative data is a useful approach for verifying research findings, with Chi (2009) providing a guide on how to do so using verbal data. In addition, Sijbesma and Postma (2008) found that quantifying qualitative data can supplement key quotes and make the findings of studies within the water sector more relevant to practitioners. As this research was part-funded by a governmental body, it was appropriate to ensure the findings are presented in such a way that policymakers will deem useful. In order to avoid generalising the findings of this study (Fakis et al, 2013), simple counts alone are used when quantifying qualitative data; statistics were deemed inappropriate for qualitative data and are thus only used

²⁵ This is the process whereby qualitative codes are converted into quantitative data (coined by Tashakkori & Teddlie, 1998, p. 126).

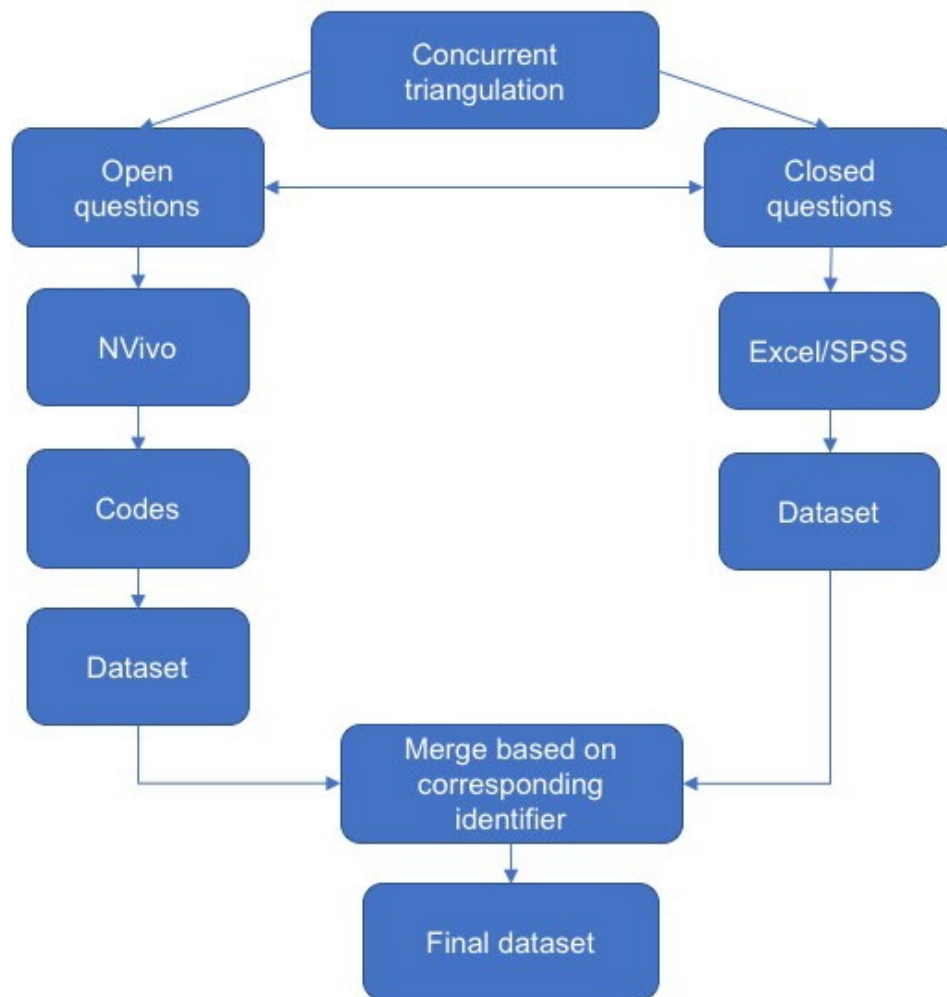
on the quantitative data deriving from the study (e.g., characteristic data and results from Likert-scale questions).

Figure 3.3. Overview of the qualitative data analysis used during this study.



All findings were triangulated during interpretation to compare and contrast each method. Quantitative data deriving from the OQS was expected to provide further evidence to support and counter the narratives that emerged during the largely qualitative TIs and FGs. Figure 3.4. illustrates how data were triangulated.

Figure 3.4. The concurrent analysis used to combine qualitative and quantitative data



3.7. Presentation of results

Presenting the findings of MMR can become confusing for readers where clear distinctions between methods are not made (Creswell, 2011, p.279). This is resolved here by dedicating individual chapters to each method (chapters 4-8) before triangulating the findings in chapter 9. As recommended by Teddlie & Tashakkori (2010), clearly labelled tables and diagrams are used throughout to simplify complex results (Dickinson, 2010).

3.8. Ethical considerations

Ethical approval for this study was obtained from the University of Exeter: Please see appendix, section 3.5 for the certificate of approval.

As recommended by Miller & Bell (2012), ethical considerations were ongoing throughout the study. The University's code of ethics was adhered to by accepting responsibility to the participants (i.e., avoid harm), to science (i.e., avoiding misrepresentation or deception), and to the public (i.e., be honest and open). It was expected that by following this code of ethics, research integrity would be achieved, leading to trust from research participants, thus resulting in a rich dataset.

Gaining true informed consent becomes challenging if it is not clear what the participant is 'consenting' to and precisely where 'participation' starts and ends. The consent forms, therefore, contained information about the research project, relevant contact details, and clarification that data will be anonymised and stored securely, thus meeting the requirements of current data protection legislation. It was also made clear that participants were entitled to go 'off the record' if they wish (Miller & Bell, 2014) or withdraw their consent at any time. The requirement for formal written consent can, however, result in a perception of excessive bureaucracy, thus alienating potential participants (Miller & Boulton, 2007). Consent forms were, therefore, completed at the beginning of research encounters rather than relying on participants to complete them beforehand.

Additional ethical considerations were made when planning the FGs as anything relayed by participants was, naturally, shared with other group members (Morgan, 1997). Participants were, therefore, asked to keep exchanges private. Although there was minimal personal risk associated with the topics, the open questions could have resulted in the disclosure of confidential information. The FGs were also video and audio recorded to enable verbatim transcription. Participants were, therefore, reassured that recordings would be used only for transcription purposes before being destroyed. Permission for this was gained by including information surrounding how the data were being gathered within the informed consent forms signed by participants at the beginning of the FFGs and AFGs.

Data gathered during this study adhered to the requirements set by the current General Data Protection Regulations (GDPR (EU/2016/679) European Union, 2018). Data were encrypted and password-protected and only used for the original purpose respondents consented to. Files were kept in a single location on the University's secure computing server. Only the researcher had access to the data, and computers were password-protected whenever unattended. Data obtained from OQS submissions were recorded automatically within the University's secure password-protected storage system. Once anonymised and analysed, data were stored securely to enable the researcher to revisit them in the future.

3.8.1. Researcher positionality

The aspects of my positionality which were expected to influence my research experience were that I am a “young” woman from a non-agricultural background.’ This positionality is shared by Chiswell & Wheeler (2016), who found that farmers appear to perceive researchers of these characteristics as non-threatening, thus may be less averse to sharing their views. I also self-identify as an ‘environmentalist,’ possess on-farm experience, and have a keen interest in agriculture. Without careful management, these stances could have affected the research findings. It was, therefore, essential to remain neutral and encourage all narratives and views equally. This was achieved by using neutral responses (‘uh-huh’) (Krueger & Casey, 2015, p.122) and avoiding using body language or facial expressions that may have been construed as exhibiting personal opinions.

3.9. Conclusions

This chapter justified why an MMR consisting of qualitative and quantitative methods (an OQS, TIs, and FGs of farmers and TIs and FGs with advisors) was appropriate for answering the research questions posed in section 1.6. Using this selection of methods was expected to deliver novel insights due to its ability to offset the limitations of single methods and to reach a more comprehensive range of farmers. This is the first study of this nature surrounding DWPA advice delivery.

The following chapters (4-8) will provide specific details about how each method comprising the MMR was carried out, and the corresponding data analysed and

interpreted, before presenting the results and demonstrating how these findings relate to the research objectives introduced in section 1.6.

Chapter 4

An online questionnaire survey of farmers: Initial insights into farmers' perceptions of DWPA advice delivery and how its efficacy could be improved

An online questionnaire survey (OQS) of farmers was the first method conducted during this sequential MMR. As outlined in chapter 3, the OQS was designed to gather a relatively large dataset to provide a foundation for the other, more qualitative methods. This chapter examines the findings of the OQS, which are later triangulated with the other methods conducted during this study (chapter 9).

A key objective of the OQS was to gather initial insights into how farmers' perceptions of the success of the CSF initiative and other DWPA advice. The farmer characteristics which influence whether farmers engage with DWPA advice were also examined in the OQS and analysed through the lens of credibility and relevance. Some questions aimed to discover how the CRELE of CSF may be strengthened and weakened by exploring the positive and negative sentiments shared by farmers and ascertain how significantly farmers believe (and admit to believing) their own farming practices likely contribute to water quality problems due to its clear implications on the relevance of engaging with DWPA advice.

This chapter begins to explore how farmers respond to the idea of additional advice and information delivery approaches in conjunction with existing advice delivery. Firstly, the prospect of being shown more 'hard' evidence surrounding DWPA by advisors and whether this may offer a potential mechanism for increasing the credibility and relevance of engaging with CSF is explored. Insights are then gathered to investigate whether farmers perceive video content as a potentially useful mode of advice delivery in conjunction with existing approaches.

4.1. Methods used for the OQS of farmers

A copy of the OQS protocol is provided in supplementary information (section 4.1).

The OQS questions were constructed following Johnson & Christensen's (2000) principles for designing questionnaires (box 4.1). The survey was piloted with a colleague prior to activating the OQS to check clarity, ensure the questions were unaffected by presuppositions by the researcher, and check that the survey was appropriate in length (i.e., took no longer than 10 minutes to complete). The lack of researcher presence during the completion of the OQS was considered throughout planning by writing questions clearly to avoid participant misinterpretation (Glastonbury & Mackean, 1991). The researcher's inability to detect nuances due to the inherent lack of emotive, visual, and auditory cues gathered during the OQS was acknowledged and considered during data analysis by comparing qualitative findings against those collected in other methods (see chapters 5-8).

Box 4.1: Principles for designing questionnaire surveys

(adapted from Johnson & Christensen, 2000)

1. Questions should be relevant to the research questions of the study
2. Understand your research participants
3. Use natural and familiar language
4. Write questions simply, clearly, and precisely
5. Do not use 'leading' or 'loaded' questions
6. Do not use double-barrelled questions or double negatives
7. Think carefully about whether an open-ended or close-ended question is most appropriate
8. Use mutually exclusive and exhaustive categories for closed-ended questions
9. Use multiple questions to measure abstract constructs
10. Ensure the questionnaire is easily accessible
11. Pilot test the questionnaire before sending to potential respondents

4.1.1. Structure of the online questionnaire survey

The OQS was hosted by Jisc Bristol Online Surveys (Jisc, 2019). The survey was clear and visually appealing, with a colourful and informative opening screen to encourage participation. This was followed by an informed consent form and data protection statement reassuring participants that the study would comply with current General Data Protection Regulations (GDPR, 2018). All questions broadly related to DWPA to instil a clear theme, thus building respondents' trust in the method. Skip patterns²⁶ provided a useful way to probe farmers about why they agreed or disagreed with particular statements, for example, why they perceived alternative mechanisms of advice delivery (e.g., videos) as CRELE. Some farmers own a desktop computer/laptop but not a smartphone (see Defra, 2020b), thus a responsive interface²⁷ was used to minimise the risk of excluding farmers who only use a single type of internet-enabled device.

The OQS began by asking farmers to indicate the extent to which they believe their farming practices contribute to DWPA (on a 5-point Likert scale, where 1 = not at all, 5 = a significant amount) as it was hypothesised that this would affect the likelihood of these farmers engaging with CSF. Respondents were then asked to indicate which sources of DWPA advice they use before asking whether they seek advice online or through mobile applications and whether they already watch videos for DWPA advice. Next, participants were asked to respond to a series of statements on a 5-point Likert scale (where 1 = strongly disagree, 5 = strongly agree), including whether they would like to be shown more 'hard' evidence which indicates whether their own practices likely contribute to DWPA, whether they believe CSF is a successful initiative, and whether they have found its advice conflicting or overly repetitive²⁸. The question surrounding whether the

²⁶ Skip patterns minimise time burdens for participants by excluding participants from answering questions which do not pertain to them, typically based on their answers to previous questions. For example, if a participant answers 'yes' to a question (e.g., 'are you a farmer?'), they may be eligible to answer follow-up questions on a topic (in this case farming), whilst if they say 'no', they can be automatically routed away from answering further questions on the topic.

²⁷ The OQS was responsive in the sense that the survey window would automatically adjust depending on the hardware (e.g., smartphone, desktop computer, tablet) used to complete the survey, making it easy to complete regardless of the device used.

²⁸ Whilst it is known that repeated interactions with advisors can be advantageous for resulting in knowledge retention and practice uptake, this is often most effective when the same messages are coming from multiple sources as this indicates that a consensus is being built. Where a single CSFO is, however, providing repeated advice on several occasions, it may lead to frustration where farmers are unconvinced of the need to uptake this information. This may also lead to wasted resources on re-

CSF initiative is perceived as successful was purposefully kept broad to gain general opinions of the initiative, and a free-text box enabled farmers to elaborate upon their answers as they wished. Participants were also asked questions to gauge their prospective willingness to pay towards DWPA advice and their awareness of the New Farming Rules for Water (see section 1.3.2). These topics are not included in this thesis thus are not discussed here²⁹. The exclusion of the research into farmer and advisor perceptions towards the concept of farmers paying towards CSF advice delivery and their awareness of the new farming rules for water was to ensure that the thesis remained coherent with a single thread running through it. The scope of this study was not sufficient to include all of the topics gathered during empirical data collection. However, a peer-reviewed paper reporting the findings of this topic has been prepared and the Environment Agency, who part-funded this research, have been sent a pre-print of the manuscript (Chivers & Collins, unpublished).

Opportunities to elaborate qualitatively were available throughout the OQS. These questions were voluntary as forcing responses may have resulted in unusable answers or opt-out by respondents midway through the survey due to the added time burden. Despite this, most respondents (90%, n = 199) provided at least one qualitative answer, indicating that they perceived the OQS questions as relevant and thus worth responding to in greater detail.

Several characteristics were gathered to enable the researcher to undertake analyses based on subsets of respondents (table 4.1). Where farmers selected 'other' for any of these questions, they were asked to elaborate qualitatively. FTI (chapter 5), and FFG (chapter 6) participants were also asked to provide these characteristics.

engaging with the same farmers rather than approaching farmers who haven't previously interacted with the initiative.

²⁹ Data relating to the 'willingness to pay for advice' topics were analysed and written up as a paper which is currently under review in the Journal of Agricultural Extension and Education.

Table 4.1. Characteristics of farmer respondents gathered during the OQS.

Characteristic	Answer options
Farm structural attributes	
% of sales from different farming types	Indoor dairy/outdoor dairy/livestock/arable/horticulture/indoor pigs/outdoor pigs/specialist poultry/other poultry/other farming enterprise
Farm size and tenure	Total area/area owned/area rented in (including full tenancy and seasonal)/area contract farmed/shared farming/other
Number of workers on-farm ³⁰	You and your family (full time/part-time/casual) Employees (full time/part-time/casual)
Organic status	Yes – all/Yes – some/ No
County	List of English counties
Postcode	Free-text
Farmer characteristics	
Age	Free-text
Gender identified as	Male/Female/Other/Prefer not to say
Level of education	GCSES/College diploma/A levels/Technical qualification/First Degree/Postgraduate degree
Status on the farm	Full time/part-time/hobby/other And Sole proprietor/Partner with (parent(s), son/daughter, spouse/partner, another relative, non-relative/Director/Manager/Other
Time spent in farming	Number of years
Economic performance	
Current business performance	Very well/Fairly well/Fair/Fairly poorly/Very poorly/I don't know
Current economic prospects	Very good/Fairly well/Average/Fairly poor/Very poor/I don't know
Predicted economic prospects in 5 years	Very good/Fairly well/Average/Fairly poor/Very poor/I don't know

³⁰ The answers given here were later used to calculate the approximate number of full time equivalents (FTEs) per farm.

4.1.2. Recruiting online questionnaire survey respondents

As the OQS was completed online, internet-based recruitment methods were used to provide respondents with immediate access to the survey. The OQS was shared across several social media platforms, including a well-known farming forum (www.thefarmingforum.co.uk), Twitter, and Facebook (as advocated by Rife *et al.*, 2014). The use of multiple platforms was expected to reach farmers with different structural characteristics; for example, Twitter users are typically younger than Facebook users (Blank & Lutz, 2017). Farmers' Weekly (www.fwi.co.uk), an agricultural news company, was also commissioned to run a paid-for advertisement campaign. The campaign consisted of a billboard displayed on the website periodically and a recruitment email that was sent to its ~30,000 subscribers during December 2020 (appendix, section 4.1.2), both of which contained a direct hyperlink to the survey.

All recruitment efforts were worded to explain the importance of gathering farmers' views and a £100 voucher prize draw offered a cost-effective way to encourage participation (Bosnjak & Tuten, 2003; Gajic *et al.*, 2012). This was used instead of a pre-paid incentive for financial reasons and because of concern that pre-payments may have coerced participation or resulted in inaccurate data and participation by non-farmers. Farmers were given an opportunity to sign-up for project outputs in addition to entering the prize draw.

4.1.3. Online questionnaire survey sample

The OQS was employed to gather initial perspectives surrounding CSF from a wide range of farmers. Farmers from across England, CSF's area of operation, were invited to participate in the OQS. This also enabled the OQS to gather the views of participants from different farming types, sizes, and circumstances (see Defra, 2020a). Attempts to target farmers from specific regions of England when advertising the survey on public social media platforms and Farmers Weekly could have caused frustration to excluded farmers outside of these boundaries who felt they had valuable opinions to share. Quotas were not, therefore, used, with all responses gathered from England included in the analysis. Whilst the recruitment methods used (section 4.1.2) were visible to farmers outside England, the messaging used made it clear that the study was not looking for

participants located in other countries. As shown in figure 4.1, the messaging was effective, with most participants located within the English borders.

The OQS was live for three winter months, the 'quietest' time in the farming calendar (02/10/2018-04/02/2019). Farmers Weekly subscribers were emailed invitations and the online billboard was deployed during December 2018, resulting in 135 responses. The email was opened by 9635 Farmers Weekly subscribers (conversion rate³ = 1.27%), whilst the billboard achieved 3631 impressions³¹ with a conversion rate³² of 0.85%. Despite appearing a low conversion rate, this aligned with rates typically achieved by Farmers Weekly, partly due to many subscribers being non-farmers. Meanwhile, social media sharing generated 86 responses. Overall, the OQS was accessed by 3452 potential respondents and completed by 225. Once inconsistent answers were removed, 221 completed surveys remained.

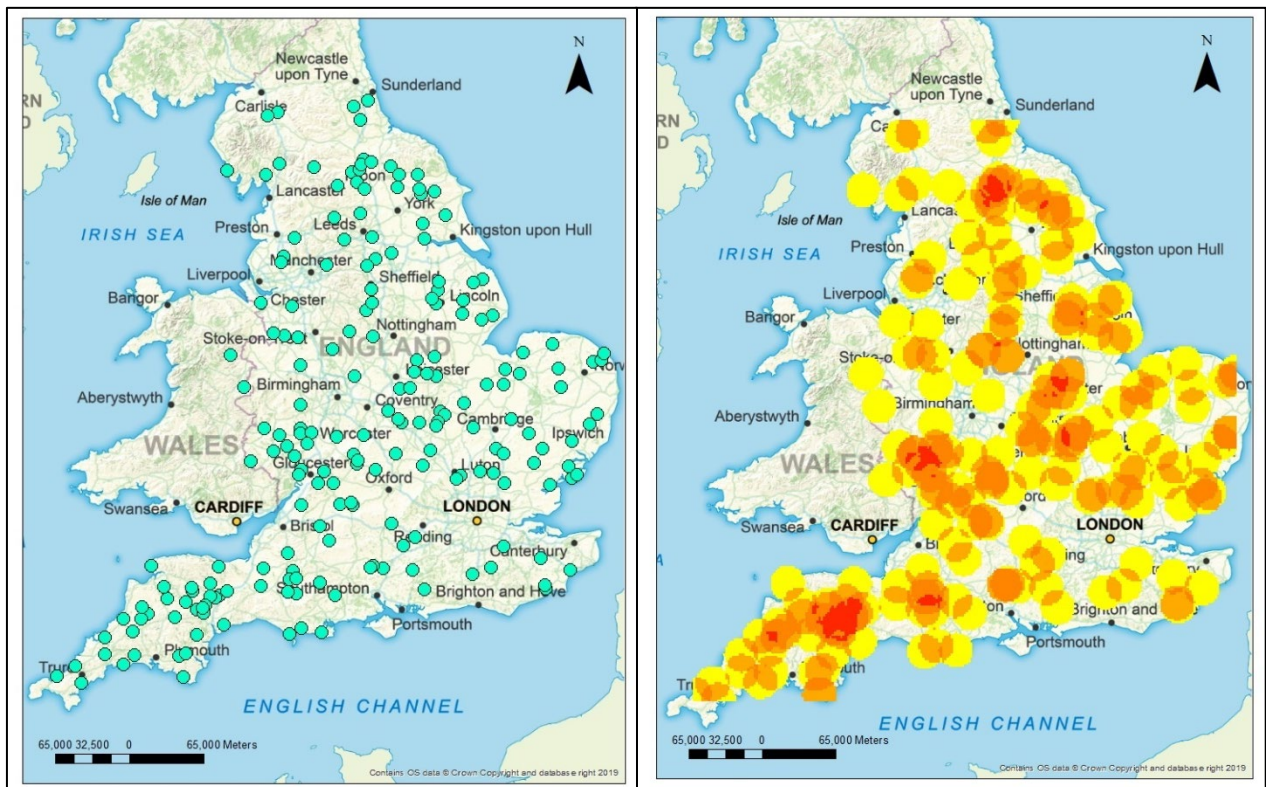
Paradata obtained from the survey platform (Jisc, 2019) were analysed. The average time taken to complete the OQS was 20 minutes, with a range of 4-59 minutes. As the OQS was open to being revisited, some participants may have completed other tasks between completing the survey; thus, these completion times may not be entirely accurate but provide a rough indication into how much reflection was required by respondents.

An XY point map and corresponding heat map of the distribution of OQS respondents was created using ArcMap 10.6 (figure 4.1). Large pinpoints and maps covering large spatial areas ensured individual farm holdings were indiscernible, thus maintaining respondent anonymity. The five counties with the highest levels of participation were: Yorkshire (12.4%), Devon (10.6%), Cornwall (5.5%), Lincolnshire (5.5%) and Norfolk (4.1%). Just two counties, Surrey and Middlesex, lacked farmer participants, whilst two respondents provided postcodes inside the Welsh border. These responses were considered usable due to the respondents' knowledge surrounding CSF, indicating that they may farm inside England.

³¹ Impressions are defined by digital media (i.e. the Farmers' Weekly billboard) rendering on a user's screen. This does not necessarily lead to completion of the survey by the user but means that the billboard was viewed.

³² whereby users clicked on the billboard and entered the survey

Figure 4.1. Distribution of OQS participants (left) and corresponding heat map (right) highlighting regional participant hotspots (right).



4.1.4. Structural characteristics of the online questionnaire survey respondents

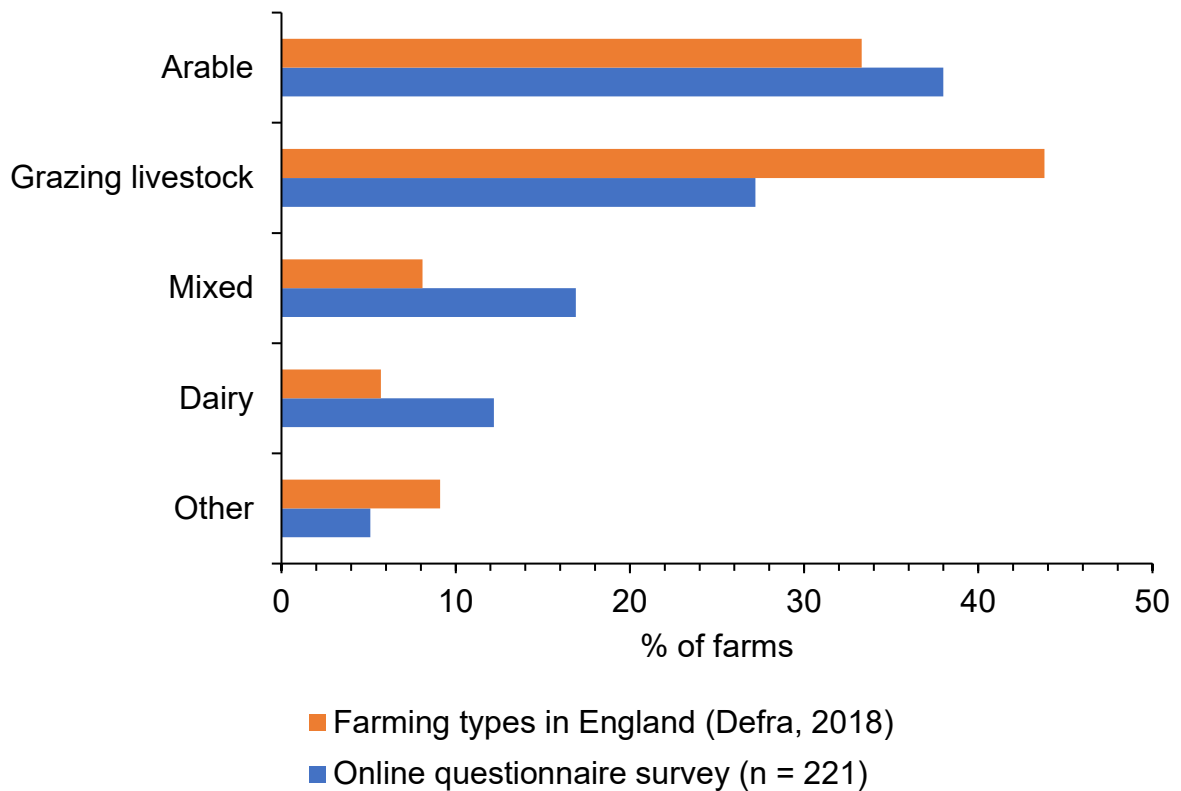
Respondents provided their % of sales from different farming enterprises. These data were compared against a national dataset (Defra, 2019c) (figure 3.13), which used standard output coefficients (SO)³³ to calculate farm business types (Defra, 2014). These SOs are calculated based on whether a single farming enterprise constitutes >2/3rds of the farming business (see Defra, 2019b,e); where a single enterprise did not contribute to 2/3rds, farms are classed as 'mixed'. Some categories used by Defra (2019c) were different to those used in the OQS; 'cereals' and 'general cropping' were, therefore, combined to constitute 'arable', whilst 'LFA grazing', and 'lowland grazing' were combined to represent 'grazing livestock'. The framing of the question used in the OQS was not identical to the equivalent question within the farm business survey; however, % of sales

³³ Standard output: 'The average monetary value of the agricultural output per unit at farm-gate prices under 'normal' conditions (no disease outbreaks or adverse weather). This excludes direct payments, value added tax and taxes on products. In England, these are calculated based on each region of England' (Defra, 2014)

was deemed a sufficient proxy for SOs, thus enabling the identification of the under or over-representation of particular farming types.

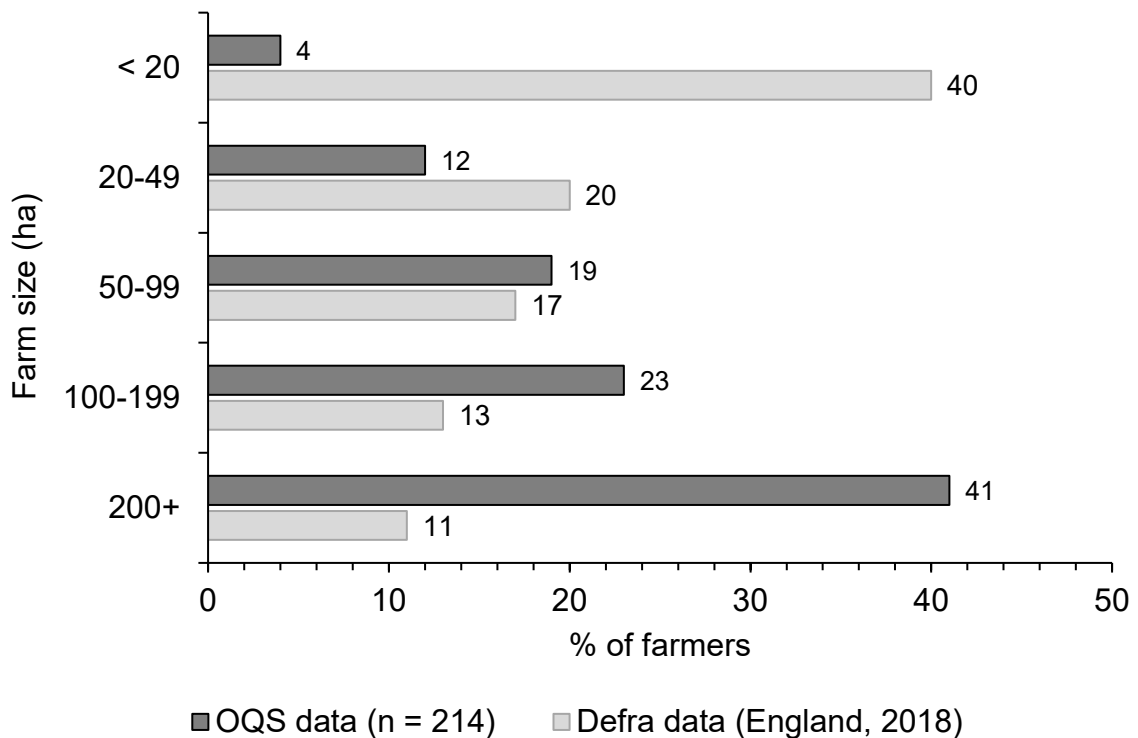
A relatively representative number of arable farmers completed the OQS (figure 4.2), whilst other farming types were under- and over-represented. Dairy farms may have been over-represented because the sector has become increasingly reliant on technology which requires IT skills (Holloway *et al.*, 2012). Many dairy farmers may, therefore, have become increasingly active internet users, thus becoming more likely to participate in OQSs. Additionally, dairying is a recognised source of many DWPA pollution incidents (see CSF Evidence Team, 2019); thus, participating may have been relevant to these farmers. Despite mixed farms being classified using the same proxy criteria used by Defra, they were also over-represented, likely because some farmers may have provided inaccurate % breakdowns of their sales. The OQS under-represented dairy and grazing livestock farmers potentially as they have less time to participate due to its hands-on nature with little dedicated 'desk' time. The under-representation of horticulture was unsurprising as they may not self-identify as 'farmers' per se, thus may not have felt inclined to participate. The reason for the under-representation of pig and poultry farmers was, however, unclear.

Figure 4.2. OQS vs national England statistics surrounding farming business types (from Defra, 2019a).



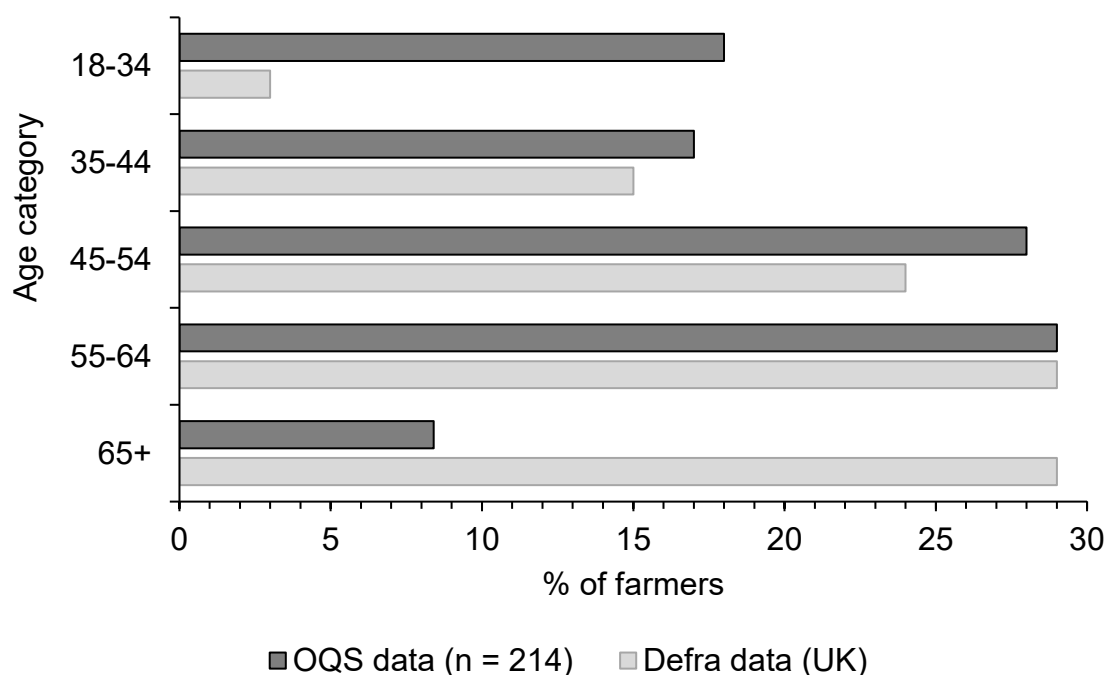
The total farmed area (ha) of OQS respondents was compared with farm size data for England (Defra 2019a, b, table 2.4). The OQS was over-represented by large farmers (figure 4.3); whilst the average size of respondents' farms was 281 ha (n = 214), the average farm size in England is 87 ha (Defra, 2019 a, b). This may, in part, be due to national data containing a high proportion of small farms (<20ha), some of which may not be fully commercial (e.g., hobby/part-time) thus may not have felt inclined to participate in the survey.

Figure 4.3. OQS farmer participant farm sizes (ha) compared to national farm sizes in England (obtained from Defra, 2019a, b).



Despite national data on farmers' ages being based on the entirety of the UK, indirect comparisons can be made. Whilst the average age of UK farmers was reportedly 60 in 2016 (Defra, 2018), the mean age of OQS respondents was 48.25 (range = 19-81, n = 214; figure 4.4). Farmers aged 35-64 were relatively consistent with national figures, whilst farmers aged 18-35 and 65+ were over- and under-represented, respectively (Defra, 2018). These discrepancies can, in part, be explained by the negative associations found between increasing farmers' age and internet use (Warren, 2000); Butler & Lobley (2012) found that 74% of surveyed farmers who were non-internet users were >56. Moreover, Defra gathers farmer ages through the June survey, whereby a single member of a farming household, typically the head of the household (often the oldest male farmer), completes the form. A less formal task, e.g., the OQS, may, however, have been more likely completed by younger family members.

Figure 4.4. OQS farmer participant ages compared to national (UK) farmer data (obtained from Defra, 2018).



Most OQS participants were full-time farmers ($n = 147/212$; 69.3%), whilst 13.1% ($n = 28$) were part-time, 8.6% ($n = 18$) were farm managers, and 9% ($n = 19$) answered 'other'. Comparisons against existing Defra data were not possible in this case. This is, therefore, simply an indication of the types of farmers who participated.

4.2. Online questionnaire survey data analysis

4.2.1. Quantitative data analysis

The OQS data were prepared using Microsoft Excel (version 16.33). Inconsistent responses ($n = 4$) were removed by identifying submissions containing excessive blank responses or conflicting answers.

The statistical approaches used here are bivariate tests. Bivariate tests are used to investigate the relationship between two independent datasets at a time, with a pair of observations taken from a single sample (Allen, 2017). These tests enable the researcher to determine whether the two groups are related and the strength of this relationship. An advantage of these tests is that they are nonparametric, thus data does not need to be normally distributed. Histograms

created using SPSS (IBM SPSS Statistics 25) indicated that the data were not normally distributed. Non-parametric tests were, therefore, deemed suitable for further analysis. A decision tree for the statistics employed is provided in figure 4.5.

Chi-squared testing was conducted to test whether associations existed between variables with more than two categories. Chi-squared testing is a non-parametric test of statistical significance which establishes how confident the researcher can be that the findings of a contingency table (which displays the relationship between more than two variables) can be generalised from a research sample to a population (Holt *et al.*, 1980; Bryman, 2016). Due to the relatively small sample sizes, > 20% of cells had expected counts of < 5, and conflation to make the test more robust led to the loss of meaningful detail. Alternative tests were, therefore, necessary. Fisher's exact tests³⁴ were conducted; however, there was insufficient memory³⁵. As recommended by Mehta & Patel (2012), Monte Carlo iterations³⁶ offered an alternative approach, whereby Fisher's exact test figures were estimated using a fully random model for removing bias.

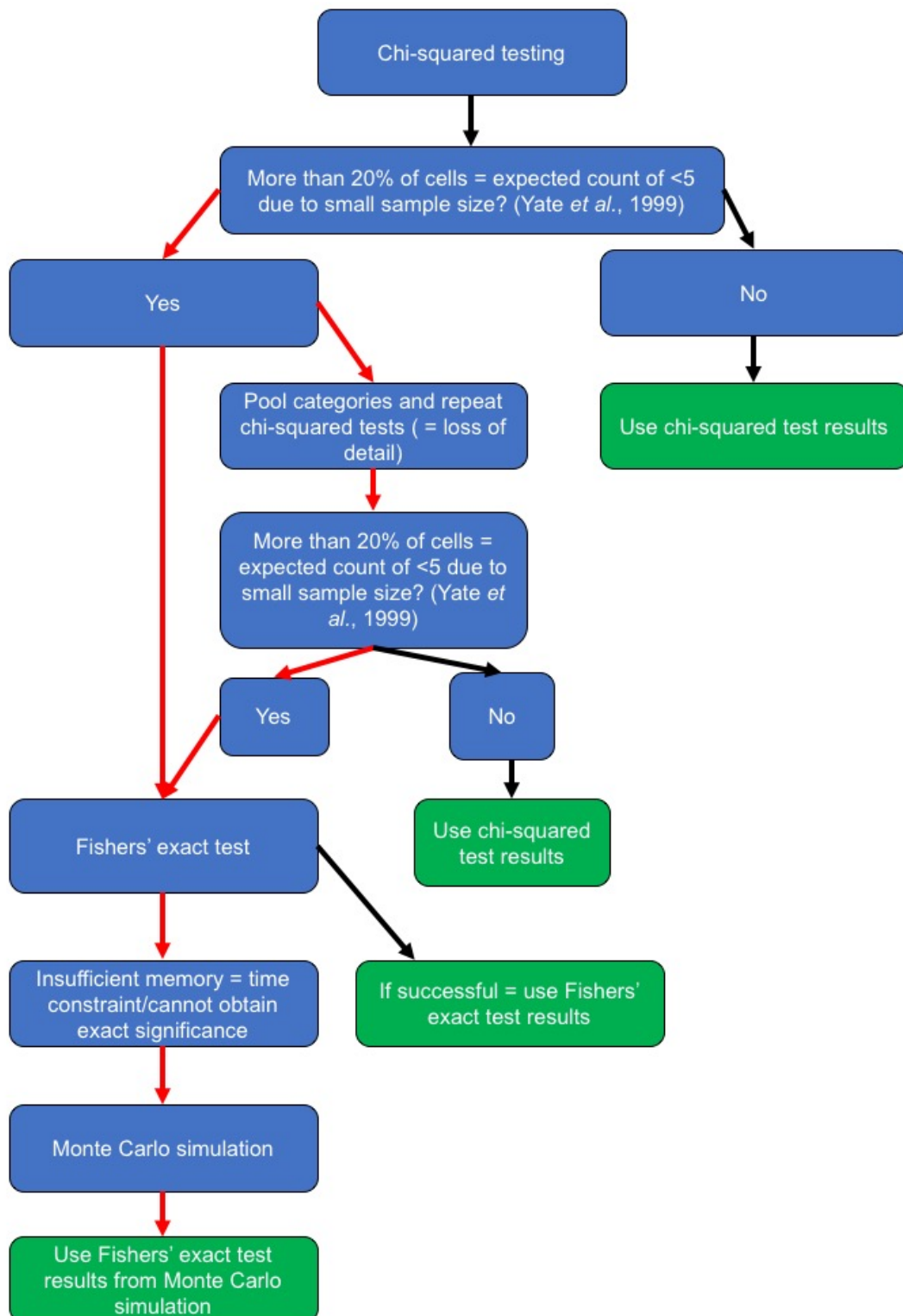
The Fishers' exact p values derived from these iterations were suitable for interpretation. The results should, however, be interpreted with caution, again due to the relatively small sample size. There is also a risk that some of the independent factors may not be independent. This was, however, unlikely in most cases; for example, age was not expected to affect farm size. Rather than relying heavily on the few statistics carried out here, they are used to merely indicate whether there are likely associations between participant characteristics and their engagement with DWPA advice. It is, therefore, important that the reader pays greater attention to the rich qualitative data gathered here than on the quantitative statistics, which are useful but perhaps not as robust.

³⁴ Fisher's exact testing is a conservative measure which determines whether non-random associations exist between two variables, and are suitable for small sample sizes (Korosteleva, 2018)

³⁵ The 'insufficient memory' error when conducting a Fishers' exact test occurs where the computer used is unable to calculate an exact p value as the dataset is too large for exact p value computations but too unbalanced for asymptotic results to be reliable (Mehta & Patel, 2012). As recommended by Mehta & Patel (2012), all other applications were closed to maximise available memory, however, the problem remained.

³⁶ Monte Carlo iterations: provide an unbiased estimate of the exact p value without having the requirements of Fisher's exact testing. The approach works by repeatedly sampling a number of possible tables to estimate the true p value (Mehta & Patel, 2012).

Figure 4.5. Decision tree of statistical tests carried out on the OQS quantitative data.



4.2.3. Online questionnaire survey qualitative data analysis

As outlined in chapter 3, the same qualitative analysis framework was used across all methods (see figure 3.17). Framework analysis was conducted using the procedure provided by Gale *et al.* (2013), leading to the identification of themes that could be compared against respondent characteristics.

4.3. OQS results

4.3.1. Farmer engagement with CSF for advice surrounding DWPA

Prior engagement with CSF advice was reported by 27.1% of OQS respondents (n = 60). Dairy farmers were the most CSF-engaged farming type (table 4.2), likely because they are heavily targeted by CSFOs due to dairying being associated with 36-63%³⁷ of pollution incidents in England (CSF Evidence Team, 2019). Grazing livestock farmers were the least CSF-engaged (table 4.2). Grazing livestock farmers may be less inclined to engage with CSF than other farm types due to a perception that other farming types contribute more to DWPA (see chapters 5-8) or because certain situational factors may be pronounced for these farmers (e.g., time/financial constraints, see below).

Table 4.2. OQS respondent engagement with CSF for advice surrounding DWPA versus farm types.

Farm type (total n)	Number of CSF-engaged OQS respondents	% of respondents
Arable (84)	24	28.6%
Dairy (28)	13	46.4%
Grazing livestock (61)	8	13.1%
Mixed (37)	15	40.5%
Poultry (2)	0	0%
Horticulture (2)	0	0%
Other (7)	0	0%

³⁷ This pollution is largely derived from slurry storage issues (CSF evidence team, 2019). There is likely significant variation in how much dairying contributes to DWPA due to difference practices adopted by different farmers (e.g., stocking rates, slurry storage etc.). Moreover, as discussed in chapter 1 & 2, it is difficult to apportion exact pollutant loadings from single sources.

The average farm size of CSF-engaged respondents was larger than the unengaged (408ha vs 233ha). This may be due to how CSFOs target farms to approach as they may assume that larger farms make more significant contributions to DWPA.

No significant associations were found (95% significance level) between CSF engagement and the average age of respondents (47.6 versus 48.5) or length of time in farming (28.3 versus 30.9) (appendix, section 4.3.1). As discussed in chapter 1, the requirements of farming have, however, altered drastically in the last 20 years, with farmers now expected to gather awareness/expertise surrounding environmental problems alongside how to maximise productivity. Even older or highly experienced farmers may, therefore, need to seek advice to adapt to these new circumstances. In addition, the use of various approaches to provide advice by CSF (e.g., 1:1 visits, farm walks, telephone consultations) means that farmers of all ages may be equally likely to engage due to the resulting inclusivity of using multiple approaches to reach farmers.

Factors affecting the ability of farmers to engage with CSF

Encouraging farmers to decide to engage with CSF advice is not only affected by the efficacy of the initiative but also by a farmer's willingness and ability to engage and adopt environmental measures (Mills *et al.*, 2017). It was, therefore, assumed that situational factors would have a profound effect on the ability and inclination of farmers to engage with CSF (see chapter 1). The main disempowering element identified within the OQS was financial constraints (n = 15); for example, this farmer illustrated a limited ability to apply for grant funding through CSF: *'Farmers are cash strapped, and that's why a lot of environmental incentives and grants aren't being taken up, farmers have to fork out the money first which they don't have'* (respondent #5: arable, female, 35-44, 101 ha) before positing that small farms are particularly unlikely to be able to engage due to financial constraints: *'Only the big farmers can do that'*.

Women were more likely than men to refer to financial constraints (3.1% of men (9 of 192) versus 26% of women (6 of 23)). This gender difference aligns with existing research which found that women are often more concerned about the farms' finances than their male counterparts (Hastings, 1988). In fact, women in

another study posited that their husbands/partners are often entirely uninvolved in the finances: *'He was never good with figures'* (Riley, 2009).

No relationships were identified between referring to financial constraints and farm types, regions, ages (29-79), levels of education, or time spent in farming. It was surprising that there was no apparent difference between farming types as grazing livestock farms in England had drastically lower business incomes than other sectors, including general cropping and dairy in 2018/19 (Defra, 2019c, f).

Minor themes surrounding engagement with CSF included time constraints (n = 3) and age (n = 1). The following quote illustrates these themes: *'Most farmers have so much to do in their day to day lives and the increasing back-office work to run a farm is something that many farms struggle to handle; the average age of a farmer is not exactly 25!'* (respondent #170, grazing livestock, 18-34, 100ha).

4.3.2. Perceived credibility, relevance and legitimacy of CSF

Some of the factors identified by Fish (2014) which affect the credibility and relevance of CSF arose within the OQS. Some farmers were unconvinced by the aims of CSF due to lacking the resources required to act (e.g., time, money), considering the initiative as incompatible with their business priorities, exhibiting fears of interference from external authorities, and concerns about the levels of bureaucracy involved with engaging with the initiative. The following findings build upon some of these themes whilst gathering novel insights into the credibility and relevance of CSF by comparing the sentiments of CSF-engaged and -unengaged farmers.

Over half of OQS participants (52%, n = 115) agreed or strongly agreed with the statement 'I believe CSF is a successful initiative'. Of these farmers, 75% (n = 45) of CSF-engaged farmers and 44% (n = 71) of the unengaged farmers agreed with the statement. This finding aligns, to an extent, with a recent CSF evaluation report (Environment Agency, 2019) where 92% of surveyed CSF-engaged farmers were satisfied with the help they received from CSF. This finding implies that the initiative may achieve credibility with those farmers it has engaged with. The finding that unengaged farmers were less likely to believe CSF is successful is likely, in part, because farmers who have not engaged with the initiative may be sceptical of it due to the knowledge that it is government-led. Previous

research, despite being conducted over a decade ago with just 31 farmers, found that some farmers may, by proxy, distrust government-led efforts due to previous experiences relating to bureaucracy a lack of two-way conversation, and a perception that it's 'us' versus 'them' (see Hall & Pretty, 2008).

Farmers were also asked to indicate the extent to which they agreed with the statements: '*I often find advice surrounding water pollution³⁸ repetitive*' and '*I have received conflicting advice surrounding water pollution in the past*'. A total of 205 respondents answered this question, with many of these claiming that they have found DWPA advice repetitive (42.7%; average 3.4). In addition, a third of 201 OQS respondents agreed that they'd received conflicting advice (33.2%, n = 67; average = 3). Delivering conflicting and/or repetitive advice may have profound implications on the credibility of DWPA advice, including CSF; this is, therefore, explored further in chapters 5-8.

Qualitative answers surrounding CSF (n = 39) resulted in 48 references³⁹, many of which were negative (n = 35). These references were categorised into two distinct themes:

1. **Low-quality advice** (n = 16), with farmers referring to a lack of credible advisors, with some CSFOs seen as lacking experience and/or only staying in their role for short periods, and a perception that other sources of DWPA advice are more credible and relevant.
2. **The limited distribution of CSF** (n = 16), constituted by a lack of publicity about the initiative and issues with how CS water quality priority boundaries are allocated, with farmers arguing that these boundaries exclude many polluters from accessing CSF advice (n = 10) and grants (n = 3).

The negative narratives shared by CSF-engaged farmers (n = 12) surrounding credibility mainly related to the quality of advice. This perceived lack of quality often related to a perception that CSFOs lack practical experience and therefore, credibility: '*I've taught my local officer more than she has taught me!*' (respondent #221, arable, 35-44, 1000ha).

³⁸ The term 'water pollution' was used rather than 'diffuse water pollution' for simplicity and to avoid farmer confusion

³⁹ Due to some respondents spanning multiple themes in their answers

Some CSF-unengaged farmers also shared negative sentiments about the initiative (n = 16), many of which related to its limited distribution: *'I don't think that we are in a CSF area, so I am not aware of their work, it doesn't feel very open to us'*. This suggests that some unengaged farmers would engage with CSF but are excluded from doing so. Some farmers who *are* located within CS high priority water quality catchments have also found CSF inaccessible: *'I have never received advice on CSF even though I farm in the Thames catchment'*. This quote insinuates that farmers may expect CSFOs to approach their farms rather than them having to reach out for advice. These negative findings, despite only being mentioned by a subset of participants (n = 35), contradicts the Environment Agency (2019), where 89% of CSF-engaged farmers said their advisor understood their needs. In addition, these themes are of importance due to their spontaneity, with participants referring to these issues doing so without being prompted to do so within the free-text questions.

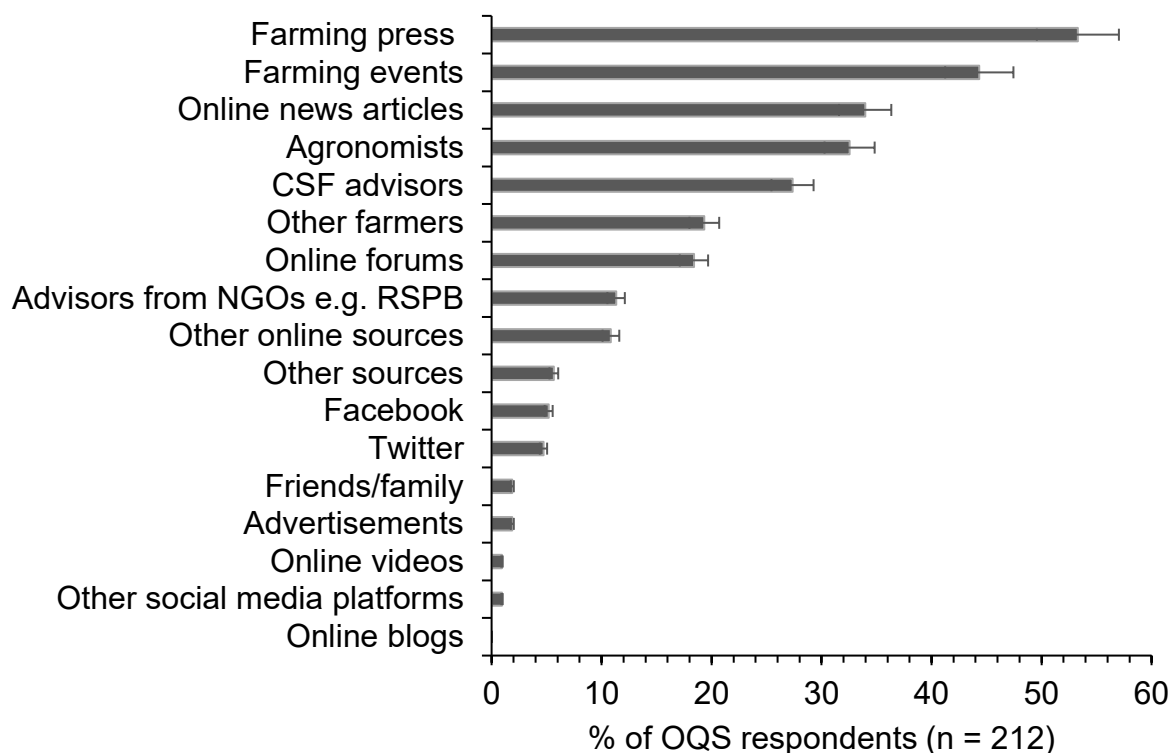
The positive sentiments relating to CSF (n = 12) primarily consisted of generic statements; *'The scheme is very crucial and useful'* (respondent #106, dairy, 35-44, 800ha); *'I believe CSF has a role in extending good quality, impartial advice and research'* (respondent #155, arable, 35-44, 175ha). This may be because farmers who are relatively satisfied with the initiative may have felt less inclined to provide detail than those who had grievances.

Some qualitative answers surrounding CSF did not reflect the quantitative data. For example, one arable farmer quantitatively strongly agreed that CSF is successful but then posited in the follow-up textbox that he'd been given conflicting advice in the past. Another arable farmer also strongly agreed that CSF is successful before sharing a negative statement relating to a lack of perceived co-benefits of engaging with CSF and the quality of advice: *'[it's] important to realise most CSF support results in little directly measurable changes to farm finances. Am also aware of varying levels of expertise amongst advisors'* (respondent #57, arable, 35-44, 200ha). These somewhat contradictory findings, alongside several participants sharing a mixture of positive and negative sentiments, shows that whether CSF is perceived as effective is not easily discernible and consists of several aspects. This reiterates the importance of gathering rich quantitative and qualitative data to gain strong insights into these complexities.

Alternative sources of advice to CSF

Many farmers (n = 212, 96%) engaged with alternative sources of DWPA advice instead of or in addition to CSF (figure 4.6). Some farmers, mostly dairy farmers with >500ha, perceived alternative sources of DWPA advice as more credible than CSF: 'Advice on water pollution should come from water companies who are ultimately responsible for water quality' (respondent #189, dairy, 35-44, 2000ha); 'Other professionals deliver this information, e.g., agronomist. They have a more detailed understanding of the farm [...] rather than someone looking at it from afar with little farming experience/knowledge' (respondent #195, dairy, 18-34, 1100ha). This finding underpins the need to ensure CSF is perceived as CRELE by farmers to avoid them gaining misinformation from alternative, potentially unreliable sources or those which do not prioritise achieving water quality improvements.

Figure 4.6. Sources of information and advice surrounding DWPA used by the OQS respondents (n = 212).



4.4. Increasing the credibility, relevance, and legitimacy of CSF in the future

The following sections will explore the potential of two approaches that may offer an opportunity to increase the CRELE of CSF and other DWPA advice. Firstly, video content, which may make advice more easily accessible to internet-using farmers, and secondly, 'hard' evidence, which may persuade farmers that the problem is relevant to them by providing them with proof as to whether their farming practices likely contribute to DWPA.

4.4.1. A potential mechanism for increasing the CRELE of CSF: increasing farmers' awareness of the likely contributions of their own farming practices to DWPA

Farmers' perceived contributions of their farming practices to DWPA

OQS respondents were asked to indicate the extent to which they believe their farming practices contribute to DWPA. This was expected to have a profound impact on whether engaging with advice is perceived as relevant. Previous studies relating to environmental behaviour have found this to be true; for example, Hines *et al.*, (1987) and Bamberg & Moser (2007) undertook similar meta-analyses of environmental behaviour and found that individual sense of responsibility and awareness of the problem affected the likelihood of people acting pro-environmentally (which, in this case, would mean engaging with DWPA advice). Determining whether farmers feel responsible for improving DWPA was, therefore, an important line of enquiry due to its likely impact on the relevance of advice.

Quantitative findings relating to farmers' perceived contributions to DWPA

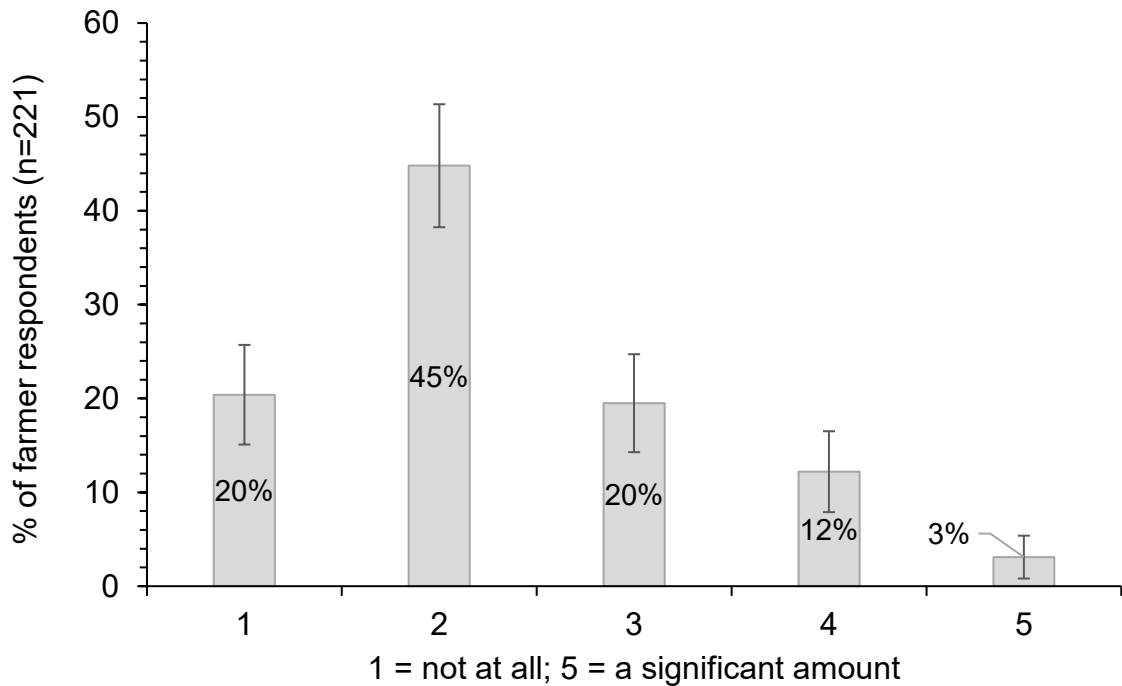
Most farm holdings likely contribute to DWPA if not significantly, to an extent depending on whether mitigation measures or alterations to farming practices have been implemented, where the topography, soil type, and land use is not conducive to significant delivery of pollutants. The cumulative nature of DWPA makes it essential that farmers recognise that whilst their own contributions to water quality problems may seem insignificant, they may have significant effects at landscape scale when combined with neighbouring farms. It is, however,

important to note that some farmers contribute more to DWPA than others; for example, low intensity, permanent pasture livestock farmers on free-draining soils may be somewhat justified in believing they do not need to concern themselves with reducing their own contributions to DWPA.

There was a risk that some farmers may know that their practices contribute to DWPA but fail to admit it due to a fear of prosecution. Another reason for denying known contributions could also be to protect their self-integrity, though this was recognised as unlikely in this case as the OQS was confidential and anonymised. Moreover, information gleaned from fellow researchers suggested that most farmers have become increasingly frank about their impacts on the environment. Farmers may be increasingly recognising the need to acknowledge their contributions to environmental problems and tackle them, particularly as widely publicised discussions on planning a pro-environmental rural payments scheme (Environmental Land Management scheme (ELMs; Defra, 2020b, p9-13) to replace the Common Agricultural Policy payments after Brexit were occurring whilst the OQS was live. OQS respondents may, therefore, have been inclined to display honesty about their likely impacts on DWPA, as accepting their contributions to environmental problems may be an important first step in accepting the future requirement to adopt more pro-environmental measures.

Respondents indicated the extent to which they believe their own farming practices contribute to DWPA (1 = not at all, 5 = a significant amount). Most OQS respondents (65% \pm 6.3%;) did not report believing that their farming practices contribute significantly to DWPA (average = 2.33 \pm 0.06; figure 4.7). This finding was similar to a recent study which found that just 26% of surveyed farmers agreed that their farms contribute to DWPA as 'fair amount' or a 'great deal' (Environment Agency, 2019). Other studies have also found that many farmers do not believe that farming, in general, contributes significantly to DWPA (Macgregor & Warren, 2006; Posthumus *et al.*, 2008). This finding has direct implications on the perceived CRELE of CSF: why would farmers engage with or uptake advice they do not believe they need?

Figure 4.7. OQS responses to 'to what extent do you believe your farming practices contribute to diffuse water pollution? (1 = not at all; 5 = a significant amount) (n = 221). Sample error was calculated based on the number of farm holdings in England (Defra, 2019b; 106,035).



Few recent studies exploring farmers' views surrounding DWPA have compared farming types (as pointed out by Blackstock *et al.*, 2010). This study does so, with Fishers' exact tests (see section 4.1.2) identifying significant associations (99% CI) between farmers' reported perceived contributions of their own farming practices to DWPA and level of education (χ^2 (16, 208) = 36.329, 0.001), current economic prospects (χ^2 (16, 215) = 30.588, 0.004), predicted economic prospects for the next 5 years (χ^2 (20, 221) = 34.714, 0.007; appendix, section 4.4.1), and current business performance (χ^2 (16, 218) = 26.389, 0.01). Significant associations (99% CI) were not, however, found between dominant farming enterprises, farm size, tenure, whether they use contract farming, gender, and farmers' status (full time/part-time etc.) (see appendix, section 4.4.1). These findings contradict Lowe *et al.*, (1994), who found that different types of farmers had distinct opinions surrounding the causes of agricultural water pollution. The differing finding in this study is likely because awareness surrounding the causes of DWPA are likely to have evolved since 1994 when Lowe *et al.* was published.

Qualitative findings relating to farmers' perceived contributions to DWPA

The qualitative data surrounding the contribution of farmers' practices to DWPA led to the emergence of four themes:

1. **Blaming alternative sources for water quality problems** (n = 9), including sewage treatment plants (as expected; see chapter 1), local authorities, amenity users, industry, residential areas, and AD plants. These sources, amongst others, have been cited by farmers in previous studies (Popp & Rodriguez, 2007; Macgregor & Warren, 2006). Most of the farmers who referred to these sources felt unfairly blamed for water quality problems: *'I feel that farmers are always the easiest targets'; 'Farmers often get bad press regarding water pollution'*. The view by many farmers that sewage contributes to DWPA was not unfounded; whilst agricultural loadings are likely higher for total nitrogen (81% vs 14%) and sediment (72% vs 1%), sewage treatment works (STWs) are a more significant source of total phosphorus (47% vs 31%) loadings in England and Wales (Zhang et al., 2014). Whilst much progress has been made towards remediating soluble reactive phosphorus (SRP) losses from STW in England (Bowes, 2010a), with 90% SRP reductions in the Thames since the 1990s (Bowes et al., 2010b; Neal et al., 2010), P removal has not been as rapid in the UK as in other Northern European countries (Foy, 2007).
2. **Blaming other farmers for DWPA** (n = 6)
3. **Blaming the weather for water quality problems** (n = 6), *'farmers are not in charge of extreme weather events'*
4. **Complete denial of their practices making any contribution to DWPA** (n = 6).

The above themes were not mutually exclusive. For example, one farmer denied that his farming practices contribute to DWPA 'at all', blaming both other farmers and sewage instead.

'It tends to be a few farmers causing the pollution (mainly surface spreading slurry on maize stubble) along with human sewage overflows, rather than us careful farmers that spread [slurry] thinly year-round on grassland safely without polluting!' (OQS respondent #42, arable, 50-99ha, 35-44).

This farmer had not engaged with CSF, supporting the hypothesis that those who do not believe they contribute may not see engaging with DWPA advice as relevant.

A minority (3.2%, n = 7) of respondents posited that their practices do contribute significantly to DWPA, with some (n = 6) providing qualitative answers: '*We do cause environmental damage, and it must be controlled and mitigated where possible*' (OQS farmer #85, grazing livestock, 65ha, 65+). This farmer, by recognising his contribution to environmental damage, may be likely to perceive CSF advice as relevant as seeking advice may enable him to restore their sense of self-integrity. Ending with '*where possible*' does, however, allude to situational factors; if a farmer is not in a strong financial position, they may not engage with CSF due to lacking agency to change behaviour. This is a likely issue as just 20 (9.2%) of the 217 respondents who answered this question posited that their farm business was performing 'very well'.

CSF-engaged and CSF-unengaged farmers were equally likely to deny that their practices contribute significantly to DWPA (CSF-engaged average = 2.23, CSF-unengaged = 2.36). The hypothesis that acceptance (and admittance) by farmers that their practices contribute to DWPA would be higher amongst the CSF-engaged was, therefore, rejected by the OQS data, suggesting that even CSF-engaged farmers may not have been shown credible evidence proving whether their farming practices likely contribute to DWPA. This led to the development of a new hypothesis: that CSF may be failing to persuade all farmers that their practices contribute to DWPA. Providing farmers with more 'hard' evidence surrounding DWPA may, therefore, increase the perceived CRELE of the initiative.

The following section will examine whether the dissemination of 'hard'⁴⁰ evidence surrounding DWPA by advisors may offer a CRELE mechanism for encouraging farmers to acknowledge their contributions where the evidence shows they are substantial. Accepting that they are contributing a significant amount to DWPA will likely threaten their self-integrity. As a result, these farmers may be more likely to perceive (re)engaging with CSF as relevant so they can restore their self-

⁴⁰ Where the term 'hard' was interpreted by the research participants

integrity by implementing recommended measures to reduce their contributions to DWPA.

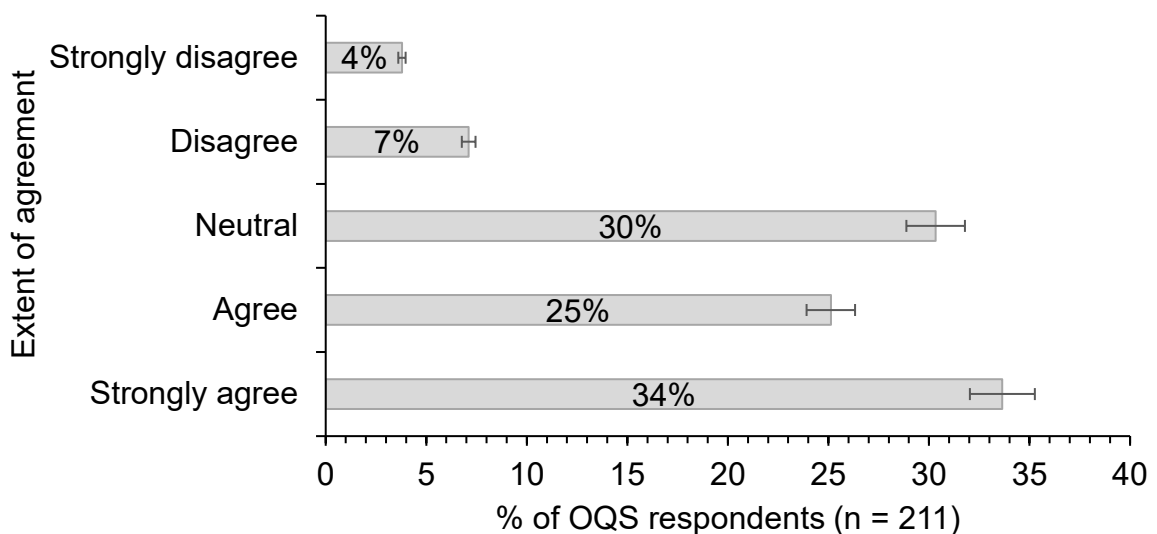
4.4.2. Would farmers like to be shown more 'hard' evidence surrounding whether their farming practices contribute to diffuse water pollution from agriculture by advisors?

As outlined in chapter 1, the OQS began to explore whether the provision of more 'hard' evidence surrounding DWPA may increase the CRELE of CSF. Farmers were asked to respond (on a 5-point Likert scale) to two statements:

- *I would like to be shown more hard evidence that indicates whether or not my farming practices contribute to water pollution*
- *I would like to learn more about the methods that can be used by scientists to test water pollution levels*

Most OQS participants agreed that they would like to be shown more 'hard' evidence surrounding whether their farming practices contribute to DWPA (average = 3.78 ± 0.148), with just 10.9% ($\pm 4.2\%$) of farmers disagreeing (figure 4.8). Moreover, 63.5% ($n = 134$ of 211) of farmers agreed or strongly agreed that they'd like to know more about the methods used by scientists to monitor water pollution levels.

Figure 4.8. OQS respondents' reactions to 'I would like to be shown more hard evidence that indicates whether or not my farming practices contribute to water pollution' (n = 211).



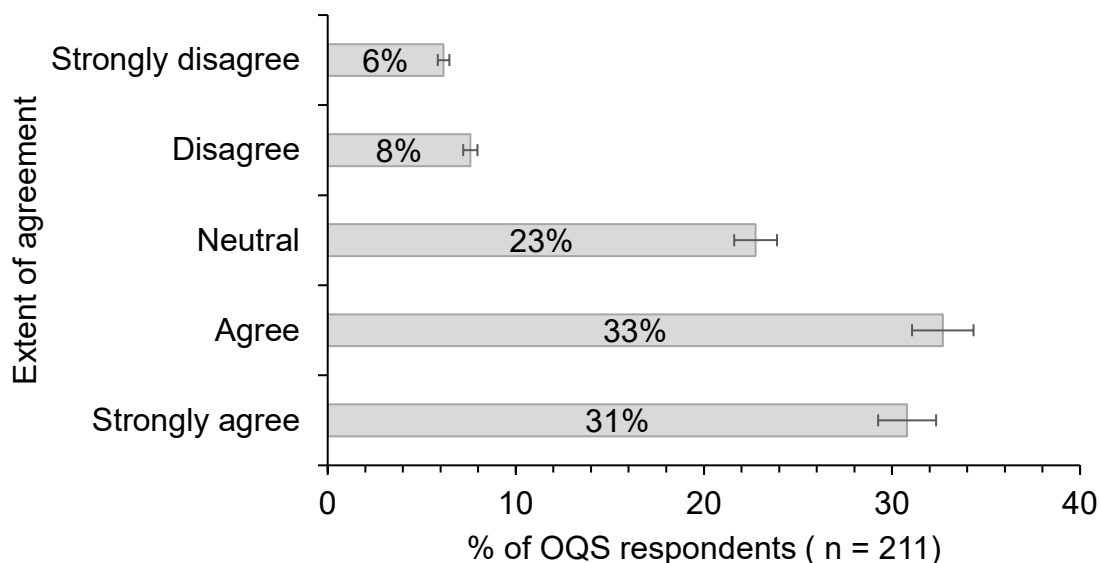
No significant associations (see section 4.1.2) were found between farmers' desire to be shown more hard evidence surrounding DWPA and dominant farming enterprise, farm size, age, region, level of education, organic status, current business performance, or predicted economic prospects in 5 years (99% CI; see appendix, section 4.4.2). Table 4.3. displays the significant associations which were revealed. These findings indicate that pro-evidence farmers may already have more positive views of CSF than those who disagreed with the statement.

Table 4.3 Characteristics significantly associated with responses to the statement 'I would like to be shown more 'hard' evidence that indicates whether my farming practices contribute to water pollution'.

Characteristic	Significance (Fishers' exact test)	Association
Believes CSF is a successful initiative*	(χ^2 (16, 199) = 32.369, 0.003)	Positive
Finds advice surrounding water pollution repetitive*	(χ^2 (16, 199) = 32.518, 0.003)	Positive
Would like to learn more about the methods used to test water pollution levels*	(χ^2 (16, 205) = 50.221, <0.0001)	Positive

*Identified from a series of statements whereby OQS responded on a scale of 1-5, where 1 = strongly disagree, 5 = strongly agree.

Figure 4.9. OQS respondents' (n = 211) reactions to 'I would like to learn more about the methods that can be used by scientists to test water pollution levels.'



Farmer respondents were then asked to elaborate on their answers to the above statements. The qualitative data surrounding 'hard' evidence resulted in three themes:

1. A clear desire to be shown more 'hard' evidence (n = 12)
2. A caveated desire to be presented with 'hard' evidence (n = 11)
3. No desire to be shown hard evidence (n = 3).

Some farmers indicated that they are unable to make informed decisions without being shown this 'hard' evidence, including whether (re)engaging with further advice is relevant to them.

'Unless we are more informed about our own area's problems, we don't know what we need to do. Generalisations don't help because some areas are worse than others.' (respondent #148, arable, 50-99ha).

This farmer also reiterated the importance of this evidence being local, a view shared by some (n = 11) other respondents: *'Some areas are very specific and localised. Things need to be on catchment level and taken in context'* (respondent #195, dairy, 18-34, >200ha). These farmers (n = 11) also had other specific requirements of 'hard' evidence surrounding DWPA. Firstly, respondents suggested that evidence would be perceived as more credible where it

acknowledges the heterogeneity of farming. Secondly, some exhibited a desire to be shown 'hard' evidence as long as they were not 'demonised' in the process. This view alludes to the 'legitimacy' component of CRELE. It is, therefore, an important consideration to be made when disseminating evidence if farmers are to be willing to engage with this evidence. Lastly, respondents highlighted the importance of presenting evidence at an appropriate level, using '*everyday terminology*'. These narratives indicate the importance of presenting evidence in a credible manner; evidence may be highly robust but may not be perceived as such by farmers if it is not disseminated appropriately.

As detailed in section 1.2 and 2.1, respectively, the complexities of the source-pathway-receptor cascade and the presence of legacy nutrients deem scientific evidence unable to 'pinpoint' sources of DWPA. Only a single outlier had unrealistic perceptions of what 'hard' evidence can offer; '*to be able to pinpoint pollution from land would be a great step forward*'. Despite suggesting they would like 'local' evidence, no other farmers indicated what they mean by 'local' (i.e., catchment-, field- or farm-scale). This is explored in further detail in chapters 5-8 where participants were asked what they mean by 'local'.

4.4.3. A potential additional mechanism for delivering advice surrounding DWPA: Video content

As most video content is accessed online, it was essential to begin by exploring how frequently respondents use the internet to seek farming information (if at all). Most of the 219 respondents who answered this question claimed to use the internet for this purpose once a week or more often (80.4%, n = 179). It must, however, be noted that the OQS respondents were inherently active internet users due to their participation in an *online* survey. The following results can, therefore, only be used to explore the views of internet-using farmers; chapters 5-7 will explore the views of farmers who may not be active internet users.

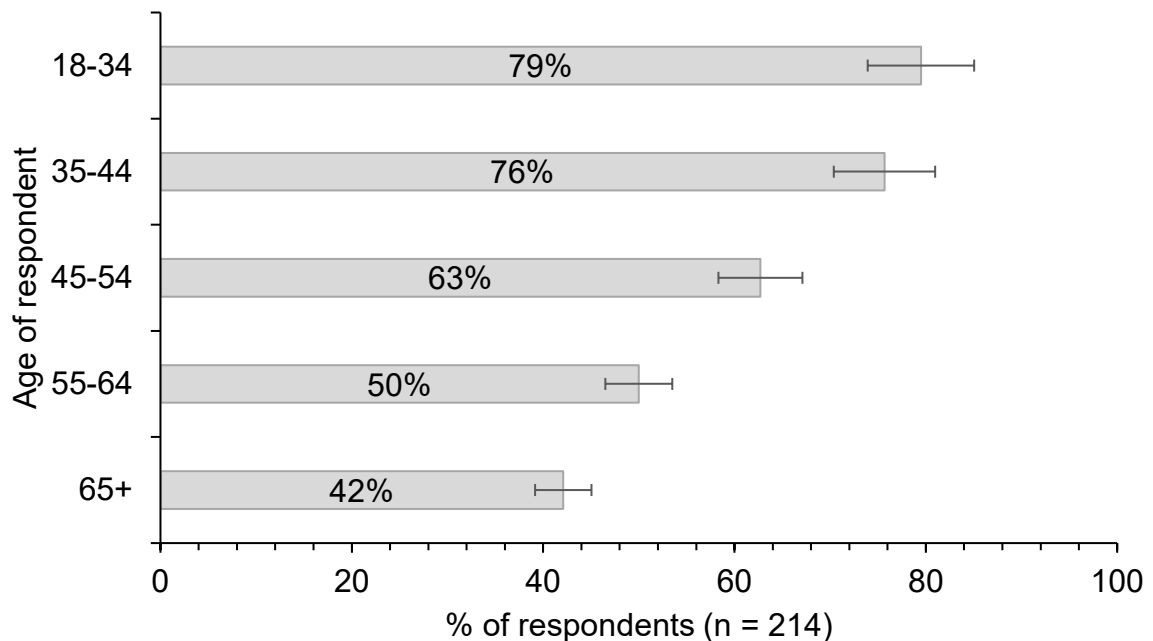
OQS respondents (n = 220) were asked whether they already watch videos to gain information about farming, with the majority agreeing (75%, n = 165). There were no noticeable differences between the characteristics of these farmers. This indicates that videos might already be seen as a credible source of DWPA advice by internet-using farmers as the format was already frequently used.

Farmers were then asked whether they would find it useful if there were more short videos available providing advice surrounding DWPA. Over half of the 219 farmers who answered (n = 137; 62.6%) agreed that it would be useful to have more video content surrounding DWPA advice, whilst 22.4% (n = 49) answered 'I don't know', and 24% (n = 33) disagreed. Of the farmers who indicated they have already watched videos (n = 160), 74% (n = 118) agreed, implying that these farmers have found videos useful in the past.

Significant associations were revealed between whether respondents showed a desire to be shown more video content and age (χ^2 (15, 221) = 25.115, 0.023), gender (χ^2 (6, 221) = 15.550, 0.011), current business performance (χ^2 (221, 15) = 32.861, 0.002) and predicted economic prospects in 5 years' time (χ^2 (18, 221) = 33.569, 0.004) alongside whether respondents have been provided with conflicting advice (χ^2 (18, 221) = 29.952, 0.024), desire to learn more about the methods used by scientists to monitor water pollution levels (χ^2 (12, 211) = 25.529, 0.004). No significant associations (99% CI) were found between whether farmers wanted to be shown more video content and dominant farming enterprise, region, level of education, tenure status, whether they believe their practices contribute significantly to DWPA, whether they've ever engaged with CSF, or their organic status (appendix, section 4.4.3).

There was a clear negative relationship between the desire for video content and age (figure 4.10), likely because younger farmers are more likely to possess IT skills. However, despite the ageing population of farmers in the UK (Defra, 2018), many family farms have a son or daughter present who may watch video content before relaying information to older family members. Moreover, the future farming population will comprise at least some of these 'young⁴¹' farmers as older farmers leave farming. Thus, these new entrants/younger farmers must have access to advice surrounding DWPA which they perceive as CRELE.

Figure 4.10. Age versus agreement that more video content providing advice surrounding DWPA would be useful.



Female farmers were more likely than male farmers to agree that video content could offer a useful source of DWPA advice (n = 18; 78.3% versus n = 119; 61.8%). The small number of female respondents may have skewed this result; however, this finding is unsurprising as many women in farming take care of the administrative side of the business, which may include seeking information online (Riley, 2009). Dairy farmers were the most likely dominant farming enterprise to indicate that they would find videos providing DWPA advice useful (n = 22; 78.6%). There was, however, no difference between the other farming types, and farm sizes both in terms of hectareage and number of FTEs also did not affect the perceived utility of video content (see appendix, section 4.4.3).

Of the farmers that agreed that videos may offer a useful source of DWPA advice, 123 provided qualitative elaboration. The positive themes included:

1. **Personal preference for watching videos rather than reading** (n = 52), largely because they find it mechanism easier to understand (n = 12) and absorb (n = 7) due to their visual nature (n = 12): *'I retain more information [watching videos]'*;
2. **Convenience** (n = 28): *'I can watch them from the tractor seat on my mobile phone. I'm then able to learn as I'm working. If it's wet, I can watch*

them in the office; it's faster to watch a video than read.' (respondent #56, arable, 18-34, Cambridgeshire, 1200 ha)

3. **The ability of videos to provide practical demonstrations** (n = 23):

The ability of video content to be timely was also mentioned by a few of these farmers (n = 5). Some of these farmers also provided caveats to their agreement that videos could offer a credible source of DWPA advice (n = 10), positing that these videos must be short (n = 8), unbiased (n = 1), and good quality (n = 1).

Of the farmers who disagreed that videos could offer an additional source of advice relating to DWPA, 32 provided reasons. Two key themes were identified:

1. **Farmers' personal preferences** (n = 10), primarily characterised by farmers who prefer reading: *'Reading gives you more time to digest and understand the information, as well as being able to re-read immediately to obtain the true meaning'* (respondent #207, dairy, 55-64, 100-199ha)
2. **Distrust in video content** (n = 8): *'With so many independent people putting their views out there you never know if it's genuine'*; (respondent #6, grazing livestock, 35-44, Northamptonshire, 20-49ha) *'They are mostly made by stupid, pompous windbags, e.g., the AHDB and NFU, the last people to listen to for advice'* (respondent #88, mixed, 55-64, 100-199ha). Farmers who referred to this theme aligned with a 'reclusive traditionalist' typology towards environmental schemes and initiatives (as described by Jansen *et al.*, 2010).

Minor negative themes surrounding videos included connectivity issues (n = 3), information overload (n = 2), time constraints (n = 2), difficulties associated with finding videos (n = 1), and the age of the farmer (n = 1).

4.5.1. Preliminary recommendations for improving the CRELE of the CSF initiative based on the OQS results

This baseline OQS has provided an initial indication into how CSF could be improved to maintain credibility and relevance according to farmers, for example by improving the quality of advice and providing farmers with 'hard' evidence surrounding the likely contribution of their practices to DWPA alongside

alternative sources of advice (e.g., videos) in conjunction with existing approaches

The following preliminary recommendations based on the OQS findings will be explored further in upcoming chapters:

- The quality of CSF advice should be consistent, with all advisors ideally long-term and with practical agricultural experience
- The CS water quality priority boundaries within which CSF operates may need reassessing
- Showing farmers more 'hard' (scientific) evidence surrounding DWPA may increase the likelihood of farmers (re)engaging with the initiative to seek further advice
- Short, high-quality video content may offer a potential additional advice delivery mechanism in conjunction with existing approaches

4.5. Conclusions

The OQS began to answer some of this study's research questions (chapter 1) by providing baseline findings into how CRELE farmers perceive CSF and the initiative could be improved, thus building upon existing literature surrounding the complex behavioural context of CSF (e.g., Fish, 2014). Most surveyed farmers posited that CSF is successful; however, multiple ways in which the initiative could be improved were identified (section 4.4.3). As the first known exclusively *online* survey of farmers surrounding CSF in conjunction with other methods, this methodology, and therefore, the findings are novel. This is the first known research that provides empirical evidence that farmers perceive the initiative as less credible as a result of having a high turnover of CSFOs and as less legitimate due to how CS water quality priority boundaries are allocated. The following chapter will explore the findings of the farmer telephone interviews, which provide further insights into the views which have begun to emerge in this chapter.

Chapter 5

Farmer telephone interviews: Building rich insights into farmers' perceptions of DWPA advice and how its efficacy could be improved

The OQS (chapter 4) provided preliminary answers to the research questions defined in chapter 1. The farmer telephone interviews (FTIs), by gathering a mixture of qualitative and quantitative data, build upon these initial findings whilst introducing new narratives.

The FTIs achieved three objectives that contribute to the overarching research aim of this study (section 1.1). Firstly, they contribute to the investigation into how farmers believe the CRELE of the CSF initiative and other sources of DWPA advice could be maintained and improved. Secondly, they continue to explore whether farmers perceive the dissemination of more 'hard' evidence surrounding whether farmers' practices make a significant contribution to DWPA as credible and relevant. Thirdly, the FTIs further investigate the potential of video content for providing an additional source of DWPA advice in conjunction with existing approaches.

5.1. FTI Methods

A full protocol of the FTIs is available in the appendix (section 5.1).

The FTIs were semi-structured. This approach meant that the protocol consisted of structured questions to ensure the topics covered related to the aims of this study, followed by spontaneous probing questions depending on how the participants responded to the predetermined questions. This semi-structured approach resulted in detailed conversations surrounding each topic and allowed participants to steer the conversation based on their priorities. The interviews were brought to an end with a closing question which encouraged farmers to provide any additional views which they perceived as important (figure 5.1). In addition, participants were given the opportunity to sign up to receive outputs from this study.

Figure 5.1. Topics covered during the FTIs.



5.1.1. Recruiting farmer telephone interview participants

Meeting potential participants at farming events (see appendix, section 5.1.1 for a list of events attended) was the primary recruitment strategy adopted for the FTIs, with 85% (n = 51) of participants recruited in this manner. Meeting farmers at various events proved a valuable recruitment strategy as it allowed the researcher to build rapport and foster trust through meeting participants in person and allowed the researcher to explain the importance of the research. Moreover, the organisers of these events often allowed me to make a short announcement about the project to make farmers aware that I would be approaching them during breaks or after the event. This strategy of approaching farmers in a friendly manner was hugely successful; on a few occasions, almost all attendees at an event provided their contact details. Moreover, this strategy overcame GDPR requirements as it allowed farmers to give their verbal and written consent to being contacted for an FTI (or FFG, see chapter 6).

Attending events was, however, logistically challenging as it was time-intensive and financially costly. Some FTI participants (n = 9) were, therefore, recruited by using publicly available contact details obtained from Yell.com. These farmers were sent letters or emails containing preliminary information about the FTIs before being expected to reach farmers who may not attend farm events and thus may have different characteristics. Using the 'Yellow Pages' to identify farmer participants has been criticised due to the over-representation of large farmers who actively market themselves (Burton & Wilson, 1999). This approach was, however, only used to recruit a few participants, thus this was not a significant issue.

Both recruitment strategies overcame the limitations caused by the latest GDPR legislation whereby it is no longer permitted for contact details to be shared freely by third parties without permission from the contacts themselves. As such, approaching potential participants myself appeared simpler than attempting to recruit participants through gatekeepers.

5.1.2. FTI sample

The FTIs (n = 60) were carried out between 16/11/2018-25/03/2019 and 23/05/2019-20/11/2019 and lasted 16 minutes on average (ranging from 8-40 minutes). The recruitment methods used meant that meaningful response rates could not be calculated; however, 89% of farmers met at events participated in the FTIs.

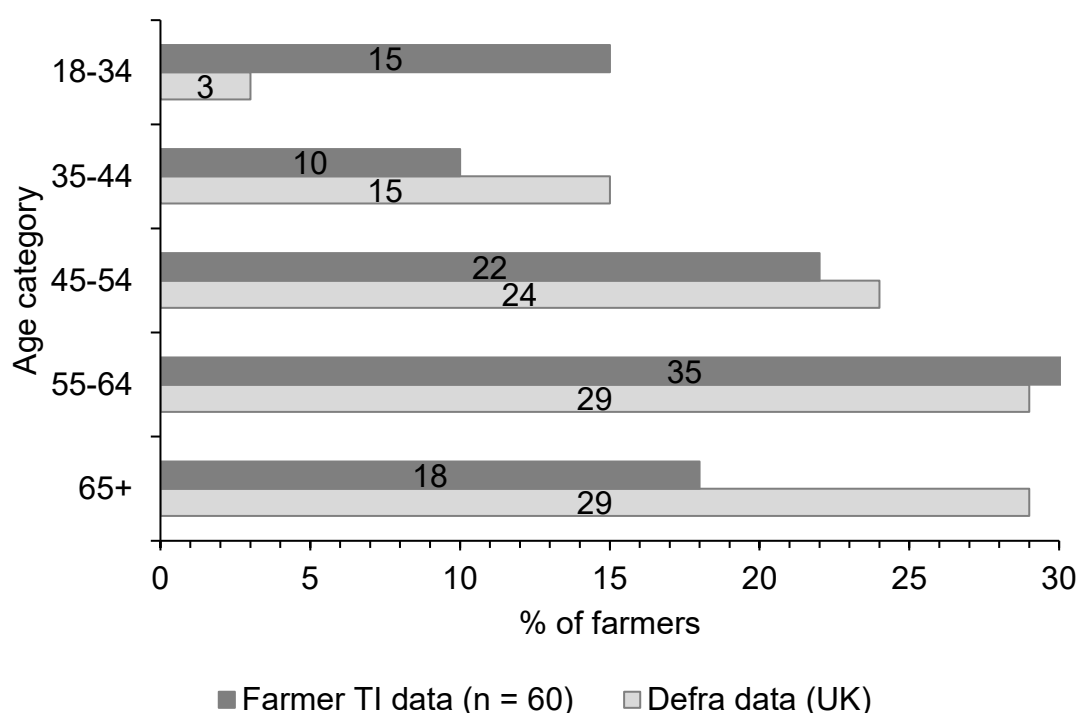
Figure 5.2 illustrates the distribution of FTI participants. The lack of coverage in the Midlands was because attending events across the entirety of England was unfeasible within the scope of this research (see section 5.1.1). Nonetheless, the sample spanned large areas of England (figure 5.2).

The structural characteristics gathered during the FTIs were consistent with those collected during the OQS (table 4.1), thus allowing comparisons to be made during triangulation (chapter 9). Most (n = 55) FTI participants were male. The average time spent in farming was 29.6 years (ranging from 3-69 years), and the average age of farmer respondents was 52 (range 20-84). Figure 5.3 compares FTI participants' ages and national statistics; as discussed in section 4.1.4., these data are based on the entirety of the UK rather than England alone (Defra, 2018). The ages represented by the FTIs were similar to those seen in the OQS (figure 4.4.), whereby young farmers (18-35) were over-represented, and older farmers (65+) were under-represented, likely due to the same reasons given in section 4.1.4).

Figure 5.2. Distribution of FTI participants (n = 60) across England.



Figure 5.3. Age of FTI participants versus national (UK) data (Defra, 2018).

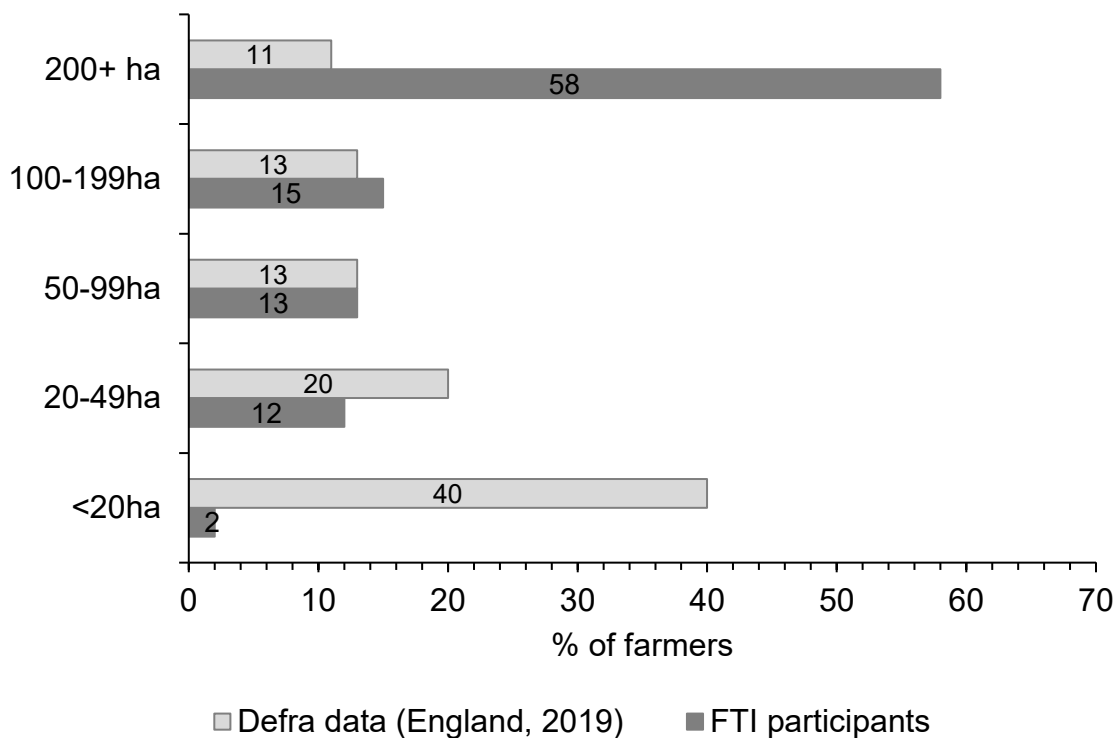


Similar to the OQS survey, small farms (<20ha) were under-represented whilst large farms (>200ha) were over-represented; the average farm size was 378ha (12-2500ha) (figure 5.4). Farming types covered by the FTIs include grazing livestock (n = 24), arable (n = 20), dairy (n = 8), mixed (n = 7), and specialist poultry (n = 1). The FTIs gathered a higher proportion of GL farmers than the OQS. Some FTI participants operated some or all of their farms organically (n = 4, 6.7%), and participants had an average of 2.7 FTE^{42s} (range 1-11) working on their holdings.

Most (n = 23, 38%) FTI participants were educated to O level/GCSE level or above (college diplomas (n = 10, 17%), A levels (n = 2, 3%), City and Guilds (n = 4, 7%), HND (n = 3, 5%), degree level or above (n = 12, 20%). A few (n = 3, 5%) participants hadn't completed any formal education.

⁴² FTE = full time employees

Figure 5.4. FTI participants' farm sizes (n = 60) versus national farm size data (Defra, 2019b).



Farmers were asked to posit how well they believe their farm business is currently performing (on a scale of 1-5, where 1 = very badly, 5 = very well). The average score was 2.9, with most believing they are performing slightly below 'average'. On the same scale, participants indicated how they predict their farm businesses will be performing in five years. Some farmers (n = 6) stated they were unable to provide an answer due to uncertainty, with most referring to the political circumstances at the time of the interviews (i.e. Brexit). Of the 55 farmers who predicted their five-year economic prospects, the average was 2.8. When these findings were compared against their current business performance, participants were equally likely to believe that their prospects will improve (n = 18), remain the same (n = 19), or worsen (n = 18).

5.2. FTI results

5.2.1. FTI participants' views surrounding CSF

Most FTI participants had previously engaged with CSF to some extent (n = 44, 73.3%). A few farmers (n = 3) claimed to have altered their practices as a result of CSF. For example, one farmer converted to ferric phosphate (FTI #6, arable, contract farmer, 4900ha), whilst another undertook farm infrastructure works by concreting their yard (FTI #38, grazing livestock, 160ha + common grazing). The high proportion of CSF-engaged farmers was likely due to the recruitment strategy used (see section 5.1.1). Many participants recruited at events had likely engaged with CSF at some point, not least because many of the events I attended were run by or attended by CSFOs.

Of the participants (n = 16) who were CSF-unengaged, most (n = 11; 45.8%) were grazing livestock or mixed farmers (n = 3; 42.9%). The average age of these farmers was 57, slightly older than the average (51) for all FTI participants. There was a clear difference between engaged and unengaged farmers in terms of how useful they have found DWPA advice. Whilst CSF-unengaged farmers, on average, posited finding the DWPA advice they've received 'quite useful' (average = 3.2), engaged farmers found it 'very' useful (average = 4.2). There were no differences identified between these participants and farm size, education level, time in farming, number of FTEs, organic status, business performance, or gender. A figure presenting how useful FTI participants have found DWPA advice in the last 3 years is provided in the appendix of this study (section 5.2.1).

5.2.2. Positive sentiments surrounding CSF

The following themes were identified when analysing positive views surrounding CSF:

1. **Quality of CSF advice** (n = 13)
2. **The availability of grant funding** (n = 11)
3. **Trusted CSFOs** (n = 6)

Most farmers who referred to CSF advice as high quality did not give particularly detailed answers, with many merely stating that they have found CSF advice of high quality. Regardless, several sub-themes arose surrounding positive sentiments relating to the quality of CSF advice, including finding CSF-led meetings useful (n = 7), finding CSF advice educational (n = 5), and the view that CSF advice is ‘farmer-friendly’ (n = 2). The following quote represents the views of farmers who viewed CSF advice delivery as of high quality: *‘They keep me informed, they’ve put on courses, seminars, and the people I deal with are very nice, open, friendly, people’*. (FTI #7, arable, 500ha). Another farmer remarked that CSF had taught him the importance of handling farm chemicals more carefully: *‘Very useful! We heard that 1 grain of Metaldehyde in a million litres or whatever of water and they trace, so you’ve got to be very careful when you’re handling it haven’t you?’* (FTI #6, cereals, contractor, 4900ha).

The availability of grant funding

Some (n = 11) farmers had positive views of CSF either because they had obtained grant funding due to support from their CSFO or because they were aware of the opportunity to do so.

‘I engaged mostly because of the (...) water capital only grant scheme so it’s the carrot that made me get engaged and the reward has been securing grant funding for capital items’ (FTI #49, mixed, 150ha).

The above quote indicates that certain farmers may only engage with CSF due to the prospect of securing funding. This emphasises the importance of this support provided by CSF as this funding may lead to behaviour change and/or water quality improvements in farmers who may otherwise be reluctant to engage.

Trusted CSF advisors

The importance of agricultural advisors being well-trusted by farmers is well recognised (Kemp *et al.*, 2000; Ingram, 2008; Fisher, 2013; Sutherland *et al.*, 2013; Garforth, 2015). Where a farmer does not trust an individual advisor, it is unlikely that they will engage with or uptake advice and information (Fisher, 2013). The FTIs provide further evidence that trust is accrued where advisors have a good rapport with the farmer, are long-term, and provide impartial,

personalised, and relevant advice (Sutherland *et al.*, 2013). For example, one farmer expressed trust towards his CSFO:

'I've got a good relationship with my local officer so he's not gonna bang on about stuff we're already doing (...) CSF's quite a good non-regulatory advice service without being judgemental and without being a stick' (FTI #13, arable, 320ha).

Another farmer also referred to the 'carrot' nature of CSF as fostering trust in his CSFO:

'I'm lucky to have the CSFO that I do, he wants to get to know everybody in the area, then when he does come on-site he doesn't just turn up, he books an appointment and if he does see something that isn't right, he's very professional in how he handles it, and he finds a solution to the problem that doesn't involve a stick, he uses a carrot. You don't feel you're being inspected and so you feel more open and willing to engage, and therefore there are positive outcomes for everyone.' (FTI #49, mixed, 150ha).

5.2.3. Negative sentiments surrounding CSF

Many (n = 24) farmers shared negative views towards CSF, resulting in 52 references. Two clear themes were identified from these: structural issues (n = 14, 24 refs) and sentiments surrounding the quality of CSF advice (n = 13, 28 refs).

Structural issues with CSF

Several farmers (n = 7) had issues with the (in)accessibility of CSF, largely relating to how CS water priority boundaries are allocated. Those located outside these boundaries expressed a feeling of exclusion: *'We've received very little advice on pollution (...) We're in an NVZ but not quite in the red catchment area, we're in the orange, so we don't seem to get looked after very well'*. (FTI #11, arable, 450ha). Another farmer outside the CS water quality areas found it difficult to secure resources due to being outcompeted by farmers who have secured grants:

'I'm not in the right area. (...) We are quite important in terms of diffuse water pollution, but weirdly everyone seems to leave us alone altogether! We're not eligible for any grants. (...) I wanted to buy some railway sleepers to help pollution and compaction, and I have to bid against people who've got massive grants to buy the same thing, they can pay most of the cost of it from their grants, and I've gotta pay for it all, and that means they can pay more and get them, so it's very difficult. It's a good thing for those who've got it, a bad thing for those who haven't.' (FTI #57, dairy/beef, 200ha).

A few of these farmers also contended that there is a lack of CSF coverage even within priority areas, with some struggling to contact CSF and others arguing that the initiative has failed to publicise both its own presence in the English AKIS and the existence of regulations for protecting water quality.

Some participants (n = 5) perceived the bureaucracy surrounding the CS water capital-only grant scheme as excessive:

'It's getting more complicated as the years go on because of paperwork and administration, that's the biggest problem now'

Researcher: Has that changed in recent years?

'Oh definitely. It was a simple, straightforward thing to do when it started ten years ago; it has gradually got more and more complicated'

- FTI #58, dairy, 280ha.

A couple of farmers (n = 2) also referred to experiencing a high turnover of CSFOs due to officers being subjected to short-term contracts: *'It's unfortunate in our area we've had a change of officer. It takes a little while to get to know the officer. We've probably had three in the last four years'* (FTI #10, arable/dairy, 970ha). This high turnover of CSFOs could reduce the credibility of CSF as long-standing advisors are vital for building trust (Fisher, 2013).

Quality of CSF advice delivery

Numerous sub-themes relating to all three CRELE attributes emerged. Firstly, some farmers stated that CSF advice is too 'obvious' (n = 5):

'A lot of it is pointing out the obvious! We're here every day so we can actually see it, we want more targeted help on actually coming up with solutions instead of pointing out the obvious (laughs)' (FTI #21, dairy, 200ha).

A few (n = 3) farmers also perceived their CSFO as lacking farming experience and therefore credibility; *'I think a lot of it you gain from farming experience, you know more...not being horrible but you know your own ground...'* (FTI #3 arable, 200ha); *'Give them a good kicking, I'll repeat that because they don't understand how things work as farmers'* (FTI #39, GL, 140ha). These farmers portrayed scepticism towards CSF due to the perception that they possess more relevant knowledge than their CSFO, thus having clear implications for the relevance and legitimacy components of CRELE.

Some farmers (n = 4) also argued that CSF advice is not practical or solution-based enough (n = 4): *'If the advice actually offered solutions instead of just a report (...), it would have a lot more legs to it'* (FTI #21, dairy, 200ha). Lastly, a couple of farmers (n = 2) perceived CSF advice as biased, thus affecting the initiative's legitimacy.

5.3. Farmer engagement with other purveyors of DWPA advice

The lessons learnt from exploring farmers' perceptions of advice surrounding DWPA delivered by various organisations other than the CSF initiative was expected to provide valuable insights into how CSF itself could be improved.

FTI participants were asked to indicate, from a list, which advisory entities they had engaged with for DWPA advice (figure 5.5). Unlike the OQS, the FTIs focused on exploring which more formal organisations/initiatives farmers use for DWPA advice rather than the more generalised sources of information (e.g., the farming press). The entities which were listed do, however, provide varying levels of DWPA advice and information (see table 1.1). It was, therefore, interesting to gauge whether farmers saw the entities who do not focus on delivering this advice as entities they would engage with should they require DWPA advice. Farmers were also given an opportunity to add any other sources of this advice to the list.

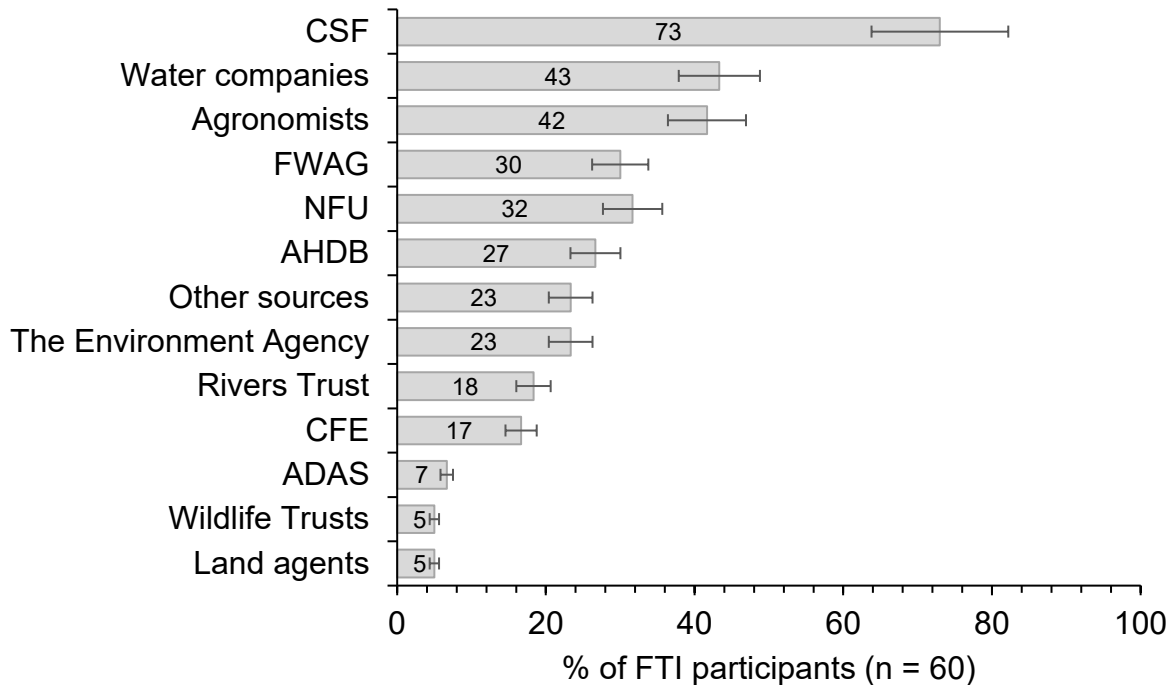
CSF was the main source of DWPA advice used by FTI participants (n = 44; figure 5.5). This was unsurprising as CSF is the main provider of free DWPA advice in England, engaging with almost 20,000 farms between 2005-2018 (Environment Agency, 2019d, see section 1.4).

Many FTI participants (43%; n = 26) had also used water companies for DWPA advice. These farmers, when probed, stated that they were willing to seek advice from water companies primarily due to the knowledge that they often offer funding for practice uptake or capital items. Other participants saw water companies as holding some responsibility for water quality, thus believed they should be involved in efforts to improve it: *'They're the ones who want cleaner water aren't they (...) that's why water companies should get involved, it's part of their industry as well'* (FTI #48, arable, 340ha). Engagement with water companies was, however, subject to some regional variation. This variation is, likely because individual regional water companies have made more concerted efforts than others to deliver advice. For example, Wessex Water has become a highly active purveyor of DWPA advice in recent years, employing several catchment advisors (Wessex Water, 2020).

Though their main priority is agronomic efficiency rather than water quality, agronomists were also relied upon for DWPA advice by many participants (42%, n = 25, figure 5.5). Some farmers, however, exhibited distrust towards agronomists due to a perception that many agronomists are driven by profit: *'Agronomy companies are becoming quite proactive (...) because there's a buck in it for them'*. (FTI #14, arable, 580ha). Previous research also found that a lack of trust (and, therefore, credibility) characterises many agronomist-farmer exchanges (Ingram, 2008), in part due to the tendency of some agronomists to recommend unnecessary agrochemicals. Some FTI participants also shared this view. Other FTI participants, however, shared positive sentiments about their agronomists, aligning with Ingram's finding that farmer-agronomist relationships vary in nature. Whilst some of these relationships are strained due to power imbalances (e.g., with agronomists ignoring or underplaying the importance of farmers' experiential knowledge), other relationships are trusting and productive, particularly where agronomists encourage two-way dialogue. This reiterates the importance of advisors possessing social skills alongside technical expertise if

they are to become effective purveyors of advice (Leeuwis, 2000; Carolan, 2006b).

Figure 5.5. FTIs were asked to indicate, from a list, which advisory entities they have engaged with for DWPA advice.



Several barriers were identified which prevent FTI participants from engaging with any DWPA advice. The most common barriers were age (n = 7) and financial constraints (n = 5). Farmers who referred to age generally felt they were ‘too old’ to try new things, thus did not feel motivated to engage with DWPA advice: ‘*You won’t have many clients my age the young ones are all into it, we leave it to them*’ (FTI #31, grazing livestock, 400ha). In general, farmers who mentioned financial constraints wanted to engage with DWPA advice but felt unable to do so due to the perceived costs involved in the uptake of recommended measures: ‘*If I had the money it would be done, but it’s always finances, you know?*’ (FTI #27, grazing livestock, 50ha). They could not, therefore, see the point in engaging with advice as they believed they’d be unable to make any changes as a result. These findings align with some of the issues introduced throughout section 2.3

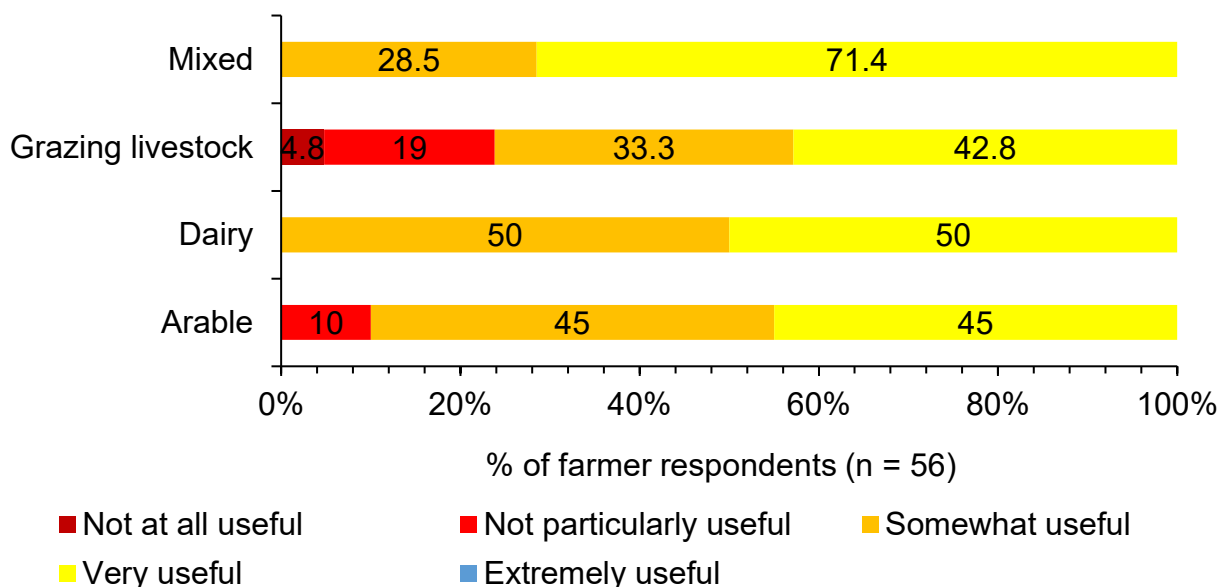
5.3.1. Farmers' perceptions towards DWPA advice from other sources

FTI participants were asked to indicate how useful they had found the DWPA advice they had been given in the past three years (where 1 = not at all, 5 =

extremely useful). Some (n = 4) participants were excluded from this analysis as they had not received DWPA advice during this period. Whilst some farmers (n = 7, 12.5%) stated that the advice they'd been given was not useful 'at all', 39.3% (n = 22) said it was 'somewhat' useful, whilst 27 (48.2%) found it 'very' useful. The average score was 3.96, indicating that most FTI participants have found advice surrounding DWPA useful. No farmers, however, found DWPA advice 'extremely' useful, indicating that there is scope for improvement.

Farmers from different farming types had varied views of DWPA advice (figure 5.6), with mixed and dairy farmers finding it the most useful. Most of the participants who did not find the DWPA advice received in the last three years useful were GL farmers (n = 5), comprising 20.8% of the farmer participants from this sector. The average age of farmers who didn't find advice useful was 59 (versus 52.3 overall), with all of these farmers aged 46-74. No other structural characteristics were shared between these farmers. No other structural characteristics were related to how valuable participants have found DWPA advice.

Figure 5.6. Farm types versus how useful FTI participants have found the DWPA advice received in the last three years.



5.3.2. Negative sentiments surrounding DWPA advice from organisations other than CSF

Several FTI participants (n = 18) provided negative sentiments surrounding the DWPA advice they've been given by sources other than CSF, resulting in 43 references due to most sharing more than one opinion. The following key themes were identified:

1. **The perception that advisors are agenda-based** (n = 9): *'Their message is driven by their own agenda and politics, it can be narrow-minded'* (FTI #49, mixed, 150ha).
2. **Information overload** (n = 4): *'The trouble with farming is that there's so much information coming towards us all the time, it's hard to keep up!'* (FTI #8, dairy, 220ha)
3. **Accessibility of advice** (n = 4), for example, where farmers have found it challenging to identify or engage with suitable advisors or where advice is only available to members
4. **Structural issues** (n = 4), including excessive bureaucracy: *'We did qualify for the grant, but the admin process got so complicated that we were just as well to crack on and just fund it ourselves'* (FTI #21, dairy, 200ha) and short-term schemes; *'There was a very useful scheme, they monitored N levels, and we followed a regime of fertiliser activity which they actually paid us for, it lasted for three years, but unfortunately it ended before it did any good'* (FTI #20, arable, 150ha).
5. **Quality of advice** (n = 3): In terms of credibility: *'Many farm consultants haven't got on very well at farming so think they'll have a go at telling everyone else how to farm, and they don't get on so well'* (FTI #21, dairy, 200ha) and relevance: *'We had an event, most of us were grass-fed, but he continued to talk about arable! (...) When somebody gives up half a day on the farm and to then have a cock-up like that is bloody ridiculous!'* (FTI #37, GL, 35ha).

These findings provide novel insights into what makes DWPA advice appear less likely to reach the CRELE thresholds according to farmers, indicating what the

CSF initiative should aspire to *avoid* doing in the future if it is to maintain these desirable attributes going forward.

5.3.3. Positive sentiments surrounding DWPA advice from organisations other than CSF

Farmers from mixed and dairy operations were the most likely to agree that they have found DWPA advice useful over the last three years (n = 28, 46.7%); figure 5.6. The average age of these farmers was 51, indicating that slightly younger farmers may be more inclined to perceive current DWPA advice delivery as CRELE.

Several participants (n = 11) elaborated on their answers, with most referring to the quality of DWPA advice (n = 8), the availability of grants (n = 3), and the collaborative nature of certain advisory organisations (n = 2). DWPA advice was perceived as high quality where advisors are experienced, forward-thinking, practical, engage regularly, and have a clear understanding of farming: *'We are members of FWAG, and they are very helpful (...), they're very sympathetic! [They give] practical advice which sometimes is a bit lacking from other agencies'* (FTI #20, arable, 150ha). According to these farmers, advisors who emphasise with situational circumstances are perceived as more credible: *'He lives in the real world, (...) he seems to grasp that we all wanna do things to the best of our ability but we've all gotta make a living, so I think he comes across very good'*. (FTI #55, specialist poultry, 45ha).

Farming events for delivering DWPA advice

Some FTI participants (n = 6) explained why they attend farming events for DWPA advice. It appears that some farmers attend events to learn, some for the free lunch, and some for the accreditation points (e.g., for BASIS/FACTS or the National Register of Spray Operators (NRoSO); see BASIS, 2019, City & Guilds, 2021 respectively):

'People were there to gain points, and (...) I think...almost if you've got to go, then you do go and so you become educated, but with some events, it's quite easy to just apply for a few points (...) and you've gained no

insight into what everybody's trying to educate the industry about' (FTI #24, GL, 50ha).

This quote also indicates that events are of varying quality, with some events seen as 'tick-box' exercises rather than opportunities to uptake advice.

5.3.4. The potential impact of underlying structures and realities on the efficacy of DWPA advice

Whilst answering several of the questions posed during the FTIs, some farmers (10%, n = 6) claimed that issues with regulations and financial support schemes for improving water quality are affecting the credibility and relevance of seeking DWPA advice. These farmers perceived the enforcement of water quality regulations as ineffective and the bureaucracy surrounding funding applications as excessive, in turn making engaging with CSF less relevant. These narratives arose spontaneously and suggest that the success of DWPA advice may be affected by how credible and relevant other instruments for reducing DWPA are alongside the advice itself.

Some farmers (8%, n = 5) also argued that increased enforcement of water quality regulations might lead to greater uptake of advice: *'If there were financial penalties or if everything were policed better, I think there would be more uptake. Sometimes a few people need to be pulled up short for the rest of the industry to take notice'*. (FTI #14, arable, 580ha). Another farmer argued that he sees CSF advice as less relevant due to it being unfair that he is expected to act environmentally whilst others continue to pollute: *'There absolutely needs to be more enforcement. Why do we bother to be good when there are bad people?'* (FTI #22, GL, 30ha).

In terms of bureaucratic loadings, some argued that they are unable to seek DWPA advice due to their administrative burdens:

'I've got enough on my plate doing the day-to-day, I've spent since 8:00 this morning trying to do reports for Defra (...), that's where I'm stuck at. The bureaucracy has got so big that the time to do this [seek advice] disappeared because all the time you've got bureaucracy' (FTI #17, arable, 400ha).

Despite just 10% (n = 6) of participants referring to this narrative, it is worth noting due to its spontaneity; farmers were not asked about this topic thus it is interesting that it arose at all. Anderson & Feder (2004) also found that the efficacy of wider agricultural extension is often dependent on the broader political context. In particular, it was argued that weak linkages between extension entities and other agencies is detrimental to its success. It is also important to acknowledge this emerging theme as it becomes a clear narrative in the other methods carried out for this study (FFGs; chapter 6 and AFGs; chapter 8).

The potential implications of a fragmented advisory system on the CRELE of DWPA advice

The English AKIS has been described as a complex, fragmented system (Prager & Thomson, 2014). The move towards the privatisation of a key state-funded advisory service, ADAS, in 1997, was seen as *'the most prominent event for many in the dismantling of this system as the AKIS became laissez-faire'* (Curry *et al.*, 2012, p244). This transition led to ADAS withdrawing from working with many of the research centres they previously undertook research with because this was longer financially viable. As a result, much agricultural research and extension became increasingly delivered by private entities and NGOs: *'The AKIS became vertically fragmented as the change in status of ADAS meant that the government has struggled to find the mechanisms to connect research on environmental protection and sustainable agriculture to farmers, as the traditional research-extension links and advisory practices become less relevant to end users'* (Ingram *et al.*, 2011, p6).

A move to make the Ministry of Agriculture, Fisheries and Food part of the newly established Defra in 2001 led to further fragmentation of the AKIS, as the aim of this new department was to respond to increasing pressure on farmers to become more environmentally sustainable (see section 1.2) (Prager & Thomson, 2014). This led to further advice provisioning by environmental NGOs alongside other, more productivity-oriented entities (e.g., agronomists). By 2013, there were, reportedly, >80⁴³ sources of advice and incentives available to English farmers (Defra, 2013b), with a combination of NGOs, public and private entities delivering agricultural advice surrounding DWPA.

⁴³ Please note: many of these sources are only available in particular regions of England.

Several FTI participants (n = 9) referred to the fragmentation of advice as problematic, indicating that the AKIS surrounding DWPA advice remains complex today. It appears that this pluralistic AKIS continues to confuse farmers, potentially leading to a lack of perceived relevance of seeking advice. This confusion was evident during the FTIs as some participants claimed that they had sought advice from a particular advisory entity before remembering later in the interview (often upon hearing the name of a specific entity) that the advice had been from an entirely different entity. These findings align with Garforth *et al.* (2003a, p300) and Curry *et al.* (2012), who suggested that the fragmentation of advice '*may lead to confusion among farmers about where to go for information, duplication and wasteful competition among providers.*'

Some FTI participants (n = 4) suggested that there should be a single source of DWPA advice: '*The problem is lots of different advisory people offering quite similar stuff, whether a central hub would be a better way of doing it...it can be confusing all the ...CFE and CSF and... there's a lot of acronyms!*' (FTI #13, arable, 320ha). Others referred to CSF when lamenting about the fragmentation of the AKIS: '*FWAG and CSF are almost treading on each other's toes (...). Maybe the two need to merge!*' (FTI #17, arable, 400ha). These findings suggest that, as previously recommended by Defra (2013), advisory entities need to become more integrated to achieve credibility and relevance. The CSF partnerships introduced in table 1.2 provide examples of this integration, whereby advisory entities work in conjunction with CSF to achieve water quality improvements.

5.4. The future of DWPA advice delivery

5.4.1. Exploring the potential of increasing farmers' awareness of the likely contributions of their farming practices to DWPA

Farmers' perceived contributions of their practices to DWPA

Despite FTI participants not being directly asked about whether they believe they contribute to DWPA, this arose in several interviews nonetheless (n = 26; 43%). Four themes, similar to those identified from the OQS data, were identified⁴⁴:

⁴⁴ Please note: these themes were not mutually exclusive.

1. **Blaming alternative sources for water quality problems (n = 17)**, including other farmers (n = 7), sewage (n = 6), septic tanks (n = 2), road verges (n = 2), housing (n = 1), and other chemical users (n = 1). *'We were accused of polluting, and it turned out it was the council houses system yet it took a while for them to accept it and then nothing was ever done about it! Very frustrating that they come accusing us...'* (FTI #8, dairy, 220 ha); *'farmers feel they're being picked on, they're an easy target (...), local farmers were being blamed for polluting, and it turned out it was the sewage works!! There was even talk of us having to go into an NVZ, everyone was up in arms, yet it turned out it wasn't us at all!'* (FTI #53, GL, 28ha). Some of these farmers (n = 9) felt unfairly blamed for water quality problems, with some farmers feeling persecuted: *'Men in little vans from [a water company] seems a funny thing... ready to prosecute a farmer at the drop of a hat when THEIR pollution runs into the brook'* (FTI #37, grazing livestock, 35ha).
2. **Complete denial of their practices contributing to DWPA (n = 8)**, thus making them perceive seeking DWPA advice as irrelevant to their farm businesses: *'I don't believe it [my farm] is contributing to the environment... I think it's just an easy target'* (FTI #9, dairy, 100ha). Most of these farmers were relatively small (<200ha) grazing livestock and mixed farmers.
3. **Placing blame on other farmers (n = 7)**: these FTI participants typically argued that dairy or arable farms are causing water quality issues: *'We don't have a lot of water flowing about, it's not as if we're a dairy farm or anything (...) so we don't have what I would perceive as a problem'* (FTI #41, grazing livestock, 68ha); *'It's definitely not us, but there are a couple of local big arable farmers that are quite liberal in their applications'* (FTI #18, mixed, 160ha).
4. **Acceptance of the likely contributions of their farming practices (n = 7)**: These farmers recognised that their practices likely contribute to DWPA: *'A lot of it is obvious, you can see the erosion and the slurry and its obvious it's us'* (FTI #38, grazing livestock, 160ha). These farmers were expected to be the most likely to perceive DWPA advice as CRELE. This is because a recognition that they contribute to a problem may threaten their self-integrity, thus making engagement or uptake of advice more relevant.

5.4.2. 'Hard'⁴⁵ evidence as a potential way to increase the perceived relevance and legitimacy of CSF

Some FTI participants (n = 6) had already been shown some 'hard' evidence surrounding DWPA by advisors, both by CSF and other advisory entities: *'Thames Water have been very good with Metaldehyde monitoring, you get some good evidence from them'* (FTI #14, arable, 580ha). Several farmers (n = 14) had, however, not been shown any evidence relating to DWPA: *'Oh God no, I don't think I've seen anything. We're not given any proof that farming pollutes'* (FTI #50, GL, 12ha (& common grazing)): *'All they ever say is that it's us that's a problem'*. (FTI #42, dairy, 485ha), whilst others (n = 4) argued that they hadn't been shown *enough* hard evidence.

Most (n = 56; 93.3%) FTI participants agreed that they would like advisors to show them more 'hard' evidence surrounding whether their farming practices likely contribute to DWPA. There were no distinct relationships between this and any structural characteristics. The following themes explain why farmers wanted to be shown this evidence:

1. **To prove that other sources contribute to the problem too** (n = 16)
2. **To prove that farming contributes to the problem (in terms of both their own farms and other farms)** (n = 14)
3. **To encourage practice/behaviour change (by themselves or other farmers)** (n = 9)

Several farmers (n = 16) posited a desire to see hard evidence which indicates the extent to which other sources are likely contributing to water quality problems in comparison with agriculture:

'In the river near us a lot of the phosphate pollution comes from the sewer works and people's septic tanks, but I don't know what proportion so it would be nice to know (...) so you could allocate a certain amount to each industry' (FTI #13, arable, 320ha).

Others contended that they feel it is unfair to be blamed for contributing to water quality problems where it hasn't been proven that other sources aren't also at

⁴⁵ All farmers appeared to interpret the term 'hard' evidence as referring to 'scientific' evidence.

fault: *'Do I want to see more evidence? Yes, I would like to know before we get blamed that it is definitely our fault. It is very easy to blame the farmer, and no doubt some farmers are polluting, but other things can be at fault as well'* (FTI #11, arable, 450ha).

Some farmers (n = 14) wanted to be shown hard evidence surrounding DWPA to prove that other farmers contribute to DWPA: *'I would be interested because people causing the problem need to be...we've got our fair share of cowboys, so yes, as long as everyone isn't tarnished with the same brush, it needs to be traced to who's causing the problem'*. (FTI #18, GL, 160ha). Others wanted to see this evidence to prove whether their own farming practices contribute to water quality problems, largely due to a desire to conform to a good farmer identity, with these farmers positing that farming *'shouldn't pollute water'*.

A number of farmers (n = 9) wanted to be shown hard evidence surrounding DWPA to trigger action: *'I would like to see more, (...) that's the first question farmers ask when you're trying to persuade us to change, where's the evidence (...) having good evidence will help persuade people to change their practices'*. (FTI #34, arable, 850ha). Several farmers also felt that hard evidence is crucial for encouraging other farmers to change:

'Yes. 100%! Farmers are a funny breed, they very much stay in their ways of doing things, and without good hard evidence, proof, we're very reluctant to change' (FTI #19, arable, 700ha)

'We do see nitrate, phosphate issues but if farmers could see the clear evidence they might farm differently (...), it's the ones that don't come out and perhaps might occasionally do bad practice, spreading [slurry] on a day like today (...) it's probably those people that we wanna target and if we gave them more evidence...' (FTI #10, mixed farmer, 970ha).

Caveats to presenting farmers with hard evidence

Almost half of FTI participants (n = 20) shared caveats to being shown hard evidence surrounding whether their practices likely contribute to DWPA. These caveats included:

1. **Evidence should not make farmers feel persecuted (n = 9):** *'It depends how that evidence is used if it was just used to batter farmers with, I don't think that would be very useful (...) that information would get taken hold of by the media and used in a farmer bashing way like a lot of things tend to be'* (FTI #21, dairy, 200ha); *'It needs to be not like where everyone's brandished with the same brush, like oh well it's just farmers polluting the rivers because they tend to switch off a bit then'* (FTI #53, GL, 28ha).
2. **Evidence should be relevant to their farm businesses (n = 9),** i.e. local (n = 6) and related to the farm business (n = 4): *'if it highlighted (...) what [we] could do to make better ... where those potential savings would be within their business, then it would have a place'* (FTI #21, dairy, 200ha)
3. **Evidence should be robust, balanced, and unbiased (n = 6):** *'Clear and precise, that's the problem... NGOs get hold of data and statistics get altered or displayed in different ways, so a balanced view, not a blaming view; just a clear where is it coming from, be clear before you stand up there, but I think that's the difficulty is knowing, pinpointing it'* (FTI #13, arable, 320ha).
4. **Evidence should take the delivery of historic pollutants into account (n = 3):** *'[We were presented] data showing implications from 50-60 years ago [but] you think well what we're actually doing now is completely different to then'* (FTI #15, arable, 300ha).

Some (n = 7) participants, however, denied a need to be shown hard evidence due to already knowing that their practices likely contribute to DWPA: *'I don't think we need the evidence; we've all gotta get more responsible, haven't we? It's like all these plastic bags in the sea; there's no disputing they're there'* (FTI #8, dairy, 220ha).

Presenting hard evidence to farmers

Several farmers (n = 16) explained how they believe hard evidence surrounding whether their practices likely contribute to DWPA should be presented to them by advisors:

1. **Using clear, audience-appropriate language (n = 9):** *'Providing it's not in science-speak! It's got to be at a level where farmers get it. I've spoken to people who obviously know their subject very well; you don't doubt that, but then whilst they may start off being non-techy, they then sort of then go off on one, and you think ah well you've just lost me there, mate (laughs)'* (FTI #53, GL, 28ha); *'In a very simple way. I don't want to be baffled by science; I want simple, clear advice.'* (FTI #11, arable, 450ha).
2. **In a visual manner (n = 5):** *'I think it's gotta be an image rather than a long list of numbers'* (FTI #1, mixed, 2500ha)
3. **Concisely (n = 3):** *'We don't want a mass of paper because that doesn't get read, quite honestly.'* (FTI #20, arable, 150ha).

5.4.3. A potential mechanism for delivering DWPA advice in conjunction with existing approaches: video content

A substantial proportion of video content is accessed online. It was, therefore, essential to explore what proportion of FTI participants were internet users. Most (n = 45) claimed to use the internet to seek information/advice surrounding DWPA, whilst some (n = 13), were non-internet users and a couple (n = 2) said that although they don't use the internet, their wives do.

Of the farmers who do use the internet to seek DWPA information/advice, several (n = 16) provided negative sentiments. These negative sentiments primarily related to accessibility (see chapter 9), with farmers finding it challenging to find relevant information (n = 9): *'You trawl for ages before you find things...maybe it's more my problem because I'm not that... it's my age, it's hard work'* (FTI #40, GL, 380ha). This farmer also referred to his age, one of the main situational factors which limited internet usage. Other situational factors cited by farmers included internet access and time constraints. A few farmers also referred negatively to the quality of online information: *'That's the difficulty, sifting out the useful things... the chaff from the straw'* (FTI #24, GL, 50ha).

Other farmers (n = 19) shared positive sentiments towards the internet, mainly relating to the ability to find information easily (n = 10) and the information-rich

nature of the internet (n = 4). These sentiments were both illustrated by FTI #36 (mixed, 84ha): *'It's getting better all the time, I think there's just that much on there that it is useful to go through'*. Several farmers (n = 13) posited a reliance on the internet for farming information: *'I'm an addict! YouTube videos on regenerative farmers, I get told off for watching it. My missus would rather I watch porn, I think! (laughs)'* (FTI #1, mixed, 2500ha). A couple of farmers even suggested that the internet is more useful than engaging with advisors: *'[It's] very useful, more useful than any flipping advisor'* (FTI #27, GL, 50ha); *'If you look for it on the internet you don't then really need someone coming to tell you stuff you already know'* (FTI #22, livestock, 32ha).

These findings provide an initial indication into whether farmers are likely to perceive videos as relevant based upon their ability and inclination to use the internet to access them.

Farmers' perceptions of videos as a potential outlet for providing DWPA information and advice

Many (n = 36) FTI participants believed that videos could offer a useful tool for providing DWPA advice in conjunction with existing advisory approaches, whilst 15 were neutral, and nine disagreed (average = 3.5). The average age of farmers who opposed videos as an approach for providing DWPA advice was 59, indicating that as expected, older farmers may be less inclined to watch videos than their younger counterparts.

Half of the FTI (n = 30) participants shared positive sentiments towards videos. Several farmers (n = 12) had already watched informative farming videos and generally showed positive sentiments towards them: *'I've learned to farm on YouTube, I've learnt more off YouTube than I've ever learnt off anyone else!'* (FTI #27, GL, 50ha). Some (n = 7) farmers expressed a personal preference for videos over other mediums: *'It's quite nice to watch a little video instead of having to read more rubbish... what really gets me is when you get sent piles of paper, and no one has time to read that, but if you can put a video on for a few minutes then you'd watch it'* (FTI #22, GL, 50ha). Some (n = 3) farmers were also keen on videos as they can demonstrate real-life examples and are convenient to watch (n = 3).

Some (n = 17) FTI participants provided caveats to videos becoming a CRELE source of DWPA information/advice, largely relating to their content (n = 13). These farmers posited that videos should be short, specific, and of high quality: *'Yeah, potentially, but you're not gonna sit down and watch a video just out of interest, it would have to be for a specific constraint, what's the advice? If it was well done, short and to the point, yeah'* (FTI #18, mixed, 160ha). Other caveats included that videos should be played at events (n = 5) and that they should be easily accessible (n = 3).

Several farmers (n = 19) shared concerns about the use of videos for DWPA information/advice. These concerns primarily related to situational factors (n = 11). These factors included age (n = 6; *'If it's online I'm not gonna see it because I'm 52, I'm not gonna go... I'd probably end up with some dodgy video instead (laughs) with my online skills, so if it's as a standalone thing, probably not'* (FTI #17, arable, 400ha)), time constraints (n = 3), and internet speed (n = 2): *'the biggest problem we've got is the broadband speed, that deters me more than anything'* (FTI #55, poultry, 45ha). Some farmers also preferred in-person advice or reading over watching videos (n = 5), and a couple were also concerned about videos resulting in a loss of detail (n = 2) or resulting in information overload (n = 2).

5.5. Preliminary recommendations for maintaining and improving the CRELE of CSF based on the FTI findings

The findings of the FTIs result in the following recommendations, some of which are novel whilst others build upon those already identified in the OQS (chapter 4):

- Participants suggested that the structure of the CSF initiative affects the relevance of engaging, mainly relating to bureaucracy, with the results also suggesting that the quality of CSF advice must be consistent if it is to reach the CRELE 'thresholds'
- Most farmers have relatively positive views of DWPA advice from various organisations/initiatives; however, no participants saw it as 'extremely useful' indicating that scope for improvement remains
- The fragmented nature of the advisory system surrounding DWPA is confusing to many, with some calling for more integration

- Farmers may respond well to 'hard' evidence surrounding whether their practices likely contribute to DWPA as this may increase the perceived relevance of seeking CSF advice
- Most farmers agreed that videos may offer a useful source of DWPA advice in conjunction with existing methods of advice delivery
- Farmers may perceive seeking advice surrounding DWPA as increasingly unattractive where bureaucracy remains excessive and enforcement is perceived as ineffective for dealing with polluters.

5.6. Conclusions

The FTIs have explored some of the topics covered in the initial OQS in greater detail, providing deeper insights into how the CSF initiative may maintain CRELE. Novel narratives were also introduced, including the finding that many farmers find the fragmented nature of the DWPA advisory system confusing, and the suggestion that the CRELE of CSF advice may be influenced by the efficacy of the current policy pillars and associated instruments for water quality. The following chapter will explore the findings of the FFGs.

Chapter 6

Farmer focus groups: An in-depth qualitative exploration into the perceived efficacy of DWPA advice

Conducting FFGs enabled the collection of more in-depth qualitative data pertaining to the research objectives introduced in section 1.6. Placing farmers in group situations on a face-to-face basis was expected to elicit rich collective discussion leading to the emergence of consensus and divergences within the group. The passive role of the researcher also enabled participants to steer the conversation, thus uncovering new narratives and building upon those introduced in the OQS (chapter 4) and FTIs (chapter 5).

The first objective of the FFGs was to explore how DWPA advice is perceived by farmers, with a particular focus on the efficacy of CSF advice. This was achieved by investigating why participants are engaged or unengaged with this advice. The findings contribute to determining how the perceived credibility and relevance of CSF could be improved in the future. The second objective of the FFGs was to identify the types of tools they find useful when seeking DWPA information and advice. This objective provides insights into which resources could be relied upon more in the future, including the potential of 'hard' evidence for providing farmers with local information and advice surrounding DWPA. An expansive 'checklist' of how this evidence should be presented was established (see also chapter 10).

6.1. FFGs: methods

Each FFG was designed to last around 2 hours to minimise participant fatigue. The groups consisted of four main topics (figure 6.1). By adopting probing questions and encouraging debate between participants, these topics were expected to evoke detailed discussion (Krueger & Casey, 2015; p5). Open questions were used when introducing new topics and where time allowed, participants were encouraged to hold discussions on related topics relevant to them. The researcher also encouraged conversation by minimising the use of technical language and ensuring the questions posed were easy to articulate,

open-ended, and related to DWPA advice (Krueger & Casey, 2015, p42-43). Giving participants some freedom to steer discussions within each topic led to the emergence of spontaneous conversations, many of which built on the emergent narrative which indicates that the CRELE of existing water quality regulations and funding schemes may be intimately linked to whether farmers will engage with DWPA advice (see section 5.3.4).

Ground rules were set at the beginning of FFGs by asking participants to remain non-judgemental and avoid interrupting other participants during discussions (Krueger & Casey, 2015, p118). Social cues, including neutral, encouraging verbal responses (e.g., 'uh-huh') were used to build rapport and incite further discussion during the groups (as recommended by Finch & Lewis, 2003). These attempts to facilitate the FFGs enabled the researcher to remain relatively passive for the majority of conversations, simply observing and moderating. There were, however, cases where it became necessary to intervene, either to dissolve disputes, encourage a conversation to continue, or to moderate participants with dominating personalities (Krueger & Casey, 2015).

Care was taken to ensure all voices were heard by making it clear that all participants were seen as experts, with all voices valued equally (Onwuegbuzie *et al.*, 2009; Krueger & Casey, 2015; p122). Naturally quiet FFG participants were expected to defer to other participants with dominating personalities or self-appointed experts. In many cases, however, reflective, quieter individuals may have more useful contributions than dominating individuals as they may only speak up when they have something valuable to say (Krueger & Casey, 2015). This can have a detrimental effect on how representative the results are (Finch & Lewis, 2003; Hollander, 2004; Krueger & Casey, 2015, p16). Any quiet participants were, therefore, asked if they had anything additional to add before topics moved on (Krueger & Casey, 2015, p122). The FFGs, similarly to the FTIs and OQS, ended with an open-ended question to encourage participants to provide closing remarks. This approach was anticipated to uncover previously unmentioned views, including from the more introverted participants (Krueger & Casey, 2015, p128). In addition, FFG participants were also given the opportunity to provide their contact details if they wished to receive outputs from the study.

Figure 6.1. Topics covered during the FFGs. Typical probing questions are shown.



6.1.1. Farmer focus group locations

In total, four FFGs were carried out in four counties across England: Devon, Dorset, Cumbria, and North Yorkshire (NY). These study locations were chosen due to information gleaned from online research which indicated how active CSF and other advisory entities are in different areas. For example, Dorset was chosen because of the high activity levels by the CSF initiative and several advisory entities in the area, in part due to the scrutiny the Poole Harbour catchment has been under due in recent years due to its poor water quality (Environment Agency, 2016). Meanwhile, information gleaned from farm advisors suggested that NY and Cumbrian farmers may have received less DWPA advice than other regions of England. Moreover, despite the presence of the Eden Rivers Trust and CSF, FTI participants located in NY and Cumbria did not refer to these sources of advice. Devon was an appropriate study site due to the logistical ease of travelling to the FFGs from the University of Exeter. Besides, the researcher was already aware of a plethora of advisory entities operating across the county (e.g., the Rivers Trusts, FWAG SW⁴⁶, CSF).

6.1.2. Recruiting farmer focus group participants

Most FFG participants were recruited at farm events (see section 5.1.1). Farmers whose holdings were located within the chosen study areas were able to give their preference as to whether they would prefer to participate in an FTI or a FFG. The FFGs were also advertised across social media (see section 3.2.3.) and on a public Eventbrite page, where farmers could sign up to the groups. This use of 'ticketing' enabled the researcher to provide potential participants with information, estimate likely FFG sizes, and encourage participation by highlighting the 'exclusive' nature of the FFGs due to the limited numbers of available tickets. The provision of a pub meal as a token gesture (recommended by Krueger & Casey, 2015, p93) was also made clear to promote participation. Lastly, Cumbria FFG participants were recruited through an advisor from North Yorkshire who recommended holding a group in the area due to the knowledge that farmers there received far less advice than in their operational area.

⁴⁶ FWAG = Farming and Wildlife Advisory Group.

Tonkiss (2004) argued that FG participants should ideally be strangers whilst sharing the same selection criteria (e.g., farmers). It was, however, difficult to avoid some FFG participants being familiar with one another given the close-knit nature of farmers, the likelihood that participants wouldn't travel far to attend the FFGs, and due to participants being recruited at a few local farm events (see section 5.1.1). During recruitment, it was clear to the researcher that many of the farmers at the same events were familiar with each other. In addition, the researcher encouraged male farmers to bring their female counterparts to the FFGs where applicable. This decision was made to ensure inclusivity and to gather full insights about participants' holdings due to the differing roles many women undertake on-farm (e.g., administrative tasks; see Dunn *et al.*, 2020, figure 3).

Focus groups consisting of too many participants can become challenging to moderate due to the potential presence of dominating personalities (Hopkins, 2007). As a result, most focus groups of agricultural stakeholders in England have consisted of eight participants (Padel, 2008; Kings & Ilbery, 2010 (n = 8); Naylor *et al.*, 2016 (mean n = 8)). Similar numbers of participants were, therefore, invited to participate in the FFGs. Over-recruitment of 20-30% was adopted (Morgan, 1997). Once enough potential FFG participant contact details were gathered, the dates and exact locations for FFGs were chosen to minimise travel times and maximise attendance. Participants were sent reminders a day before the FFGs to minimise non-attendance (Krueger & Casey, 2015, p93).

All focus groups (including FFGs and AFGs; chapter 8) were carried out in public settings with pub staff nearby, and a personal contact was aware of the researchers' whereabouts at all times. An assistant facilitator⁴⁷ was present for the first two FFGs (Dorset and Devon); however, they transpired to be less challenging to facilitate than expected. A single moderator (myself), alongside audio and video recordings, was, therefore, deemed sufficient for future groups. Additional ethical considerations were required when carrying out the focus groups (including the advisor focus groups; see chapter 8) without a second researcher present, mainly relating to potential safety issues to both the researcher and participants. Upon arrival but before the FFG topics began,

⁴⁷ Beth Dooley, PhD Researcher, University of Exeter

participants were asked to complete paper questionnaires about their characteristics (see table 4.1) alongside an informed consent form.

6.1.3. FFG sampling

The FFGs lasted 1.5-3.5 hours. Most groups (n = 3) lasted longer than the planned two hours due to participants' enthusiasm to continue discussions, indicating that the topics covered were perceived as relevant by the participants. The average group size of the FFGs was 6.5 (ranging from 4-8), with a total of 26 participants across all four FFGs (table 6.1). Most farmer participants who had signed up for the Devon, Dorset, and Yorkshire FFGs attended the groups; however, there were three farmer 'no-shows' at the Cumbria FFG, which transpired to be due to a local darts competition.

Figure 6.2. Distribution of the FFG participants' farm holdings (1: Dorset; 2: Devon; 3: Cumbria; 4: Yorkshire).

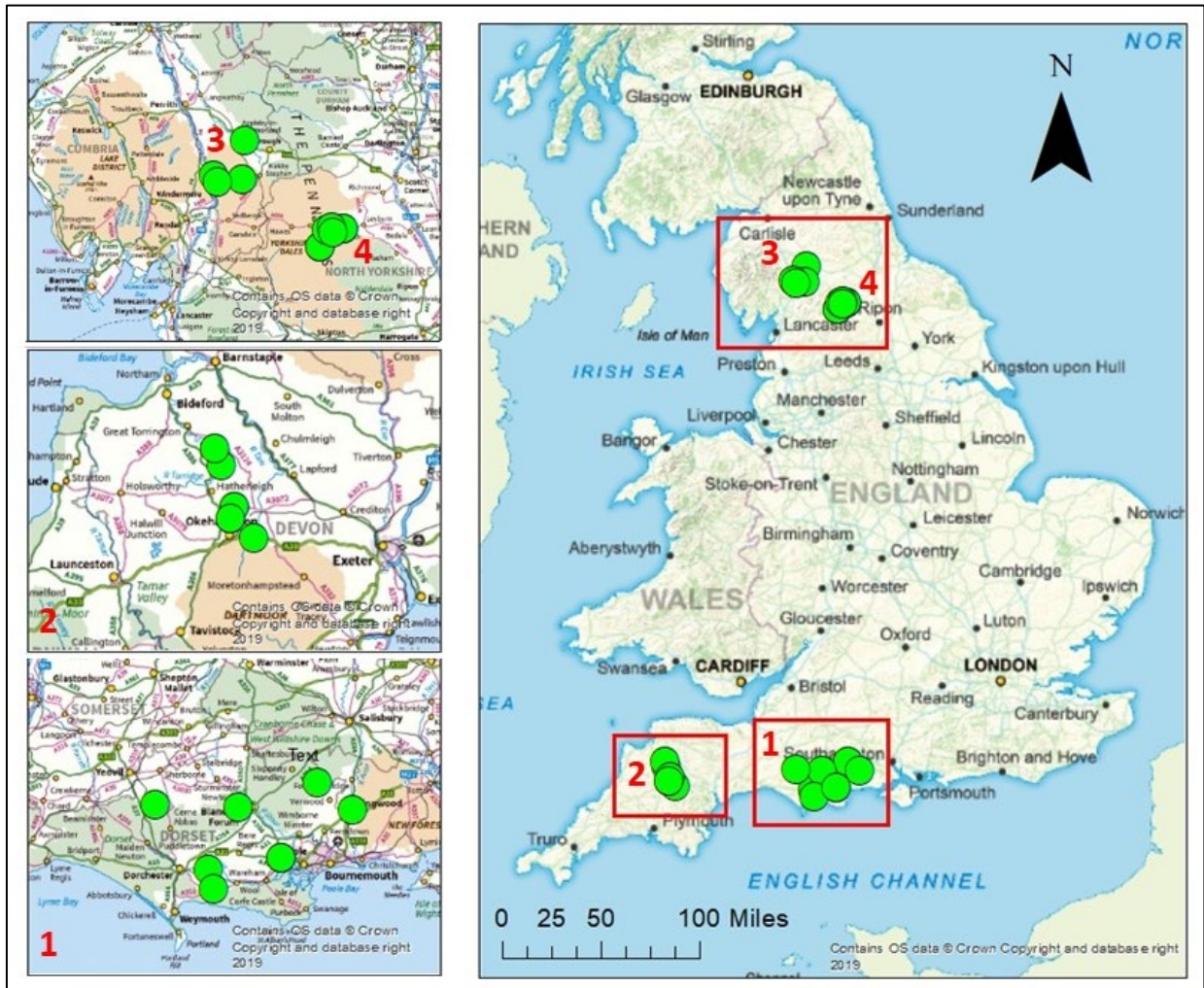
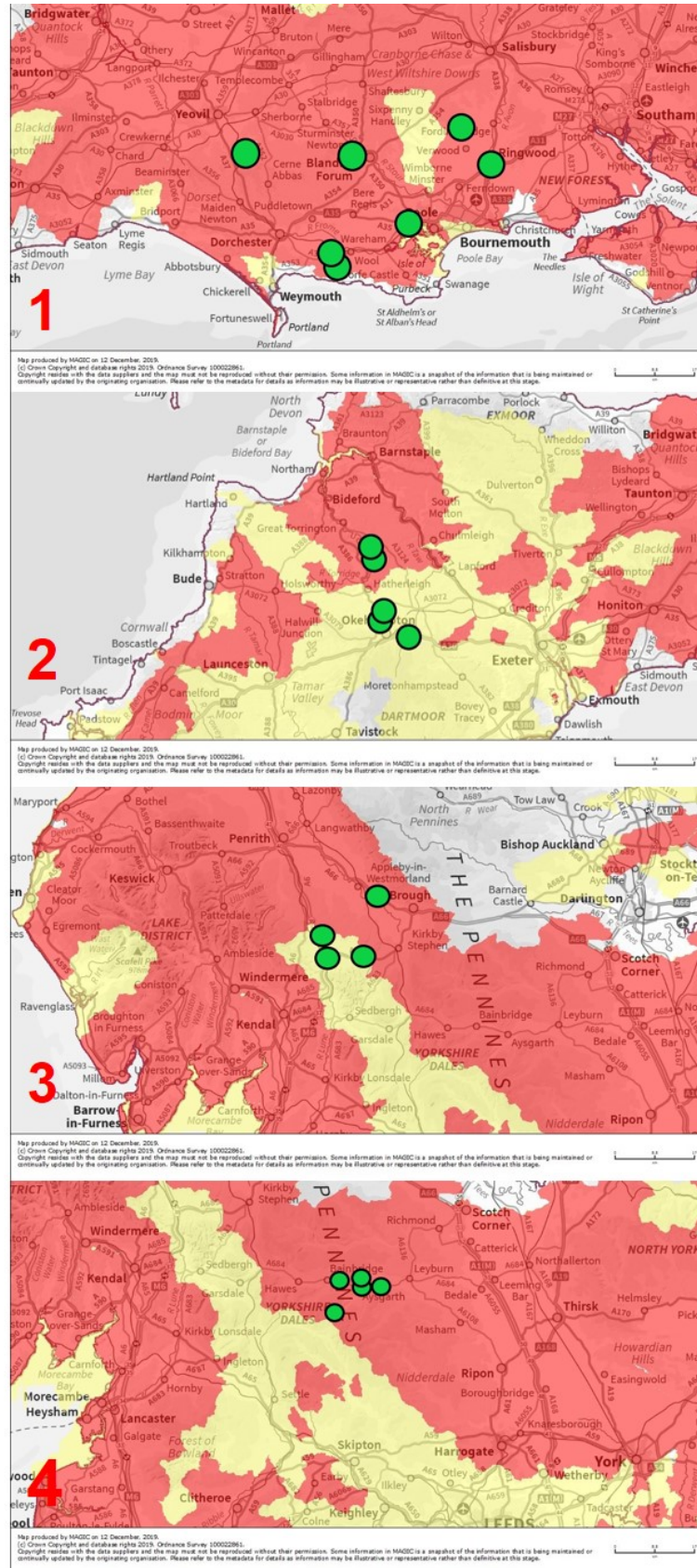


Figure 6.3. Distribution of FFG respondents mapped onto CS water quality priority designations (where red = high priority; yellow = medium priority; grey = non-priority; (1: Dorset; 2: Devon; 3: Cumbria; 4: Yorkshire).



All participants were situated within a high or medium CS water quality priority area (figure 6.2, 6.3). Table 6.1 provides an overview of the characteristics of the FFG participants. Several participants (n = 11) were predominantly beef farmers, whilst just a single mixed farmer attended. The average farm size of participants was 259ha, ranging from 39-810ha. The Devon FFG had the smallest average farm size (86ha), whilst Dorset had the largest (404ha), in part due to two large arable farmers in attendance. FFG participants were generally highly experienced in agriculture; across all four FFGs, the average time spent in farming was 26.8 years (ranging from 2-60). The average age of FFG participants was 50.4 (ranging from 32-75).

Table 6.1. Characteristics of the FFG participants

FFG location	Resp. no.	Dominant farming enterprise	Farm size (ha)	Time in farming (years)	Age	Gender	Organic?
Dorset (n = 8)	1	Dairy/beef	135	15	32	M	Conversion
	2	Suckler beef	120	40	55	M	N
	3	Suckler beef	220	25	43	M	Y
	4	Arable (with some beef/sheep)	810	35	60	M	N
	5	Arable	450	26	45	M	N
	6	Arable	600	11	38	M	N
	7	Beef	600	10	59	F	Y
	8	Beef	300	2	41	M	Y
Devon (n = 7)	1	Organic beef	150	40	61	M	Y
	2	Mixed	180	30	50	M	N
	3	Sheep	57	10	40	M	N
	4	Haylage & Beef	39	42	58	M	N
	5	Haylage & Beef	39	42	55	F	N
	6	Sheep	57	10	40	M	N
	7	Dairy	81	34	61	F	N
Cumbria (n = 4)	1	Beef, sheep, eggs	156	42	64	M	N
	2	Hill sheep & suckler cattle	150	20	58	M	N
	3	Beef & sheep	350	28	48	M	N
	4	Dairy	360	20	46	M	N
Yorkshire (n = 7)	1	Heifer rearing & sheep	200	7	47	F	N
	2	Dairy & sheep	200	36	51	M	N
	3	Beef & sheep	400	25	58	M	N
	4	Beef & sheep	485	20	32	M	N
	5	Sheep	140	18	39	M	N
	6	Dairy	230	50	65	M	N
	7	Dairy & sheep	220	60	75	M	N

6.1.4. Analysing and presenting data from the FFGs

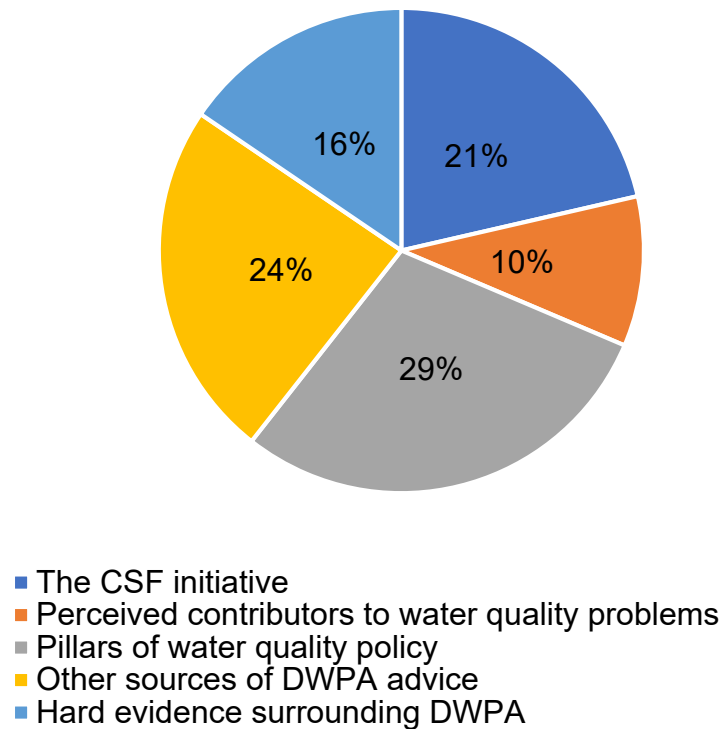
Data deriving from FGs can become particularly challenging to analyse (Mansell *et al.*, 2004) as participants' opinions can change as group discussions develop; detecting these subtleties was crucial. Individual, group and interaction levels of analysis were used to establish full narratives relating to the research questions. This approach was used because whilst a consensus may have been reached by most group members, it was important to acknowledge the views of those who did not support the status quo.

When conducting framework analysis using NVivo 12 (according to Gale *et al.*, 2013), it became clear that referring to the number of coded references was inappropriate when reporting how frequently particular themes arose during the FFGs. This decision was made because a single reference within a focus group could constitute a 10-minute long conversation between several participants. Using numbers to represent narratives (as used in the OQS) was, therefore, likely to drastically under-represent the importance of each theme. Instead, the % of time spent discussing individual themes is used, with the duration of a discussion providing an appropriate proxy relating to the importance placed on each topic by the research participants.

6.2. Results of the farmer focus groups

Figure 6.4. provides an overview of the average percentage of time spent during the FFGs discussing each of the main topics explored during this chapter, providing an initial indication of the emphasis farmers placed on each subject.

Figure 6.4. Percentage of time spent on each of the main topics covered during the FFGs. Despite not being a planned topic within the protocol, themes relating to the pillars of water quality policy were discussed for the longest durations.



6.2.1. FFG participants' perceptions of the main contributors to water quality problems

FFG participants were not directly asked which source(s) they believe contribute significantly to water quality problems. Nevertheless, this topic arose in all four groups when discussing how they would improve the CSF initiative and when general conversations surrounding DWPA advice were taking place. Whether farmers feel responsible for water quality problems was a vital narrative to consider; where farmers believe other sources contribute more significantly than their own farming practices, they may be less likely to perceive engaging with DWPA advice as credible or relevant.

Similarly to the findings of the OQS (chapter 4) and FTIs (chapter 5), some FFG participants recognised the likelihood that their own farming practices may contribute significantly to DWPA. They were, however, more likely to place blame

on other farmers, mainly referring to farmers who maintain traditional, productivist practices, and other farming types. The farming types perceived as significant contributors to water quality problems varied between FFGs, and, similarly to the FTIs (section 5.4.1), farmers from particular sectors tended to perceive farm types other than their own as more significant contributors. For example, beef farmers blamed dairy farming and maize growers for water quality problems:

'It's the big dairy farms that have the biggest problems and the advice over the years has always been keep another 20 cows you'll earn more money, and of course, the system that's not set up for it is usually causing the biggest problem' (Devon, R1, organic beef, 150ha).

'The worst offender for Nitrate leaching is maize' (Dorset, R8, beef, 300ha);

Meanwhile, a dairy farmer blamed general arable cropping for water quality problems; *'The chemical pollution from arable is phenomenal, it's not sustainable!'* (NY, R6, dairy, 230ha).

Many FFG participants also recognised the contribution of non-agricultural sectors to water quality problems. Echoing the findings of the OQS and FTIs, sewage treatment works (STWs) were the most frequently blamed source of water quality problems: *'I have talked to people until I'm blue in the face and they accept that [Water company] is responsible for 50% of current nitrates and farmers are responsible for 50%'* (Dorset, R7, beef, 600ha). A farmer within the Cumbria FFG had experienced runoff from STWs:

R4 (beef/sheep, 485ha): *I think there are other factors rather than just farmers, if you look at water treatment works up and down, they have an awful lot to answer for*

R1 (heifers/sheep, 200ha): *Yep. Yep. Ohhhh, I can think of a lot that pull the plug when there's a flood*

R2 (dairy/sheep, 200ha): *Yeah*

R1: *I have evidence of a lot, like proper treatment works!*

This direct observation of contributions from other sources is likely to make engaging with DWPA advice appear less credible or relevant to these farmers. Farmers will, therefore, likely be reluctant to seek advice or change practices

whilst they perceive other sources such as STWs as causing significant contributions to the problem.

6.2.2. Situational factors affecting farmer engagement with DWPA advice

Some FFG participants cited specific factors which reduce a farmer's agency and inclination to engage with DWPA advice due to it losing relevance where these factors exist. These factors include financial constraints, farm size, time constraints, farm tenure, age, internet connectivity, and stress. Most farmers who mentioned pecuniary constraints as restricting engagement with DWPA advice referred to unengaged farmers rather than themselves:

R1 (beef, 150ha): *'A lot of the problems are financial. You get yourself in a corner, and it's really difficult, and you try to get out of it*

R7 (dairy, 81ha): *And sometimes, these big farmers are on a treadmill, they keep having to expand to pay their...and then they get more borrowings, they're just on a treadmill*

R1: *It's horrendous'*

- Devon FFG

Some FFG participants came from small farm holdings (<100ha). These farmers argued that they have limited scope to make changes to their practices, largely due to the cost involved in applying for grant funding, thus making engagement with CSF less relevant to them:

R4 (haylage/beef, 39ha): *'We're only 100 acres so there isn't much we can tinker with*

R7 (dairy, 81ha): *It's like us, we're only 81ha with 80 cows (...)*

R4: *I think there's a scale issue too, with all due respect, if you've got 1000 you can employ somebody to do it but when you've got 100 acres, it's no good blowing £1000 on somebody to draw it all up for you! Then some of us are a bit nervous about filling the forms in so just won't bother!'*

- Devon FFG

A NY FFG participant shared similar sentiments, arguing that DWPA advice and other interventions have been designed for larger businesses: *'In this area, there*

are more small businesses than any other part of the UK, and everyone's flogging their guts out and trying to survive with regulation, and it's very, very difficult'. (NY, R2, dairy/sheep, 200ha).

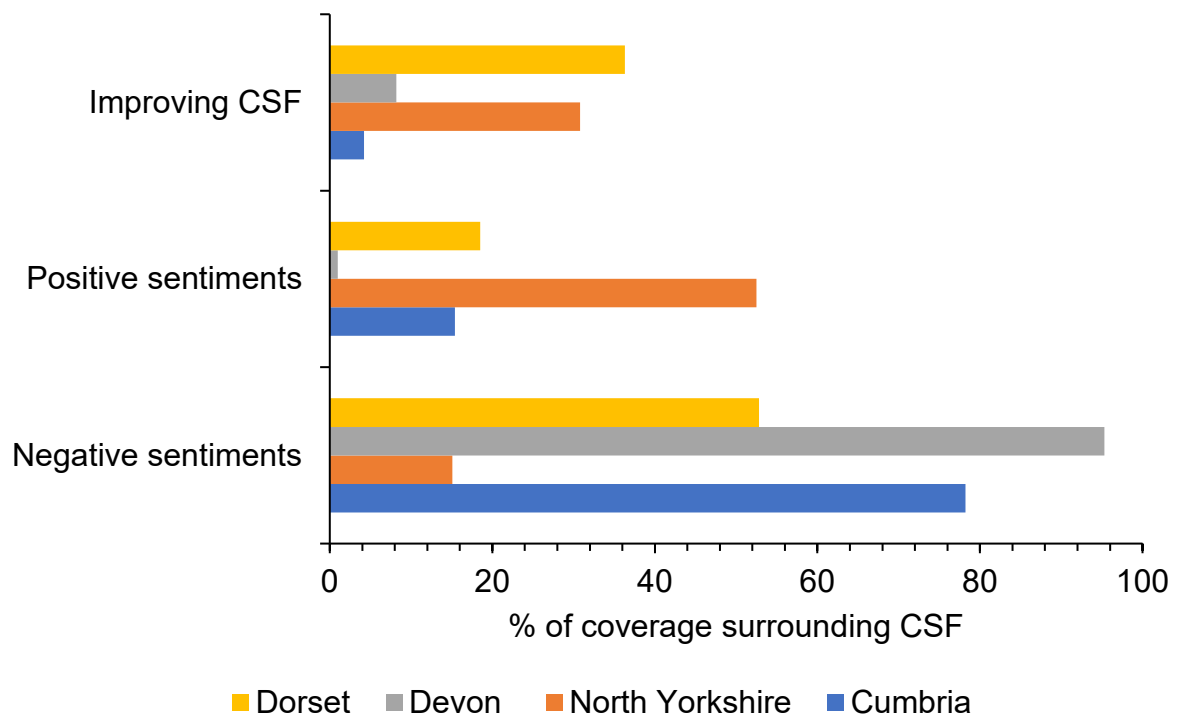
Farmers also suggested that the number of roles they have to fulfil makes it challenging to engage with DWPA advice or apply for new grant schemes: *'Unfortunately, you're the compliance officer, you're the CFO, you're the chief executive, but you don't now have time to be the operator'* (Dorset, R8, beef, 300ha). This finding aligns with Cummins (2013), who pointed out that farmers are expected to simultaneously act as a *'veterinarian, nutritionist, agronomist, meteorologist, botanist, engineer, financier, and psychologist'* when producing food. It is, therefore, unsurprising that these time-constrained farmers may see engaging with DWPA advice as irrelevant unless it reduces their time burdens or leads to clear business benefits.

6.3. FFG participants' perceptions of CSF

On average, 12.8% of the FFG discussions related to CSF (Cumbria = 13.0%; Devon = 11.8%; Dorset = 16.2%; NY = 10.3%). Whilst the sentiments shared by the NY FFG participants were mostly positive or constructive, most sentiments surrounding CSF given during the other FFGs (Cumbria, Devon and Dorset) were negative (figure 6.5).

According to FFG participants, 'high quality' advice is characterised by impartial, trusted advisors, ideally from a farming background who hold useful courses and events and provide concise, specific reports.

Figure 6.5. The proportion of discussions (% time) surrounding the CSF initiative which were positive, negative, or suggesting ideas for improving the initiative.



6.3.1. Positive perceptions of CSF according to FFG participants

Most positive sentiments surrounding the CSF initiative referred to the availability of grant funding and the provision of advice whilst completing their applications (figure 6.6):

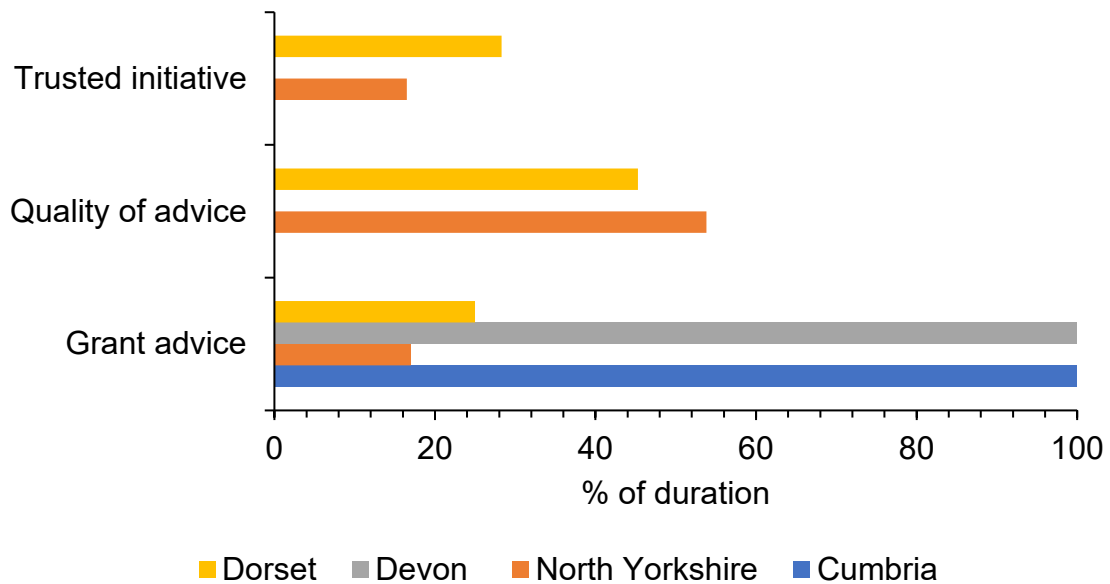
R7 (beef, 600ha): *I'd say out of all of them, CSF is the one that actually comes through and do something*

R4 (arable, 810ha): *'That's because they pay you a wedge of money!'*

[group laughs]

- Dorset FFG

Figure 6.6. Percentage of time spent on specific themes by FFG participants whilst providing positive sentiments surrounding CSF. The provision of grant advice was the most discussed theme when farmers were conversing positively about the initiative.



The Devon FFG participants spent just 4.7% of their time discussing CSF providing positive sentiments, all of which related to the provision of grant funding. Participants within the Dorset and NY FFGs spoke positively about the quality of CSF advice due to these farmers having a long-term, trusted CSFO in their area: *'There's been a number of courses that [my CSFO] has organised related to arable software and those have been really helpful'* (Dorset, R4, arable, 810ha). Devon FFG participants, when referring to CSF negatively, also placed importance on CSFOs having local knowledge *'rather than from big central officers with people that don't really know the area'* (R6, Devon, sheep, 57ha). This indicates that there is regional variation in the quality of CSFOs.

The NY FFG all receive CSF delivery from the same CSFOs, who are employed by the Yorkshire Dales National Park and seconded to CSF. These CSFOs have built a good rapport with these participants, resulting in the CSF initiative achieving high credibility: *'We're very lucky around here because we have the national park ladies (who deliver CSF advice), so we've had workshops and things.'* These officers also come from agricultural backgrounds; *'They're all from a farming background, and they're very good'* (NY, R6, dairy, 230ha), which is known to increase the credibility of advice (Curry, 1997). These farmers found

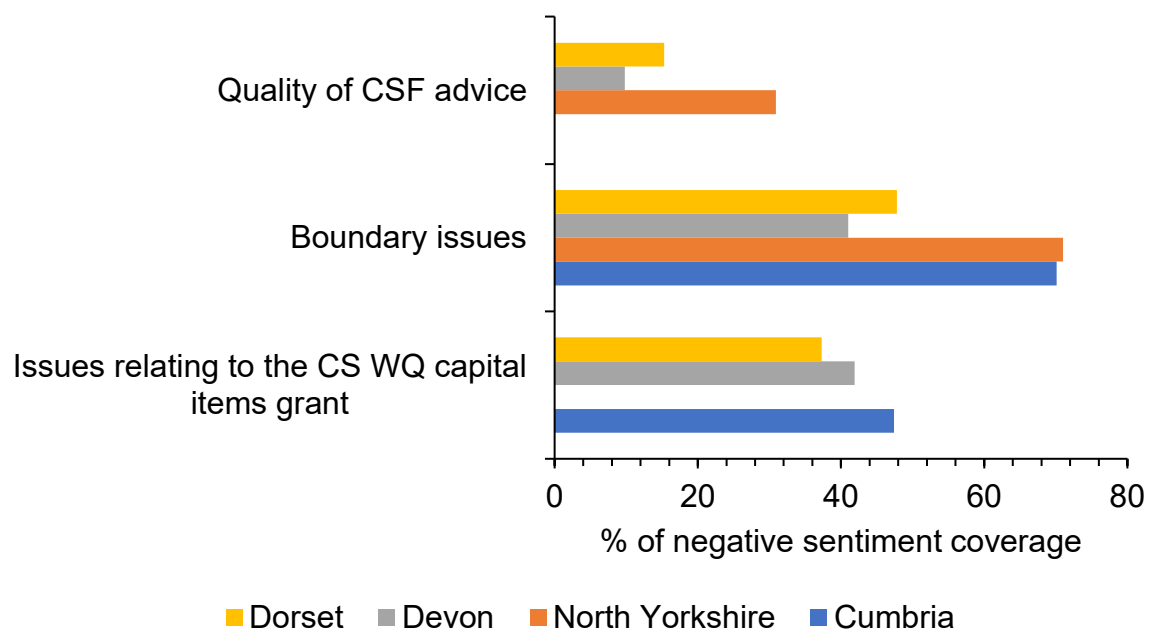
on-farm CSF visits led by these CSFOs and the resulting reports particularly useful: *'We had somebody come from the national parks, they did like an audit of round our farm, the yard and buildings, that was excellent'* (NY, R2, dairy/sheep, 200ha). The follow-up reports from these CSFOs were perceived as high quality and of an appropriate length (6-pages).

6.3.2. Negative perceptions towards CSF according to FFG participants

Three key topics emerged from the negative sentiments shared by FFG participants when discussing the CSF initiative. These issues relate to the CS water quality capital items grant, how the boundaries of CSF are allocated, and the quality of CSF-delivered advice (figure 6.7).

Figure 6.7. Percentage of time spent on specific themes by FFG participants whilst providing negative sentiments surrounding CSF.

Issues with the CS water quality capital items grant scheme



Several participants shared negative sentiments surrounding the CS water quality capital items grant, an existing funding scheme associated with CSF, whereby farmers have to engage with CSFOs during the application process (Defra, 2020). Most of these sentiments related to excessive bureaucracy, the notion that the grants 'reward' polluters whilst failing to recognise farmers who are already undertaking measures for minimising DWPA, and the view that

obtaining a grant can become costlier than 'doing it yourself'. A few farmers also argued that the application windows are too narrow and that the scheme is overly inflexible in terms of the measures which can be applied for.

FFG farmers who referred to the bureaucratic loadings associated with applying for a CSWG complained that in addition to being an arduous application process, funding isn't guaranteed:

R6 (sheep, 57ha): *Lots of farmers and I don't think this is atypical because other farmers I've spoken to have said the same, you know, we're just not bothering with it*

R3 (beef, 220ha): *No*

R4 (arable, 810ha): *No*

R6 (arable, 600ha): *Because it's just too hard (...), you're expected to fill in so many forms*

R7 (beef, 600ha): *And you have to pay to fill in the form*

R6: *And you might not get it anyway!*

- Devon FFG

The following quote illustrates the views shared by Cumbria and Dorset FFG participants, who argued that the current allocation of grant funding is unfair: '*We feel like if you're already polluting you get money chucked at you. If you're not polluting, you have no chance*' (Cumbria, R4, dairy, 360ha). The Dorset FFG went further, claiming that rewarding polluting farmers with grant funding for capital works is likely to lead to further intensification, thus failing to achieve improved water quality or attitudinal change:

R6 (arable, 600ha): *You give the matey a grant for his slurry store and a new shed, which is fine, and then he goes and gets twice as many cows, so he needs a bigger slurry store (laughs)'*

R8 (beef, 300ha): *I think all that system does is reward a lack of investment and mediocrity and to a degree all you're doing, you may solve a problem now, but in 25 years you'll have the problem again because... fundamentally... you're simply rewarding somebody that's been, let's be honest, farming pretty poorly for 30 years*

R4 (arable, 810ha): *Badly*

R8: ... with a new slurry store, to me, is a huge waste of money

R4: (...) If I were in charge, my first concern would be to just stop the shit going in the rivers either by driving them out of business... I agree with you; they've been farming badly, so they've got nothing to invest. They should've bloody farmed better and invested in the slurry store themselves because it's their business!

As shown in figure 6.7, Devon FFG participants also provided negative comments about the grant scheme associated with CSF, including some who had not previously interacted with the initiative. This may indicate that these farmers were referring to another grant scheme, or that they have engaged with CSF after all. This finding aligns with the FTI participants who suggested that the indicated pluralistic advisory system in England has led to farmer confusion, with farmers mistakenly discussing the wrong advisory entities and grants (see section 5.3.3).

Boundary issues

Several of the Devon FFG participants' farm holdings were located outside of the high priority CS water quality priority boundaries and claimed that they had not directly engaged with the initiative. This lack of engagement was the topic of many of the negative views shared by participants, with how CS water quality priority boundaries are allocated referred to frequently (see 6.3.2). Cumbria, Dorset, and Devon FFG participants shared negative views towards how CS water quality priority areas are allocated, with farmers outside of the high priority boundary feeling excluded from receiving CSF advice. When FFG participants were asked what they would improve about CSF and why, the main answer given by participants from all four FFGs was the view that CSF should aim to reach more farmers. Box 6.1. provides a verbatim transcript of a detailed discussion surrounding this topic which occurred during the Devon FFG which aligns with the discussions which occurred during the other FFGs.

BOX 6.1. Devon FFG discussion about how CS water quality priority boundaries are allocated

Me: *'Has anyone else had issues with CSF boundaries?*

R3 (sheep, 57ha): *That's what we found isn't it*

R2 (mixed, 180ha): *There's always boundaries, when you can get it you don't want it and when you wanna join you can't, and they say sorry you're on the wrong side of the river or whatever*

R3: *Yeah!*

R1 (beef, 150ha): *Yeah there's been some real issues, a chap across the valley got a new shed and the one this side hasn't, depends where you are (laughs)*

R4 (haylage/beef, 39ha): *That's the reality*

R1: *Yeah it is*

R3: *The grass is always greener! (laughs)*

R1: *I think the targeting is unfair, that's the main thing with CSF, and it's not very logical as to why they choose the regions, the great advantage of being in CSF is getting better grants or there's a lot more grant aid available if you're in a CSF area, and er, there's a few on the Taw, upper Torridge, then there's gaps in the lower Torridge, there's gaps if you look on Magic it'll show you and I think that's really quite unfair*

R4: *I thought it was quite bizarre that we're on the Okement which feeds into the Torridge and I think I'm correct in saying that none of it's in CSF priority in that area*

R7 (dairy, 81ha): *They've only just bought the upper Torridge in, and they've only just bought it in*

R1: *And it really is beneficial and you've got the availability of a CSF specialised officer who you've got to come in and OK any grant aid that you get, so that is very useful for those in a targeted area and if you're not, you wouldn't be aware really, I don't think anyone outside would even be aware of what CSF is really because you only get sent it if you're in the area*

R7: *I don't think mine's CSF. We don't get invited to anything and if we do it's really far away'*

Cumbrian and Dorset farmers argued that CSF should be rolled out nationally⁴⁸. Meanwhile, Dorset and NY FFG participants recognised the importance of reaching so-called 'hard to reach' farmers first:

'I would put a lot of funding into getting onto every single farm that's in an area where there's potential, and I'd be looking for the more difficult ones first! You've gotta start with the difficult ones; there's no need going to the easy ones with farmers like most of us around the table who can fill in a

⁴⁸ The researcher has reason to believe that CSF may be rolled out nationally in coming years, however, no announcement has been made and the fieldwork was undertaken prior to any knowledge of CSF considering removing the existing CS boundaries.

grant application form with our hands tied behind our backs because very often these grants are taken up by people who don't really need them!' (Dorset, R6).

The Devon FFG participants also acknowledged that CSF is useful for those who have access to its advice: *'It really is beneficial, you've got the availability of a CSF specialised officer whom you've got to come in and OK any grant aid that you get, that is very useful for those in a targeted area and if you're not...'* (Devon, R1, beef, 150ha). This quote suggests that the Devon FFG participants also likely believe that CSF should be rolled out on a broader scale.

Dorset FFG participants also emphasized the importance of all farmers receiving CSF advice on a face-to-face basis, reiterating the findings of several existing studies on the topic (see section 1.3.4):

R7 (beef, 600ha): *Every farmer should have a visit from CSF, and there should be no bidding windows.*

R1 (dairy/beef, 135ha): Yes.

R4 (arable, 810ha): *It's the visit, to walk around the farm with you like the person I was describing earlier, and erm, to discuss and try and broaden the farmers' mind if there are issues they are dealing with*

R3 (suckler beef, 220ha): *I mean they should be able to say, you need a slurry pit there, you need covering there, job done.*

R7: *Yeah, everyone needs an ADAS visitor or a CSFO [...]*

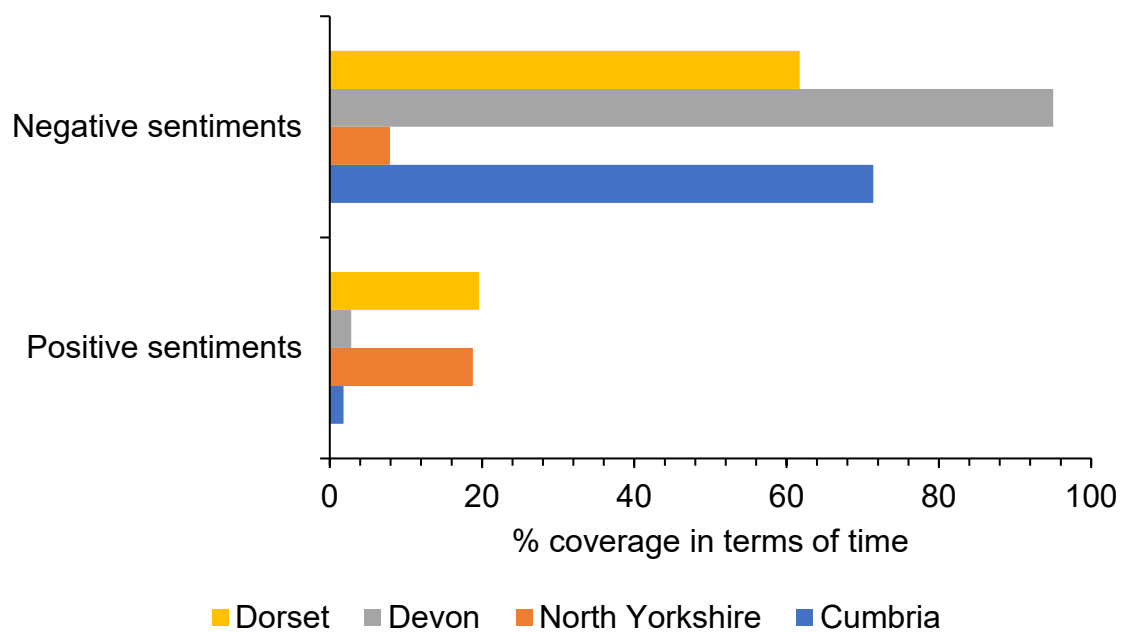
Similar conversations to this also occurred during the FTIs and ATIs, with ADAs (as it was before it moved towards a privatised model) romanticised by both farmers and advisors.

6.4. FFG participants' opinions towards other sources of DWPA advice

FFG participants were asked what their perceptions were of sources of DWPA advice other than CSF. This topic was important as it was expected to illustrate 'what works' for other entities delivering DWPA advice, thus providing lessons

into how CRELE of the CSF initiative itself could be improved. Figure 6.2. shows the % coverage of positive and negative sentiments surrounding this topic. The sentiments were largely negative within the Dorset, Devon, and Cumbria FFGs, whilst NY participants shared more positive views (figure 6.8). On average, these discussions lasted for 14% of the duration of the FFGs (7.6% - NY; 9.4% - Dorset; 15.3%- Devon; 23.8% - Cumbria).

Figure 6.8. Percentage of positive and negative sentiment coverage shared by FFG participants when discussing sources of DWPA advice other than CSF.



6.4.1. Negative Sentiments surrounding other sources of DWPA advice

Fragmented advisory system

Cumbria FFG participants lamented that they don't receive enough (if any) DWPA advice. In contrast, Devon and Dorset participants exhibited frustration towards the large number of advisors from various entities who had approached them to provide DWPA advice. Dorset FFG participants were particularly frustrated by the fragmented nature of the English advisory system, stating that too many different entities approach them:

Me: Do you find that you have a lot of different organisations coming to you about water pollution from farming?

R4 (arable, 810ha): *Yes!! Yes, it's ludicrous!!! You've got the EA, RPA, pressure groups of one sort or another; they're countless! There's a myriad and CSF is just but one!*

(room laughs and makes sounds of agreement)

R8 (beef, 300ha): *They'll give you advice, and then they disappear into the ether and then come back and go oh I don't know why you've done that (huffs), or another one comes in and says well by doing this you've...*

R4: *There is nothing tied up, there is nothing tied up, you'll find that probably the main feature from today's meeting will be our frustration that we're dealing with the RPA, the EA,*

R7 (beef, 600ha): *NE,*

R8 (beef, 300ha): *Wessex Water, Natural England...*

R4: *There are all these things... CSE, CLA, CSF.... (laughs)*

R7: *CPRE*

R4: *If you sit and write them all down, there are bloody masses of them!!*

R8: *It's not being coordinated to my mind, for me, because we're being drip-fed lots of little bits from lots of different sources*

This pluralistic AKIS, with some DWPA-focused entities (e.g., water companies, CSF) and some entities which deliver some DWPA advice as a smaller part of their remit, is likely to affect the credibility of re-engaging with advice where farmers become unsure as to which organisations/initiatives to trust or where they suffer from information overload. Moreover, having a choice of advisors to use, may lead to farmers seeking advice from those who they believe will prioritise their business needs, will provide advice which aligns with pre-existing beliefs rather than those who will provide targeted advice for achieving real reductions in DWPA. This is evidenced by several farmers who argued, in a topic not covered within this thesis, that if CSF were no longer free at the point of delivery, they would seek advice elsewhere, likely from entities that support their ambitions (Chivers & Collins, unpublished). However, it is important to note that farmers may perceive the AKIS relating to DWPA as more pluralistic than it is in reality; for example, the RPA and CPRE are not advisory bodies but were mentioned as such during the discussion above. This finding is interesting in itself as it reiterates the hypothesis that farmers are unaware of whom they should engage with when seeking advice.

Conflicting advice

Echoing Vrain (2015), who found that some farmers stated that they had received conflicting DWPA advice, Cumbria, Dorset, and Devon FFG participants shared experiences of receiving conflicting DWPA advice, whether at different times or from different advisors; *'Often if you ask three different people you'll get three different bits of advice I expect, and this is the trouble with advisors* (Devon, R1, beef, 150ha). Even where this conflicting advice was provided decades apart, this appears to have resulted in a lack of credibility, indicating that farmers prefer information which doesn't change over time, with all three of these FGs appearing to perceive DWPA advice as being based on 'whatever's fashionable' at the time:

R8 (beef, 300ha): *It was only five years ago that we were told not to drill in the autumn and that more land needed to be left bare for lapwings over the winter, so...it's not easy*

R7 (beef, 600ha): *It changes! It's whatever's fashionable isn't it*

R8: *Yeah, it changes, so it's not easy*

- Dorset FFG

Quality of advice from other sources

Farmers from Cumbria, Devon, and Dorset referred to the perceived quality of DWPA advice from entities other than CSF. A participant within the Dorset FFG provided a story about receiving poor quality advice which led to immediate scepticism from the other participants:

R7 (beef, 600ha): *I asked when she came about the new rules, and she didn't know anything about them (laughs)*

R5 (arable, 450ha): *Well, they don't know the difference between wheat and barley!*

R3 (suckler beef, 220ha): *It's all done by people who don't understand farming*

The findings relating to the quality of DWPA advice indicate that advisors who are seen as lacking knowledge are likely to be seen as incompetent by farmers. These advisors will, therefore, lose credibility, thus significantly affecting whether a farmer will re-engage with that entity. This reiterates the need for CSF itself to

continue employing experienced CSFOs with a strong understanding of farming if they are to remain credible.

6.4.2. Positive sentiments surrounding other sources of DWPA advice

Most views shared by FFG participants surrounding non-CSF DWPA advice were negative; however, there were also some positive sentiments (figure 6.8). These positive views were largely shared by participants who had received useful information from an advisor they perceived as credible, which appears to be characterised by being from an agricultural background, making on-farm visits, possessing good communication skills, being long-term, and providing simple, trusted advice: *'Our local man [from a water company], he's absolutely charming, I really like him, he's sat around my kitchen table, and I really get on well with him, I'm interested in what he's doing with his sample pots, I trust that guy, and I like him'* (Dorset, R8, beef, 300ha); *'I get very good advice about building slurry stores, they come out and say what you should put in it, and they check your wind speeds and all this, they come out and...'* (NY, R7, dairy/sheep, 220ha). The Devon FFG placed particular emphasis on the importance of advisors coming from an agricultural background and communicating at an appropriate level:

R2 (mixed, 180ha): *He's a farmer and has a great background, that's the kind of guys you need, people who are actually good communicators on the ground, and actually does farming so can relate to...*

R1 (organic beef, 150ha): *Yeah and he can put things quite simply too*

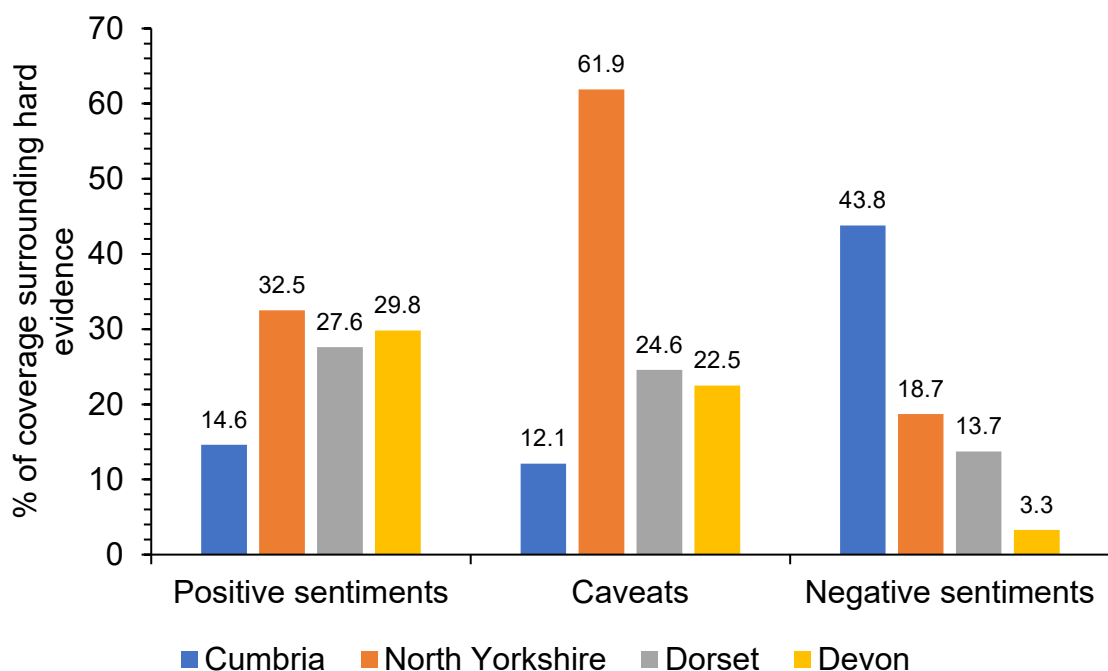
R7 (dairy, 81ha): *Yeah cos if you get one in your catchment area who's got a reputation and people trust, word of mouth, people will go to them*

These positive experiences shared by farmers about other organisations provide further evidence that the CSF initiative should aim to recruit CSFOs who meet these criteria. As already identified in this research (see sections 4.3.2, 5.2.3), Natural England, however, often offer CSFOs short-term contracts during recruitment. This use of short-term contracts is likely to impede their ability to recruit high-quality advisors, due to permanent opportunities available within other entities.

6.5. The potential of disseminating ‘hard’ evidence for improving DWPA advice

On average, 9% of the FFGs were spent discussing whether farmers would like to be shown by advisors more hard evidence surrounding whether their farm practices likely make a significant contribution to DWPA (Devon = 5.2%, Dorset = 6.7%, NY = 11.6, Cumbria = 13%). Aside from the Cumbria FFG, farmers shared mostly positive sentiments towards this topic; however, many of these views were caveated with specific requirements relating to its dissemination (figure 6.9).

Figure 6.9. The proportion of time spent providing different sentiments surrounding the potential of hard evidence for increasing engagement with DWPA advice.



6.5.1. Positive sentiments towards the prospect of being shown hard evidence surrounding DWPA

Farmers from all four FFGs agreed that they would like to be shown more ‘hard’ evidence by farm advisors, primarily to indicate whether or not their own farming practices are likely contributing significantly to water quality problems; *‘Yeah, (...) because how do we know if we’re polluting, we might not even be polluting in the first place mightn’t we so unless they test that how do they know?!’* (Devon, R7,

dairy, 81ha). Similarly to the OQS (chapter 4) and FTIs (chapter 5), farmers appeared to characterise the term 'hard' evidence as referring to scientific evidence. This is evidenced by farmer participants specifically referring to scientific research throughout this topic: *'I think University research is very good'* (R8, beef, Devon FFG 300ha).

Devon FFG participants indicated that being shown this evidence may lead to action: *'That would be useful, yeah. If you said in a 10 mile stretch of the Torridge, you could give us a percentage breakdown of where sediment has come from, and if it were 80% farmland then we'd say woah, hang on, we gotta do something!'* (Devon FFG, R4). Some participants even suggested they are happy to be shown that they pollute as long as they know they can improve it: *'I don't mind getting a bad result if I know I can improve it'* (Devon, R7, dairy, 81ha). These views align with the 'good farmer' narrative, whereby hard evidence indicating that a farmer's practices contribute significantly to DWPA may encourage action to restore their sense of self-integrity: *'I think if we want it though, farmers would want to feel they are squeaky clean because once you prove it's farming you then have to live with that'* (Devon, R6, sheep, 57ha). This view was shared by Cumbria FFG participants, who also indicated that being seen as a 'polluter' clashes with their perception of what constitutes a 'good farmer':

R1 (mixed, 156ha): *'Farmers don't want to pollute! People almost insinuate that we don't give a toss! We don't want to pollute the place'*

R3 (beef/sheep, 350ha): *NO, no*

R1: *It's our livelihoods! We are there to maintain and keep good and grow things, like; we don't want pollution'*

Again, where these farmers are shown evidence indicating that their practices likely contribute significantly to DWPA, this may result in further engagement with advice or action.

6.5.2. Caveats surrounding the dissemination of hard evidence surrounding DWPA

Although there was a consensus that farmers wish to be shown more hard evidence surrounding the likely contributions of their practices to DWPA by advisors, numerous caveats were provided surrounding this sentiment. Most

caveats were only mentioned by a single FG, indicating that there may be regional differences in farmers' perceptions of what makes hard evidence CRELE.

Firstly, NY FFG participants suggested they would need to be offered solutions for reducing their contributions to DWPA in conjunction with hard evidence to enable them to respond accordingly:

'Definitely, I think if you could identify sources and deal with them in a proactive manner and especially if it's linked with funds, they could say look you have a problem here, let's address it. I think it's important to identify where the source of pollution is, a lot of the time people may not know how they contribute or the damage they're doing until somebody comes along and says well actually, and not in a draconian way but if they would identify there's a problem and say is there something we can do! And they come along and say we're prepared to put some money into this project or we'll help you with this' (NY, R6, dairy, 230ha).

NY FFG participants also argued that scientists need to be more aware of how farming works in their local area. In addition, some NY participants had previously allowed researchers onto their land but were not then given any results from the study; another caveat, therefore, is that evidence should not be extractive:

R3 (Beef/sheep, 400ha): *'Someone will come along and say can I come and do this, I'm researching this or that, and yeah, as an owner of land you're interested in what's on your property! And very often you'll say yep, fine, off you go, just let me know what you find... and then you never hear anything!!*

R2 (dairy/sheep, 200ha): *No, no*

R3: *And that, to me, is just... is so rude!! It's just so discourteous, and I appreciate when you're pulling work together and writing things that you just need to get it banged out but actually to share your results is just... and I say that quite a bit, it just does my head in!! We want to learn!'*

The Dorset FFG participants emphasized the importance of building trust in science: *'until we trust the science, there is no way you're going to pull along a group of farmers, and that I'm afraid to say is... does everyone agree?'* (Dorset,

R8, beef, 300ha). These participants were also concerned with knowing who commissioned the research they were being shown due to potential bias. Dorset FFG participants also explained how hard evidence should be gathered, contending that it must have derived from multiple, long-term projects to be deemed credible.

Cumbria FFG participants were wary of who was showing them hard evidence and who carried out the research, arguing that they would need to trust their advisor before they would deem evidence shown to them as credible. These participants also stated that this evidence must consider the heterogeneity of farming; *'My farm is completely different to x's farm and to that farm and your farm!'* (Cumbria, R3, grazing livestock, 350ha), insinuating that evidence would need to be relatively specific.

A prominent theme which arose in all FFGs was that hard evidence should not be used to blame all farmers for DWPA: *'Let's not point fingers but let's act because there's too much of a culture of pointing fingers (...), we're always in the firing line'* (Cumbria, R4, Dairy, 360ha), arguing that if they were shown evidence which proved that they were contributors, this shouldn't lead to immediate enforcement:

'I don't want them going to the EA when they spot something, they could just say be careful with that, that's leaking there, just be careful on that one and leave it at that but if they're then going to go running off to the EA and the RPA (...) that would put me right off!' (Dorset, R5, arable, 450ha).

Echoing the views of the Dorset FFG, Devon FFG participants also argued that there should be no fear of prosecution when they are shown evidence that their practices contribute significantly to DWPA: *'I'd like it to start without a chance of being fined!! And then gives you a chance to... cos some things come out, and you think oh God, now I'm gonna get an inspection'* (R7, Devon, dairy, 81ha). NY farmers agreed with this, arguing that people should be shown solutions alongside hard evidence: *'Not in a draconian way but if they would identify there's a problem and say is there something we can do! And they come along and say we're prepared to put some money into this project or we'll help you with this, or ask what our long-term plans are'* (R6, dairy, 230ha).

6.5.3. Negative sentiments surrounding the provision of hard evidence surrounding DWPA

A few negative sentiments towards hard evidence were given across all FFGs; however, little emphasis was placed upon them. The most prominent negative view was scepticism towards science, shared by participants within the Cumbria, NY, and Dorset FGs. Cumbrian farmers were the most sceptical, with one individual perceiving scientists as ‘meddling’: *‘I’m very sceptical about scientists! They’re bugging about with our livelihood. Sorry, I’m just very sceptical about scientists (laughs) (...) they don’t look at the full picture, and it’s not practical’* (Cumbria, R1, mixed, 156ha). A participant in the NY FFG also claimed that much evidence is based on outdated research:

‘Methane production from cows, it’s still reliant on research by one bloke in Edinburgh in the 1950s and when you think back to when cows were all tied up in biers, and we used to go in and scrape the shit out. The amount of methane they were producing, if they’d had a fag in their mouth all the buildings would’ve blown up!’ (NY, R3, beef/sheep, 400ha).

The views of this farmer are, in reality untrue; several recent studies have measured and modelled methane (CH₄) emissions from cattle (e.g., Ellis *et al.*, 2001, 2007; Milne *et al.*, 2014). Besides, it has been found that of the four devolved nations of the UK, English farming produces the highest methane emissions due to the relatively high stocking rates (Milne *et al.*, 2014). The fact that this farmer believed there was no recent evidence surrounding methane, however, indicates that there has been a lack of dissemination of this research, something which may also be occurring with research relating to DWPA.

Some farmers also argued they did not need to be shown this evidence due to already being able to observe runoff on their farms. Other minor themes mentioned in passing included the view that science fails to account for heterogeneity, doesn’t consider historical contributions of pollutants, and that science can be inaccurate.

6.5.4. Farmer preferences when being presented with hard evidence surrounding DWPA

FFG participants contended that when being shown hard evidence, it should be user-friendly (i.e., through adopting clear language): *'I've been sitting at home, I've got this much information, great wedges of it, erm, but actually to have it as something that's a little bit more user friendly would be...'* (Dorset, R7, beef, 600ha). NY farmers agreed with this, indicating that evidence should be presented at the correct level:

'OK, so let's be clear about what the group were saying... if somebody were to come and present some information, we'd want it in a way that we could understand or how it related to our level of knowledge, expertise, if you just give a talk that'll go way over people's heads it's wasted, erm, but there's a certain amount, you can always question data if you did want to examine more, the finer points' (NY, R6, dairy, 230ha).

Several participants, particularly within the Devon FFG, contended that hard evidence should be presented concisely, beginning with results before providing detail:

'I think it would always be best to see results first and then work backwards? Because if you present masses of written information you just think oh I really haven't got time to look at that, and that's the end of that isn't it, but if you see the end result and you kind of agree with it you think oh that's fair enough but if you see the result and you don't agree with it then you might work your way back' (Devon, R5, haylage and beef, 39ha).

6.6. Do underlying structures and realities affect whether farmers engage with DWPA advice?

Issues with two of the pillars of water quality policy, regulation and funding schemes, arose repeatedly within all four FFGs, despite this not being a planned topic. This theme had already begun to emerge during the FTIs (see section 5.3.4). As a result, the researcher allowed these discussions to continue, thus enabling farmers to discuss what they believe is important when talking about DWPA advice. The researcher also adopted probing questions to gain

clarification and further detail to identify how this narrative was linked to DWPA advice. As a result, this theme had, on average, the highest coverage across all four FFGs (figure x) and was the main topic covered in the Devon (22.2%), Dorset (18.9%), and NY (18%) FFGs and was a reoccurring topic within the Cumbria FFGs (9.6% of conversation).

This narrative was characterised by general frustration towards bureaucratic loadings, issues with existing funding schemes, mainly relating to bureaucracy, inflexibility, and how these schemes are organised, negative views of current regulations, primarily relating to a perceived lack of enforcement and scepticism towards government bodies.

6.6.1. A perceived lack of inspections and enforcement against polluting farmers

Several FFG participants were under the impression that the Environment Agency is failing to fulfil its remit of inspecting those farmers who repeatedly pollute watercourses: *'Unfortunately they only inspect when there's a problem. The whole thing is hopeless, and that's the whole thing really'* (Dorset FFG, R7, beef, 600ha).

'It's as if they know where the pollution is coming from, but they won't actually go and nail it, and likewise, with shit and nitrates and what have you, you've only gotta go and visit farms to see, or walk on footpaths, if you take the railway from Blandford to Shillingstone, there's a dreadful farm right alongside there, very close to the River Stour and I don't understand why they don't just hammer these people who are very clearly breaking the rules and making a bloody mess' (Dorset, R3, suckler beef, 220ha).

This quote, amongst others that expressed similar sentiments, led to the finding that FFG participants believe that there should be a bigger 'stick' (i.e., more risk of inspection/prosecution) for those farmers who continue to refuse to engage with the 'carrot' (CSF advice):

R8 (beef, 300ha): *'For God sake take the bloody lawbreakers to town!! Put them out of business!!'*

R4 (arable, 810ha): *It needs to be someone who starts with a friendly approach because there are farmers, with our experience that we've had in another organisation, there are some farmers who are INCREDIBLY ignorant, incredibly thick-skinned, and frankly, bloody stupid! And quite a lot of them need to be drummed out of business the sooner, the better, the ones who won't let their 50-year-old sons get hold of the cheque book, for example, all that sort of thing... those people need drumming out of business and free up...*

R7 (beef, 600ha): *Yeah, I couldn't agree with you more!*

R4: *Because we're getting so much, a lot of the stick we get for pollution is off all the... because of a few who are stuck in the 17th century.'*

- Dorset FFG

Devon FFG participants also discussed whether there should be more enforcement of water quality rules. There was an agreement within the group that the current approach allows farmers to pollute with little or no consequences: *'Is a soft approach the right thing to do because then I could be like well I'll just bung a load of stuff in the river because I know they'll only treat me softly'* (Devon, R4, haylage/beef, 39ha). These participants, despite showing frustration towards neighbouring farmers who continue to pollute watercourses, indicated that they would never report them to the authorities and instead, that the Environment Agency must be responsible for recognising those who are causing a problem:

R1 (beef, 150ha): *'We all know the name of those within 10 miles that pollute without any doubt at all'*

R7 (dairy, 81ha): *Hope it isn't me! (laughs)*

R1: *But people would never shop each other, it's not done in the industry, it's for the EA to do their job'*

R2 (mixed, 180ha): *No way, you knock on the door and try and help'*

R5 (haylage/beef, 39ha): *It's gotta be very bad'*

R1: *No! It's not our job to do that'*

R2: *Yeah, it's up to the EA to have their system working better, so people on the ground know exactly where to turn'*

R4 (haylage/beef, 39ha): *Its enforcement isn't it*

R1: *Yeah, you need enforcement'*

- Devon FFG

6.6.2. Scepticism towards government bodies

Participants within all four FFGs voiced feeling sceptical towards government bodies, primarily towards the Environment Agency and the Rural Payments Agency (RPA). A farmer within the NY FFG even requested an opportunity to complain specifically about the Environment Agency (*'When can we be abusive about the Environment Agency?'* - R3, beef/sheep, 350ha) during a discussion about CSF. This question may indicate that this farmer was particularly frustrated by the Environment Agency so decided to introduce the topic spontaneously. Alternatively, it may be because farmers associate CSF with the Environment Agency due to both being government or because the fragmented advisory system (see section 6.4.1.) has led to confusion about which entity is which. Moreover, where farmers do not feel like they trust governmental bodies, they may be resentful of complying with regulations or applying to schemes where they may receive late payments or deal with staff they see as incompetent.

Some FFG participants believed that Environment Agency staff rely upon outdated knowledge due to the view that agency officers fail to recognise the changes farming has undergone in recent years:

'I think there's a lack of farming knowledge in some of the EA; they don't seem to realise just how far farming has come on in the last 20 years in terms of the fact that fertilisers are very, very expensive, people put them on very sparingly, farmers, as you know, go around their field with drones, they find out where the patches are where they should be putting on nitrates and shouldn't be... it's all very targeted, and I don't think people realise just how much nitrate usage has changed and dropped'. (Dorset, R7, beef, 600ha).

A farmer from the Cumbria FFG had experienced a visit from the Environment Agency recently and exhibited scepticism towards the competence of the officer:

Me: *'Have any of you had any dealings with the Environment Agency recently?*

R3: *Over to you R4 (laughs)*

R4 (dairy, 360ha): *Well I'll tell you ... I was blamed for polluting the watercourse, we're on limestone ground... was it me, probably, but they couldn't prove it, they tried their best, set up all these tests, came back inconclusive. Anyhow, end of the day, they came back and said something's leaking, the silage, they said we can see it is so you need to do something about it. So we did, the third or fourth time we've done it, and she then came back and did another inspection, but she didn't know the difference between water and uphill or downhill, she's fairly... she's hard work, put it that way*

R1 (mixed, 156ha): *That doesn't bode well, like, they should at least if they're gonna come and tell you what to do they should at least understand what they're talking about.'*

- Cumbria FFG

Where these officers are not perceived as credible, this could result in disengagement with CSF advice due to it being a government-led initiative which the Environment Agency itself has some involvement in.

6.6.3. Negative views surrounding environmental funding schemes

Farmers from all FFGs expressed negative sentiments towards various agricultural support schemes, including those which include measures for reducing DWPA (e.g., Countryside Stewardship). The main issues related to bureaucracy, the inflexibility of the schemes, and the notion that these schemes reward polluting farmers. Other issues included the view that many schemes are unaccommodating to small farms, frustration due to receiving late payments, problems with the mapping used during funding applications, the belief that the wrong items are funded, that these schemes are often too short term and that there is fragmentation between schemes and the view that these schemes are poorly organised. These findings align with Enticott (2008), who recognised that farmers are sceptical of government bodies due to the government neglecting to

use farming knowledge when making decisions in the context of animal health; these findings suggest that the same may be the case in the case of DWPA.

Excessive bureaucratic loadings

Dorset FFG participants gave a succinct account of how bureaucratic loadings have impacted the relevance of engaging with DWPA advice and funding, with previous experiences of excess bureaucracy dissuading them from re-engaging:

R4 (arable, 810ha): *'When you get the bloody RPA and its mapping and this fiasco we had last year when they remapped 80% of the land in the country (...), I spent God knows how much time sorting out what had been... everybody has probably had the same problem... what had been sorted since 2005, they threw it all up in the air, and I had to redo it! I spent hours and hours and hours, so that's what we're up against, this bureaucratic bloody waste of time which doesn't encourage you to engage with new things going forward because you think well how much of a bloody headache is this going to be! It's a seriously important issue...'*

R3 (suckler beef, 220ha): *all of Gove's⁴⁹ lovely new ideas but after the bureaucrats have crept all over it and put their fingerprints on it, the people who invented the BPS and the rural land register and all that other crap, God knows what it'll be!*

Some farmers also reminisced about past policies and schemes where bureaucratic loadings were lower:

'In the old days where it was [...] do this, bang, get your money, but now it's gone into so much detail that you lose the will to live! If you read all the different rules, you might as well just stick your head in the oven. That's the problem with the modern world, we have lost the ability to make things simple for the guy on the ground to understand.' (NY, R2, dairy/sheep, 200ha).

Several research participants, particularly within the Dorset and Devon FFGs have become so disillusioned with administrative burdens associated with

⁴⁹ Michael Gove – the secretary of state for Defra at the time of this fieldwork

applying for grants for reducing DWPA that they fund environmental changes themselves, bypassing advice and financial support:

R4 (haylage/beef, 39ha): *'We've put down 4 1/2 miles of fencing in the last 3-4 years [...], but we did all the work ourselves. I just could not face the prospect of getting that grant-funded*

R1 (Organic beef, 150ha): *Ahhh*

R4: *And the ties that that would ... bring*

R1: *Interesting*

R4: *We were in ELS up until last year, and again, I just find it so restricting for the amount of money you get that it's not worth it.'*

- Devon FFG

Despite a couple of FFG participants installing items such as riparian fencing themselves to avoid bureaucracy, it is likely that other farmers may not be so environmentally minded. As a result, when these farmers disengage due to bureaucratic loadings, it is unlikely that they will then act environmentally independently.

The inflexibility of existing support schemes

Farmers within the Dorset, Devon, and NY FFGs referred to how inflexible existing support schemes are: *'There's no leeway and no common sense, sometimes you need to adjust and change things, and it's like no, you have to do this, and it has to be done then, it needs to be more flexible for common sense'* (NY, R1, heifers/sheep, 156ha). These farmers argued that many funding schemes fail to account for the temporal flexibility required in farming, whereby farmers' needs and uses of capital items may change over the years:

R1 (organic beef, 150ha): *'The technicalities of the usage of things like sheds, you've got to use it for that particular purpose for years and sometimes... you might...*

R3 (sheep, 57ha): *It doesn't reflect the business or how it might evolve*

R1: *No, it doesn't!! You might wanna fill the shed up with hay one year you know, you need to be adaptable*

R2 (mixed, 180ha): *It's all about flexibility init*

R1: *There's no flexibility is there!'*

- Devon FFG

Farmers within the Devon FFG also referred to the restrictive nature of the timings they are forced to adhere to when they are involved in a funding scheme, indicating that this dissuades them from applying, particularly where the terms of the scheme are too complicated:

R1 (beef, 150ha): *'If you've gotta grow an overwinter stubble and it's gotta be drilled between Sept and Oct, and you must make sure it's harvested by 14th July, and that's gotta stay bare ground for another six weeks before you put it into another crop and you look into it and go oh, look at that*

R3 (sheep, 57ha): *I've lost interest already!*

R1: *Yeah, lost interest! But then you see it's worth £285 per hectare and suddenly, ooh and you think maybe you can fit it into your system, but not many people get there. You don't because it's horrendously complex*

R7 (dairy, 81ha): *Also what if it's gotta be done by a certain date but the weather changes*

R1: *You get derogations, and that's fine, but again you have to go through that, there are ways around it, but a lot of them are very off-putting*

R3: *Yeah, it's hard.'*

Other FFG participants have experienced a lack of flexibility in terms of when their funding schemes begin, with some having gaps between funding:

'Our current HLS agreement runs out in November 2020; the next ones start in May 2021, so there are months between them, we cannot shorten ours to fit in ... we can't get out of one to get into the other! So we've got a period where we're not in any... so this is just nonsensical, this continuity, it just doesn't fit into their overarching... so there's no fluidity' (Dorset, R8, beef, 300ha).

6.6.4. Linking issues with water quality policy with the CRELE of DWPA advice

There is a clear link between the perceived CRELE of regulations and support schemes and whether a farmer will engage with DWPA advice, including CSF. As the CSF initiative is government-led, it may be particularly affected by these issues as farmers may not differentiate between different state-led initiatives and policies. Where farmers are disillusioned by existing water quality policy and support schemes, they are unlikely to perceive engaging with advice for adhering to these regulations or applying for support schemes as relevant. These two policy drivers are, therefore, inextricably linked to the efficacy of DWPA advice. It is, therefore, hypothesised that the entire system must be deemed CRELE by farmers to maximise engagement.

6.7. Recommendations for improving the CRELE of DWPA advice according to the FFGs

Building upon the findings of the OQS (chapter 4) and FTIs (chapter 5), the FFGs led to the strengthening of the following recommendations:

- CSF should be delivered by longstanding, trusted, and impartial CSFOs if it is to be deemed CRELE by farmers; the perceived success of the initiative is heavily affected by the quality of its local CSFOs
- The bureaucracy surrounding funding schemes must be reduced if policymakers wish to encourage farmers to commit to altering their farming practices or land management
- Farmers would like to be shown hard evidence surrounding whether their practices likely contribute significantly to water quality problems as long as it doesn't lead to immediate prosecution and it is disseminated in a clear, concise manner from impartial advisors

Several novel recommendations can be identified from the FFGs due to the rich insights gathered which led to the emergence of additional ways of improving the CRELE of DWPA advice, including that delivered by CSF:

- Policymakers should recognise that regulation and support schemes relating to water quality and the wider environment are inextricably interlinked to the credibility and relevance of engaging with DWPA advice.

They must, therefore, ensure that these pillars are perceived as CRELE when attempting to maximise engagement with advice

- Farmers who are currently engaged with DWPA advice may, in future, disengage where they continue to observe other farmers continuing to contribute to water quality issues without consequence

6.8. Conclusions

The FFGs gathered detailed insights which allow the researcher to move closer towards answering the research objectives provided in section 1.6. They also revealed an emerging narrative surrounding the importance of regulation and funding schemes being perceived as CRELE if farmers are to perceive engaging with DWPA advice as credible and relevant to their farm businesses. Where farmers feel there is no risk of prosecution, they may disengage with advice due to a lack of perceived need to engage. Meanwhile, farmers who do engage are likely to become increasingly frustrated by farmers who fail to comply with environmental legislation surrounding DWPA.

Chapter 7

Advisor telephone interviews: An exploration into the perceived efficacy of DWPA advice according to farm advisors

Farm advisors are key actors within the context of this research, thus their views were gathered to build a deeper understanding of how credible and relevant current DWPA advice is and to identify common and contrasting themes. Advisor telephone interviews (ATIs) (n = 50) and focus groups (AFGs) (n = 3; chapter 8) were conducted in England. This chapter explores the findings of the ATIs to begin identifying the key similarities and differences between farmer and advisors' perceptions towards DWPA advice and whether advisors have a clear understanding of what farmers perceive as credible, relevant, and legitimate in this context. The ATIs explored how credible and relevant farm advisors believe the CSF initiative and other DWPA advisory services are, both in their own opinions and based on their interactions with farmers. Advisors were also asked how they believe farmers would respond to currently underused advice delivery mechanisms, video content, and 'hard evidence' surrounding farming practices' contributions to DWPA.

7.1. Methods used for the advisor telephone interviews

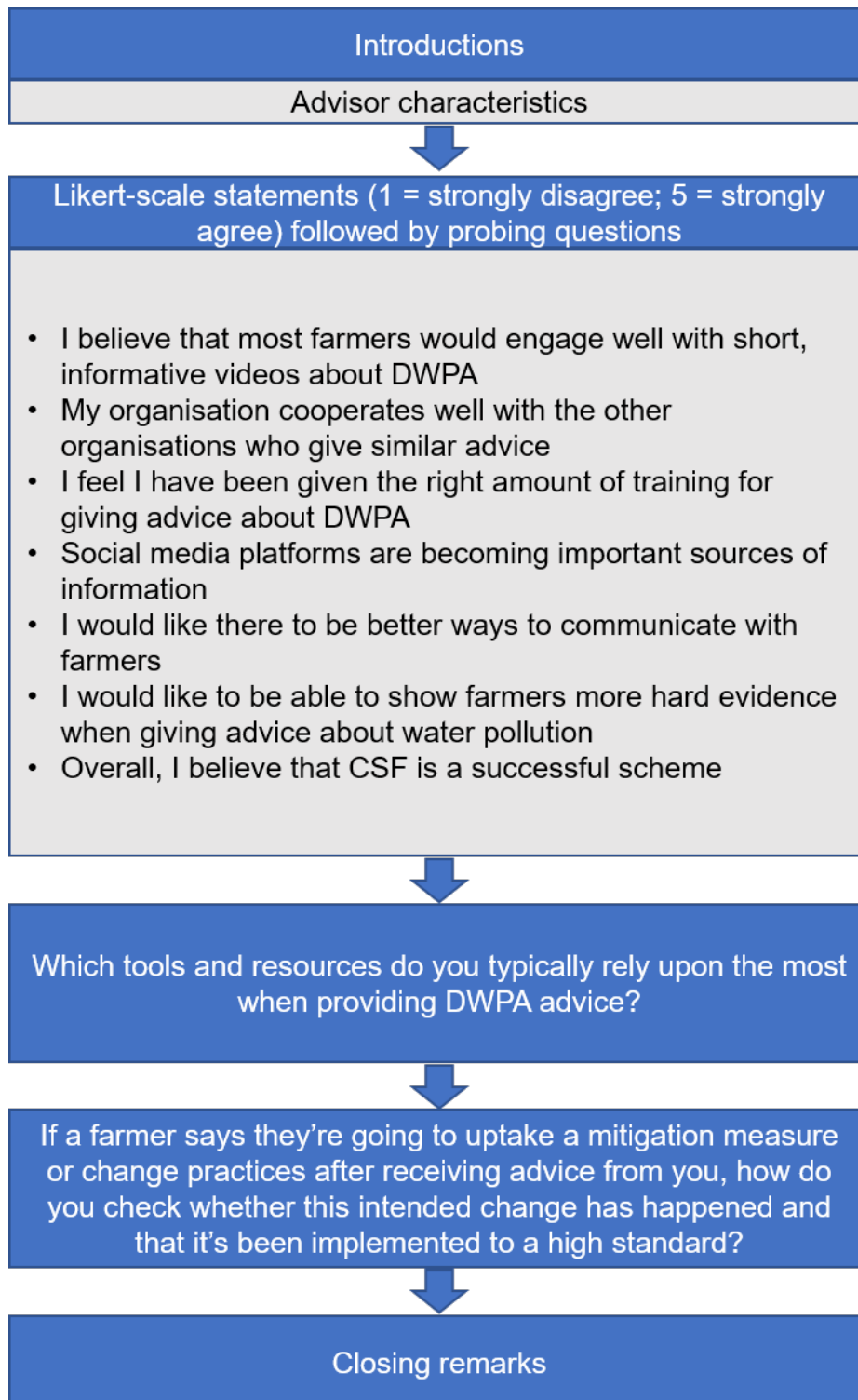
The full protocol for the ATIs is available in appendix (section 7.1).

The approach used for the ATIs was broadly similar to that used for the FTIs (chapter 5). An overview of why telephone interviews were conducted for this study is provided in section 3.3. Figure 7.1. provides an outline of the topics covered during the ATIs, many of which align closely with those covered when exploring farmers' views (see chapters 4-6). At the end of the interviews, advisor participants were asked whether they would like to receive outputs from the project.

The following advisor characteristics were gathered during the ATIs:

1. Advisory entity worked for
2. Time spent in an advisory role
3. Level of education and subject
4. Age of the advisor
5. Region of advice delivery

Figure 7.1. Topics covered during the ATIs.



7.1.1. Recruiting ATI participants

Both CSFOs and advisors from other entities were recruited for the ATIs as advisors from outside of CSF were likely to have their own perceptions of how credible and relevant the initiative is. Advisor participants were more easily recruited than farmers due to the largely public nature of their contact details and a general willingness to participate due to their interest in this research. ATI participants were mostly recruited through email correspondence (n = 43), with contact details obtained from a publicly available list of CSFOs (Natural England, 2020b). Advisors from other organisations were identified using Google searches and visiting organisation websites. A few (n = 3) ATI participants were also recruited through networking at events (e.g., the annual Rivers Trust conference). During these events, rapport was built with potential participants who were either not identified during online searches or had not responded to initial contact. One private advisory organisation was less straightforward to engage with as it does not share advisor contact details publicly and a senior advisory manager was initially reluctant to engage. However, once reassured that the surveys would last just 15-20 minutes and that participants would be anonymised, the contact details were shared as requested. As a result, several advisors (n = 4) from this entity were successfully recruited.

7.1.2. Advisor telephone interview sampling

The ATIs (n = 50) were carried out between 30/07/2018-21/06/2019 and lasted 16-127 minutes (mean = 32 minutes). Table 7.1 provides an overview of the regions the ATI participants operate within.

Table 7.1. Regions of England covered by the ATIs.

Region of England	Number of ATI participants (n = 50)
South West	15
South East	10
East of England	9
The Midlands	4
Yorkshire and the Humber	10
North West	2

Advisors from 24 organisations/initiatives participated in the ATIs (table 7.1). ATI participants deriving from regional advisory entities with a national presence were amalgamated into a single organisation when presenting this research to enable participants to maintain anonymity. For example, while advisors from five regional water companies and six separate Rivers Trusts participated in the ATIs, they are treated as two national entities rather than naming the local entities individually. The amalgamation of these entities was necessary for maintaining participant anonymity due to the relatively small number of advisors within some of the regional entities.

Table 7.2. The advisory entities from which ATI participants derived.

Type of organisation	Number of ATI participants (n = 50)
Government bodies, including Natural England (CSFOs = 16) and The Environment Agency	17
Regional water companies (e.g., Wessex Water, Anglian Water)	10
Non-governmental organisations (e.g., FWAG, the Rivers Trusts)	15
Private companies (e.g., agronomists, ADAS)	8

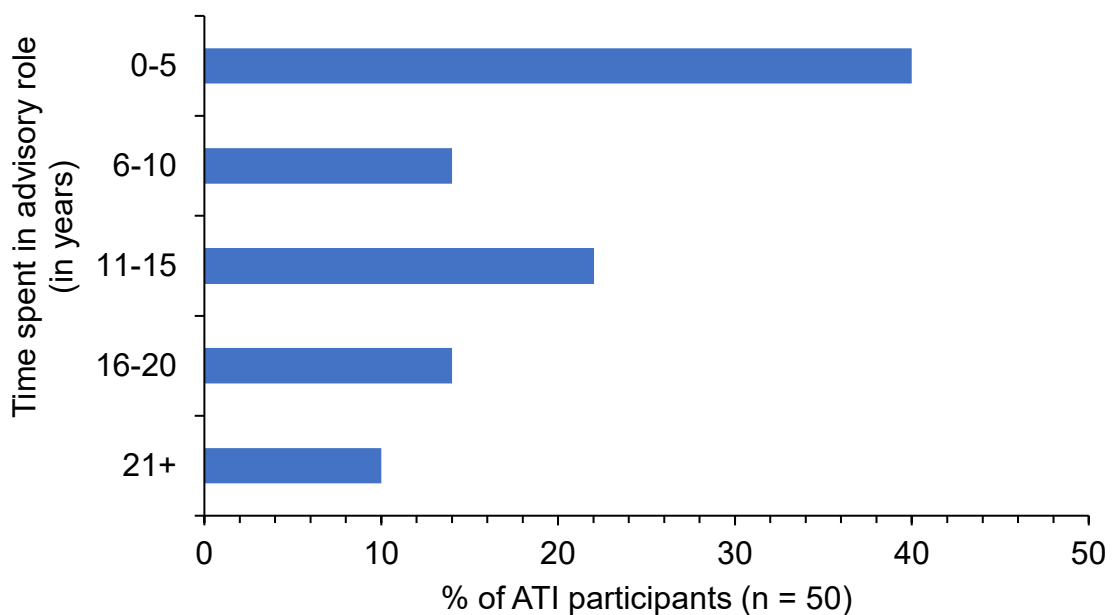
In terms of gender, just under two-thirds of participants identified as male (n = 32), with the remainder identifying as female (n = 18). Most (n = 42) were educated to bachelor's degree level or above, with 21 completing their education

in agriculture, 23 in the environment, three in neither discipline, and three specialising in both.

On average, participants had been in advisory roles for 10.5 years (ranging from 0.5-35 years; figure 7.2). Several ATI participants had held advisory positions relating to DWPA for 0-5 years (figure 7.2). The high number of advisors who haven't been in their advisory jobs for long offers evidence that there may be a high turnover of advisors, in particular within CSF; 50% (n = 8) of the CSFO participants had been in an advisory role for <5 years.

A cross-tab of time spent in advisory roles versus age was conducted to explore whether the newer advisors were new simply because they were young (i.e. aged 18-34). This was, however, not the case; many of the 19 advisors (23.4%; n = 11) who had been in an advisory role for <5 years were 35 or older, with 7 of these advisors aged 45 or older. This indicates that these advisors may have changed entities or regions in recent years, or that they have had previous careers. Many of these previous careers may, however, have been farming-related. This indicates that although farmers place trust in advisors who have been in their roles for a long time or older advisors, this may not necessarily be a true indicator of an advisors' experience level.

Figure 7.2. Breakdown of ATI participant time spent in advisory roles.



7.2. Results

7.2.1. Farm advisors' perceptions towards the CSF initiative

ATI participants were asked to respond to the statement, '*I believe Catchment Sensitive Farming is a successful initiative*' on a 5-point Likert scale. The average score given by ATI participants was 4.1, with no advisor participants disagreeing or strongly disagreeing with the statement. How long ATI participants had been in an advisory role did not affect how successful they perceived the CSF initiative as. Just one CSFO provided a neutral answer, with most agreeing or strongly agreeing with the statement (average = 4.5). Meanwhile, the average score given by advisors from other organisations was 3.9, indicating that CSFOs have somewhat more positive views of the initiative than external advisors do. The two main organisations with advisors who provided a neutral answer (n = 14) were water companies (n = 6) and the Rivers' Trusts (n = 4). Advisors operating within the South West, East of England, and the South of England were slightly more likely to provide a neutral answer. Advisors were then asked to elaborate on their answers. Similar numbers of participants shared positive (n = 35) and negative (n = 34) qualitative sentiments, with several (n = 19) conveying mixed sentiments.

Despite giving a high score when responding to the quantitative statement surrounding how successful CSF is, several advisors (n = 11) often contradicted the number they assigned when elaborating. Of the 35 ATI participants that agreed or strongly agreed that CSF is successful later shared negative sentiments towards the initiative. For example, a CSFO (advisor #37) strongly agreed that CSF is a successful initiative but later shared concerns surrounding how it is funded and the short-term nature of many CSFOs:

'There is good communication there but sometimes there's a lack of trust. I think that's partly because of the world we work in with funding restrictions, we've got a bit of a revolving door with advisors where people come in and out of catchments quite a lot. Just as someone starts to build up a relationship with someone, the CSFO moves onto a different job or gets a promotion and moves somewhere else. There needs to be something to keep people in post for a little bit longer.' (ATI #37, CSFO).

This indicates that while most advisors broadly see CSF as a success, there are clearly several ways in which the initiative could be improved. This reiterates the importance of gathering qualitative and quantitative data and indicates that the 5-point Likert scale questions were prone to a degree of subjectivity.

Positive sentiments towards CSF shared by ATI participants

The positive sentiments surrounding CSF provided by ATI participants related to the following themes⁵⁰:

1. The quality of CSF advice (n = 21)
2. The availability of funding and grant-related advice for farmers (n = 10)
3. Perceived outcomes of CSF delivery (n = 7)
4. The structure of the CSF initiative (n = 6)

According to ATI participants (n = 21), CSF advice is characterised as high quality (and, therefore, credible) where the CSFO is longstanding and trusted in their catchment and provides informative, impartial, practical information. Table 7.3 provides an overview of how CSFOs (n = 6) and advisors (n = 15) from other entities defined high quality advice from the CSF initiative.

Table 7.3. Terms used by CSFOs and advisors from other entities when discussing what makes CSF advice ‘high quality’. Terms are in order of use, with continuity and experience seen as most important by both subsets of participants.

CSFOs (n = 6)	Advisors from other entities (n = 15)
Continuity	Continuity
Experienced advisors	Experienced advisors
Practical	Practical
In-depth advice	Useful events
Farming background	In-depth advice
	Evidence-based
	Non-prescriptive

⁵⁰ Please note: these themes are not mutually exclusive, with several advisors referring to multiple themes.

Several of the terms used by advisors when describing 'high quality' advice (table 7.2) align with those used in existing literature (see Cox *et al.*, 1990; Blackstock *et al.*, 2010; Sutherland *et al.*, 2013) and by participants from the other methods conducted during this research (see chapters 4-6). Alongside praising the quality of CSF advice in general, some advisors recognised CSF-led events (n = 6) as successful for facilitating farmer-farmer learning:

'I did a series of workshops for CSF where we had a farmer (...), and he'd shown that by improving his practice how the Metaldehyde levels had dropped in his catchment specific to where he was... growers respond very well to seeing that their actions can make a positive contribution, erm, and that is always very good to be able to show a factual statement of where this improvement has led directly to benefits' (ATI #13, independent agronomist).

The above quote, alongside illustrating that farm events held by CSF are perceived as meeting the credibility and relevance components of CRELE, indicates that some non-CSFOs collaborate with CSF more than others, with this agronomist delivering events on their behalf.

Several ATI participants (n = 10) referred to grants when discussing the efficacy of CSF. Many of these participants suggested that farmers engage with the initiative primarily to obtain grant funding, including farmers who may not, perhaps, typically engage with DWPA advice without this: *'The attraction of grant aid has bought a few to the table that perhaps wouldn't normally have come along by choice'* (ATI #48, ADAS).

Of the ATI participants (n = 7) who believed CSF has resulted in positive outcomes, most were CSFOs (n = 6). Of these advisors, some (n = 4) believed CSF has resulted in water quality improvements:

'If you look at the data on water quality since CSF was formed, there's certainly been an improvement in the quality of water and the reduction of diffuse pollution from agricultural sources' (ATI #50, CSFO).

'We have some data that shows that some pesticide levels have gone down, and I know from farms that I've gone out to that we have made a difference' (ATI #44, CSFO)

The remaining ATI participants (n = 3), all of whom were CSFOs, had, however, seen proof that CSF *has* had an impact on measure uptake: *'66% of the advice we give is acted upon and results in changes on the ground, so I believe that CSF advice changes practices for the better'*. (ATI #35, CSFO).

The positive aspects of how the CSF initiative is structured (n = 6) included the provision of 1:1, on-farm advice, the fact that its delivery is free at the point of delivery, that it is a longstanding initiative, and that it collaborates with other entities.

Negative sentiments towards CSF shared by ATI participants

The following themes emerged from the negative sentiments surrounding CSF shared by ATI participants:

1. Issues relating to how the CSF initiative operates (n = 19)
2. Issues relating to the Countryside Stewardship water quality grant (n = 10)
3. A failure by CSF to reach unengaged farmers (n = 8)
4. A perceived lack of evidence that CSF has led to water quality benefits (n = 7)
5. Variation in the quality of CSFOs (n = 7)

Issues relating to how the CSF initiative operates

A key issue relating to how CSF operates was the perception that there is a high turnover of CSFOs (n = 9) due to the use of short-term contracts by Natural England (see also section 5.2.3). The following quote summarises this view and explains why having short-term advisors within a catchment is likely to reduce credibility:

'There has been a huge amount of turnover of CSFOs! Huge amount. (...) A lot of our advisors have been in place for tens of years, which gives a lovely level of continuity when you're working with farmers. They like to see familiar faces. It takes time to understand how a catchment works; each farm is run individually due to the lay of the land, soil types, (...) and things change, some people move over to dairy, or go into beef... you need that continuity to understand what's happened at the farm (...), understanding the farmer, understanding the son, you need a long-term

commitment to the catchment. CSF, the advice can turn over on a six month or annual basis, which is not... the farmers don't know whom they're dealing with' (ATI #25, The Rivers Trusts).

A current CSFO said they were leaving CSF shortly due to a lack of job security; *My contract expires in March every year, and if I haven't got a job, I'm in big trouble, so it is undoubtedly an issue. I know other CSFOs have had that issue as well.'* (ATI #37, CSFO), while another ATI participant, now working for an NGO, had previously worked as a CSFO but left due to this issue:

'It would be successful if they gave permanent positions. In the catchment that I worked on a couple of years ago, I was given four months in the job, and before that, three or four other advisors had only lasted six months each because the contracts are so short, so people move on. (...) It's hard to achieve anything when you lose any relationship you've built as soon as that person leaves' (ATI #28, FWAG).

Another problem surrounding the structure of CSF related to how the CS high priority water quality boundaries are allocated (n = 4): *'I have a catchment where the river hasn't had CSF for a long time, and it's a massive chip on everyone's shoulder'* (ATI #21, Wildlife Trusts). This was also a key narrative shared by farmers (chapters 5-6). Some ATI participants (n = 4), including CSFOs, also argued that there are not enough officers to fulfil the goals of CSF:

'I'm one advisor covering (...) about 3000 farms, all of whom want advice, and to be able to give them the quality and the depth of advice they need, a few things are caught between two stones!' (ATI #27, CSFO).

Lastly, a few (n = 3) ATI participants contended that CSF is poorly coordinated, while a couple (n = 2) claimed that the remit of CSF has become too broad since the addition of air quality to the initiative (see also section 8.3.2).

A failure by CSF to reach unengaged farmers

Some (n = 8) ATI participants suggested that CSF tends to attract the 'usual suspects' while failing to reach unengaged farmers:

'You get the same people engaged, I've seen the same people that get the capital schemes, and it's the same people every time (...) I've been to a few of the meetings, and the farmers who go are enthusiastic about it, but

you're only getting the top 10% of farmers that aren't doing so much wrong anyway' (ATI #12, agronomist).

There was also a suggestion that some CSF-engaged farmers may only do so to gain grant funding, not necessarily because they are concerned about improving water quality *per se*: *'I think some who engage do it for the wrong reasons, i.e., they're gonna get a grant to improve their farms rather than that they're thinking about pollution'* (ATI #40, ADAS). However, this participant did acknowledge that this may not necessarily be an issue as long as the resulting grant leads to water quality improvements. It should be noted that a single grant is unlikely to result in tangible water quality improvements; thus, this advisor may have been misinformed about the landscape-scale changes needed to make substantial improvements to water quality.

Issues surrounding the CS water quality capital grant scheme

Some advisors (n = 5) perceived the CS water quality grant scheme's application process as excessively bureaucratic: *'Complications with the administration of the scheme have put many people off, the complexity of it has put people off'* (ATI #26, Rivers Trusts). Moreover, a water company advisor believed that some farmers are willing to be paid less where the requirements to complete paperwork are minimal. As a result, it was argued that these farmers are more attracted to engaging with their organisation than with CSF due to their simpler funding scheme:

'Their contracts are very specific; they're quite complicated and take the farmer quite a long time to fill in. We benefit from that because our schemes are much simpler, farmers will take less money because our scheme is simpler' (ATI #11, water company).

Alongside referring to the bureaucratic loading faced by farmers, some ATI participants (n = 5) also lamented about the bureaucracy faced by CSFOs, suggesting that it impedes their ability to fulfil their roles:

'I've got friends who work for CSF, and they go through so much bureaucracy, they spend half the time trying to get consent to do stuff rather than getting on the farm to deliver...it's not very time efficient, it could be delivered better' (ATI #18, Rivers Trusts).

Despite the small numbers of ATI participants who introduced this narrative, it is of note due to its spontaneity. ATI participants were not asked to discuss the CS water quality capital grant scheme, thus their desire to discuss it despite this indicates that the topic was important to these participants. Had all participants been asked about the CS water quality scheme, it may have become a prominent theme. Regardless, it must be noted that this may also mean that the remaining 45 participants did not see this topic as concerning enough to mention.

Variation in the quality of CSF advice

Some advisors (n = 3) perceived some CSFOs as lacking ample farming knowledge or expertise:

'I believe that some CSFOs do not take a full overall picture of the farm; they are somewhat blinkered... I've been to farms that have already had a CSF visit and picked up on problems that should have been noticed on the first visit. But that may be due to my level of experience. I tend to look behind sheds, not in front of them' (ATI #25, Rivers Trusts).

'Lots of other catchments have got much newer, younger people, nothing wrong with that, but they may not have the farming experience' (ATI #35, CSFO).

A few advisors (n = 3) remarked that there's a lack of continuity of advisors, thus impeding the ability of CSFOs to build long-lasting rapport with farmers:

'I did CSF work when I worked for ADAS, and my biggest bug-bear was that there was no relationship built between the advisors that CSF got in to do the visits and the farmer. You would go out and do a visit, create a report, follow up with the farm with maybe a telephone call to say did you receive the report, and that would be it!' (ATI #20, water company).

A lack of evidence that CSF has led to water quality improvements

While some ATI participants believed there is clear evidence that CSF has resulted in water quality improvements (see section 7.2.1), others (n = 7) were sceptical: *'I have heard other agricultural specialists say there isn't much evidence that it has led to water quality improvements'* (ATI #15, Rivers Trusts). Other advisors were unsure as to the level of uptake of measures and practice changes CSF has directly led to:

'Have any mitigation measures been put in place due to CSF, and if so, how many? That's a question I'm always asking. I see them as good organisers for demonstration days, and they're very good, but how many cover crops are put in? How many buffer strips? We never really get to the bottom of that' (ATI #14, water company).

Upon analysing these results, it appears that the advisors who were sceptical of CSF's impact have not been provided with enough evidence proving that CSF has resulted in water quality improvements or uptake of measures. The scepticism surrounding the impact of CSF has likely had a profound effect on the initiative's perceived credibility.

7.2.2. Do advisors believe that their organisations and initiatives are cooperating effectively when providing DWPA advice?

According to the findings presented in chapters 5 and 6 alongside existing literature (Ingram *et al.*, 2011; Curry *et al.*, 2012; Sutherland *et al.*, 2013), the English AKIS is fragmented, with a multitude of actors involved in delivering farm advice. Advisors were, therefore, asked to respond to the statement *'My organisation/initiative cooperates well with the other organisations delivering similar advice surrounding DWPA,'* on a 5-point Likert scale. The average Likert score was 4.21, indicating that most advisors believe their organisations cooperate effectively with other actors delivering DWPA advice. As suggested by Prager *et al.* (2017), cooperation and collaboration may lessen the negative aspects of fragmentation, and according to this finding, this may already be the case for many sources of DWPA advice.

When asked to elaborate on their answers, over half (n = 28) of advisors provided positive explanations, claiming that their organisation or initiative is effective at collaborating with others, generally due to the shared goals of different advisory actors:

'There is a really good willingness and shared vision, I think, between ourselves and CSF (...) and we are always working on improving how we work with agencies like the Forestry Commission and NGOs, the Eden Rivers Trust, Cumbria Farm Network, the Woodland Trust; there's (...) people I work with on a fairly regular basis' (ATI #27, CSFO).

Many participants, including the one above, listed the other advisory entities they cooperate with. Most of these lists consisted of a combination of government-led initiatives (e.g., CSF) and NGOs (e.g., The Rivers Trusts). Private companies and agronomists were not mentioned particularly often, indicating that farmers know that many of these advisors specialise in delivering advice unrelated to DWPA.

Despite assigning a score indicating they agreed with the statement above, several advisors (n = 17, including 6 CSFOs), reported a lack of cooperation between advisory entities. This disjuncture between entities was typically attributed to the disparate remits covered by different organisations (n = 7) (*'We have a very clear mandate, nitrate, so we're very mono-focused and I think that sometimes is a bit of a difficulty for other advisors who are looking at a wider number of parameters. (...) I think sometimes it does affect our relationship with them a bit'*, ATI #11, water company), the fragmented nature of the English AKIS (n = 6): *'We don't necessarily interact with other organisations so we might go and see a farm and they might as well (...) It can be a little bit difficult, I think farmers prefer to just have one advisor and that's not always possible'*, ATI #44, CSFO), and a lack of available funding or time to form meaningful collaborations (n = 4): *'We are so tightly constrained at the moment by what we can do, it limits practical worthwhile engagement'*, ATI #35, CSFO.

Some advisors (n = 8) referred to the Environment Agency as failing to collaborate with them; of these advisors, 4 were CSFOs: *'I personally think that EA is so lacking in funding and people on the ground, they're so stretched that they've got limited scope to join up with us'*. (ATI #23, CSFO).

'The more that organisations can work together the better. We have really struggled, we invited the EA to come and speak at our latest joint meeting and they were appalling. All they did was talk about all the ways that they could find farmers and legislate against them, there was nothing positive and how they could work together and help farmers become compliant, it was so embarrassing. It was awful'. (ATI #6, AHDB).

The above quote further evidences the different remits held by advisors within the DWPA AKIS and illustrates the challenges which can arise when these entities attempt to collaborate, particularly when the remit of one (the Environment Agency) is largely regulatory as well as advisory.

7.2.3. Farm advisors' capacity to revisit farm holdings

ATI participants were asked the extent to which they can follow up with farmers they have previously visited, particularly where farmers have indicated that they intend to make a change on their farm upon being given advice. Knowing whether measures have been taken up is a good indicator of how effective these advisory efforts, including CSF, are. In addition, revisiting a farm holding was expected to be essential for both maintaining an ongoing relationship with farmers to instil credibility and for investigating whether measures are both being implemented in reality and the quality of the uptake (i.e., the right measure, implemented correctly, in the right place and sustained through time).

Many of the 41 ATI participants (n = 28, 68.3%) who answered the question surrounding whether they revisit their farmer clients stated that they have at least some capacity to do so. However, of these advisors, some (n = 10; 35.7%) admitted that the number of farmers they revisit is limited. These advisors shared various reasons for lacking the capacity to revisit farms, including resource constraints, a perceived lack of a need to revisit certain farmers (primarily due to recommended measures being voluntary), or placing trust in their farmer clients to act on advice. Several advisors (n = 7; 17%) stated they are more inclined to visit farmers who have received funding or a grant. Some advisors (n = 13; 31.7%), however, said that they do not typically revisit farms, most of whom derived from entities other than CSF (see below). This was primarily due to resource constraints and some advisors (n = 4; 30.8%) believing that this is not within their remit and should instead be undertaken by inspectors (e.g., from the Environment Agency).

According to the Environment Agency (2019), 53% of CSF-engaged farmers have engaged three or more times. It was, therefore, assumed that CSFOs can make multiple visits to many farmers. As expected, of the 14 interviewed CSFOs, most felt either fully able (n = 8) or at least somewhat able (n = 4) to revisit farms. Other CSFOs (n = 2), however, felt they were limited on their ability to make repeat visits, primarily due to time constraints. These CSFOs recognised that a lack of repeated interaction might be detrimental to their credibility as farmers like to 'show off' their efforts:

'I don't always have the time to follow up, so I'm trusting them to just get on with it. I would like to follow up with everyone [but] it comes back to resourcing. I'll be totally honest and say there's possibly a training need there for me, but on the whole, it's down to the number of catchments and being spread invariably thin. Farmers are keen to show off the work they've done, so it's a shame and a weakness that we don't get to come and see them positively and say 'blimey, you've done a good job of that!', or actually 'you've not quite got this right, you need to consider this, this and this.' (ATI #35, CSFO).

The approaches used by advisors both within and between advisory entities varied. Some advisors planned their return visits:

'I do it a set time after I've given the advice. My experience in the delivery of advice is that deadlines help encourage farmers to do them. So, if I say I'm coming back in 8 weeks to check that you have done it, and I come back, and they haven't done it, then they have to justify why they haven't done it, and it puts them under a bit of pressure' (ATI #13, Independent agronomist)

Meanwhile, other advisors were more relaxed, stating that they simply 'see farmers around the catchment' or at farm events where they'll ask them whether they've made any changes. Some advisors from entities other than CSF claimed that they have more ability than CSFOs to maintain engagement with farmers after an initial visit:

'We're quite fortunate in that typically the number of farmers to a catchment advisor is one advisor to 25-30 farmers, whereas the CSFOs are maybe one advisor to 2-300 farmers, so they have to operate differently, they're not seeing each farmer as often as we are.' (ATI #9, water company)

One advisor who works for a private entity which undertakes CSF work on contract exhibited concern that they aren't then asked to make repeat visits afterwards:

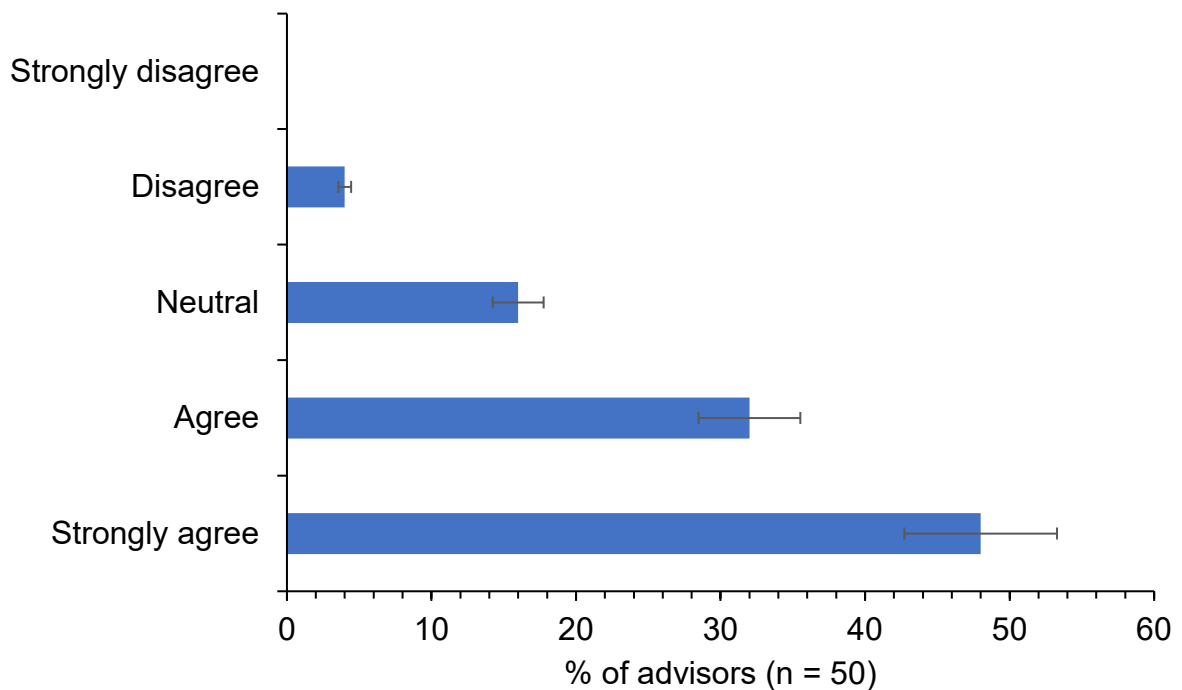
'I'm not! For CSF I go out, [we've] been tendered for the work, we've done the 1:1 visit, we agree the advice, and that's the last we see of the farmer unless we win the tender to evaluate it. It would be nice to know what some of them have done, whether they've taken any notice of you! Occasionally you do see the same person again, and they'll say, oh I haven't done it yet, but other than that, you don't know whether they've done it or not or whether they intend to do it.' (ATI #48, private company)

The following sections identify how farm advisors believe DWPA advice, including that delivered by CSF, could be improved under future circumstances, including through the dissemination of more 'hard' evidence surrounding the contributions of farmers' practices to DWPA (section 7.3), through social media, and increased delivery of video content providing DWPA advice (section 7.4).

7.3. Advisors' views on the use of 'hard' evidence for providing DWPA advice

Most ATI participants (80%; n = 40) agreed or strongly agreed with the statement *'I would like to be able to present farmers with more hard evidence in the future'* (figure 7.3; average Likert score = 4.2). There were no discernible differences between participants' answers and any advisor characteristics (see section 7.1).

Figure 7.3. ATI participants responses to the statement, 'I would like to be able to show farmers more 'hard' evidence when giving advice about water pollution.'



Upon providing a quantitative indication of their agreement with the above statement, ATI participants were probed about their answers to gather qualitative narratives. The resulting answers revealed several themes, including reasons why advisors perceive particular types of evidence as meeting the CRELE thresholds and caveats to how this 'hard' evidence should be collected and presented to farmers.

7.3.1. Advisors perceptions towards existing tools and resources which provide 'hard' evidence surrounding DWPA

ATI participants were asked which tools and resources they already use for gathering information and evidence to disseminate to farmers when giving DWPA advice. Advisors' responses were expected to provide insight into the criteria advisors use when determining whether resources are credible and relevant for encouraging farmers to recognise their likely contributions to DWPA, continue engaging with their advice or make changes to their farm practices. Almost all surveyed advisors (n = 49) reported using at least one tool or resource when delivering advice. The single ATI participant (a CSFO) who did not refer to using

any informative tools or resources surrounding DWPA was new to the role, having been in the position for less than a year.

The RB209 nutrient management manuals (AHDB, 2020b) were the most used source of information and are relied upon (n = 14) or used by (n = 29) by most interviewed advisors. Other notable tools and resources used by advisors when planning or delivering DWPA advice included various decision support tools (n = 33), including (the now inactive) 'What's in your Backyard', 'MAGIC maps' (Defra, 2020), 'MANNER-NPK' (MANNER-NPK, 2020), and 'PLANET Nutrient Management' (PLANET, 2020), Demonstration Test Catchment research (n = 23) (DTC, 2020), Catchment Data Explorer (n = 22) (Environment Agency, 2019), phosphate test kits (n = 19), SCIMAP online (n = 16) (SCIMAP, 2020), and Farmscoper (n = 16) (ADAS, 2018).

Negative sentiments towards existing advisory resources for DWPA advice

Many ATI participants (n = 38) expressed negative sentiments towards the tools and resources already available to them surrounding DWPA, resulting in 103 references. Accessibility was the most prominent theme (n = 22), with many of these advisors stating that they find it challenging to locate information:

'Demonstration Test Catchment research is useful, but I think it's extremely poorly advertised; they store a lot of it on Gov.web or whatever they call themselves, and it's near on impossible for an outsider to get into that information (...) it's a minefield trying to access it' (ATI #18, Rivers Trusts).

'I don't think data is shared well enough. For example, the EA; yes, they monitor some of the rivers, but unless you're lucky enough to pick up a report, you never see that data' (ATI #14, water company).

These sentiments convey a potentially negative aspect of the fragmented AKIS already identified in this study (chapters 5-6), indicating that a lack of shared resources is likely hindering DWPA advice's ability to maximise its credibility and relevance.

Several advisors (n = 13) also stated that they find some existing information sources and tools difficult to use:

Me: 'You mentioned that 'What's in your Backyard' isn't as useful as it was; why is that?'

ATI #39 (ADAS): Because various chunks, particularly the soil protection zones mapping, has been transferred to Magic where it is less easily accessible... it's much more difficult to get a clean screenshot.'

Even where information deriving from a tool may be useful to an advisor, if it is difficult to access this information, this will affect the credibility and relevance of using these tools and resources: *'Farmscoper is a complicated one, and it's not worth...'* (ATI #40, ADAS). Moreover, several advisors (n = 13) also argued that much of the information provided by resources is not relevant enough, mainly due to the scale at which they operate at (n = 5):

'Farmscoper is alright, but it's very limited in the scale you can use it at, it's fine on a catchment scale and sub-catchment depending on the size, but at farm level, I don't think it's up to much.' (ATI #17, Rivers Trusts).

The above quote illustrates the confusion advisors face when remembering which tools and resources are due to the disjointed, high-turnover nature of resources relating to DWPA. Farmscoper is, in fact, specifically a farm-scale tool. It is, therefore, likely that this participant was thinking about a different instrument when making this statement.

Farmers are known to find local information credible, while national scale data is less likely to be seen as relevant due to their recognition of the heterogeneity of farming. Other advisors (n = 4) were concerned by a perceived loss of detail in the latest edition of the RB209 nutrient management manual, resulting in it losing relevance to some farmers:

'If you (...) find old copies of RB209 when it was A5 and lookup potatoes, there were specific recommendations for moss soils and potatoes, and then another one for peat soils, they've all disappeared now, and they just give you a range of nitrogen. I think a farmer wants something more precise!' (ATI #48, ADAS).

Another key concern shared by several ATI participants (n = 11) was that some existing advisory tools and resources relating to DWPA are inaccurate. These perceptions threaten these tools' credibility, with advisors unlikely to show them

to farmers where they are sceptical of their reliability. Some advisors were concerned about the accuracy of the data used within the RB209 nutrient management manuals, with some claiming that parts of it are incorrect; *'I've heard that the phosphate amounts are incorrect, so they're going to do an amendment? They're (the RB209 manuals) only useful as long as their data are correct'* (ATI #31, CSFO). Other participants (n = 4) referred to tools which provide water quality data (e.g., phosphate test kits) as at risk of misleading farmers due to their 'snapshot' nature rather than using long-term monitoring:

'A one-off sample can show you an anomaly that doesn't give you an accurate picture of what's going on. I've not used them because I'm not completely comfortable with what they're showing.' (ATI #49, CSFO).

There was also concern by some (n = 7) that the data used within evidence tools and resources for DWPA advice has become, or is at risk of becoming, outdated, primarily due to a lack of long-term funding (n = 6). Some advisors exhibited frustration towards this, stating that this has resulted in the development of several tools which essentially offer the same information as a previous tool: *'We've used PLANET, but we're wondering what's coming next because no one is supporting that at the moment'* (ATI #16, CSFO).

"What's in My Backyard?" was very useful, (...) it was helpful to give the link to farmers to say, OK these are the sensitive areas... it was a useful information tool for (...) them to see an independent organisation or website saying what we were saying, so that is a bit of a loss. Again, the EA comes up with something really quite useful, and then as soon as people start to think 'hey, we can use this!' they then stop funding it, and you just think, aagh! I think there's a little bit of trying to make our jobs hard! (laughs)' (ATI #32, water company).

This lack of sustained funding may have contributed to the emergence of the plethora of tools and resources available to advisors, which was seen as problematic by some ATI participants (n = 4).

Positive sentiments towards existing resources for DWPA advice

Many advisors (n = 30) shared positive sentiments towards existing information and resources, most referring positively to the tools that can provide them with

evidence. The informative resources and tools seen as credible and relevant by advisors appear to be those which identify key areas of concern (n = 14), provide farmers with evidence of their contributions to a problem (n = 15), and those which are trusted by both farmers and advisors (n = 9) and provide visual information (n = 4).

7.3.2. Positive sentiments towards the prospect of showing farmers more 'hard' evidence surrounding DWPA

Many ATI participants' (n = 35) shared positive sentiments towards the prospect of providing farmers with more 'hard' evidence surrounding DWPA, resulting in 48 references. Several of these participants (n = 15) simply agreed strongly with the statement without elaborating: *'I'd give that an absolute 5, yeah. Totally agree'*. (ATI #23, CSFO); *'I think the more evidence you have, the better'* (ATI #50, CSFO). There were no characteristics which identified whether an advisor would qualitatively strongly agree with the statement, with CSFOs (n = 3), agronomists (n = 2), and advisors from various water companies (n = 4), FWAG (n = 2), The Rivers Trusts (n = 2) AHDB (n = 1), and CFE (n = 1) responding with strong preference for hard evidence.

Other ATI participants (n = 10) agreed that they would like to show farmers more 'hard' evidence to prove whether their agricultural practices are likely making significant contributions to water quality problems: *'I completely agree we need hard evidence to be able to show farmers that actually, this water quality incident has come from farming'* (ATI #20, water company).

'Evidence is key to proving there's a problem, and in fairness, I strongly agree with that, I strongly agree. (...) That's the type of thing that would be very valuable, to say that this is coming from this particular sub-catchment, so this is why we're targeting you. Farmers quite like that! I think they're quite happy with that! If you can say look, it's coming from here, like, when you put the metaldehyde maps up, and they can see which sub-catchments are failing, they like it! Because it's like right, that's an issue, and they're like OK. That's probably good to reveal to them OK, there is a problem, there is some evidence, we can't deny it, and it's on my doorstep'. (ATI #10, NGO).

When estimating the contribution of farmers' practices to water quality problems, some advisors suggested that farmers may not be aware of the contributions from their land due to most runoff occurring during rainfall:

'The more you can show them, hard evidence, photos, videos, stuff actually happening... the trouble is that when it IS happening, they're in the office because it's pissing with rain and they're not out there watching it, and if you show them it happening they can't deny it, so the more... I think almost video evidence you've got, the better.' (ATI #23, CSFO).

Some ATI participants (n = 4) also suggested that providing this evidence may lead to increased engagement with advice and policies:

'Farmers see all the turnover of different policies like the new farming rules for water, and they think they've seen it all before and it's not very backed up by evidence. If you show evidence and show it works, they'd be a lot more receptive.' (ATI #2, Rivers Trusts).

These advisors also indicated that the practical nature of farming makes evidence credible to them: *'farmers tend to be quite practical people so actually proving something to them is a good way to go'* (ATI #12, agronomist), while others suggested that they find science credible, with evidence opening doors: *'Showing a farmer the impact of something that they're doing, particularly with a 'sciencey' touch to it is, it opens doors'* (ATI #11, water company).

Some advisors (n = 4) also indicated that providing hard evidence can result in change by farmers, mainly where solutions are offered in conjunction with the evidence:

'Hard evidence, that's what farmers need. If you can give them the hard evidence to show them what they're actually doing and the effects that they're having, they sort of go, oh! And the natural response for them is 'well, what can I do about it?' Right, OK, here's a whole load of mitigation measures we could look at! And then we provide the evidence once they've done the mitigation, so that's how I work with farmers, and they seem to appreciate it.' (ATI #14, water company).

7.3.3. Caveats surrounding hard evidence according to ATI participants

Many ATI participants (n = 20), although responding positively to the prospect of providing farmers with more hard evidence surrounding DWPA, provided several caveats and requirements of this evidence.

Firstly, several advisors (n = 8) argued that 'hard' evidence should be presented in an easily accessible, inclusive way to maximise farmer engagement. This means that appropriate language should be used when disseminating evidence (*'It depends on how you present it, not too much scientific speak pitched right to the audience.'*, ATI #49, CSFO) alongside a format which is engaging and easily understood:

'If it's in the right format. Hard evidence is often presented very poorly by water companies or Natural England, with a workshop with 20 graphs [which] are impossible to interpret or slides and slides of writing; it's not a farmer-friendly presentation.' (ATI #40, ADAS).

Secondly, several advisors (n = 8) contended that this evidence should be locally derived where possible, thus maximising relevance:

'I'll just qualify that saying local as well, local hard evidence. There's nothing like being able to say, well so and so's trying this, do you want to go over and have a look at that, because all the soil conditions are so important to them, the local climatology and all that sort of thing, so it makes a huge difference being able to talk about case studies in the local area.' (ATI #21, Wildlife Trusts).

Several minor caveats also arose, including the view that hard evidence should be backed up by farmers (n = 3), for example, by asking farmers to explain to their peers how they changed their practices in response to evidence:

'I did a series of workshops for CSF where we had a farmer, and he'd show that by improving his practice how the metaldehyde levels had dropped in his catchment and specific to where he was. Growers respond very well to seeing that their actions are making a positive contribution. That is always very good as an advisor to show a factual statement of where this improvement has led directly to benefits.' (ATI #13, independent agronomist).

Another minor caveat was that hard evidence should relate to the implications for the farm business (i.e., financial costs of polluting) (n = 3): *'They want detail, hard evidence, especially if it relates to costs. If we can give them evidence of the financial implications of losing soil erm, it just means all the more, really'* (ATI #22, Rivers Trusts). One CSFO went as far as suggesting that 'hard' evidence alone won't lead to change unless the business implications associated with it are communicated: *'You can give them the hard evidence, and on its own, it makes no difference at all! (...) It's not that... it's the well, what's that costing your business... it's still evidence, but that has a bit more impact than the original data'* (ATI #27, CSFO).

Lastly, some advisors argued that presented evidence must be reliable and robust (n = 2): *'We need to apportion that, so we do need to make completely sure that we're satisfied that it is coming from agriculture rather than just poking fingers'* (ATI #20, water company). Despite being a minor theme here, reliability was mentioned several times by farmers when discussing hard evidence, indicating that advisors may not realise how much emphasis farmers place on the credibility of the evidence itself.

7.3.4. Negative sentiments towards providing farmers with more hard evidence surrounding DWPA

Some ATI participants (n = 12) stated that they do not require any additional informative tools and resources: *'A lot of the advice I'm giving is common sense, so I don't necessarily need that sort of stuff'* (ATI #16, CSFO), with some (n = 4) arguing that there are already too many, resulting in confusion and information overload. Other advisors, primarily those from water companies and private companies (e.g., ADAS), portrayed a belief that they already possess enough water quality data from within their own entities, thus do not tend to engage with resources and tools from elsewhere.

Another negative sentiment (n = 3) related to concerns surrounding the cost associated with gathering and obtaining hard evidence:

'The problem with sediment fingerprinting⁵¹ is that we would need to do a number of exercises over a number of years and it does get quite costly. You need a cheap, or a simpler type of evidence because we just couldn't afford to do it. You also wonder where do you stop? How far do you take it, it is a good thing to do in certain cases but what it would be good to define is what sort of evidence that you would be providing as well.' (ATI #7, CSFO).

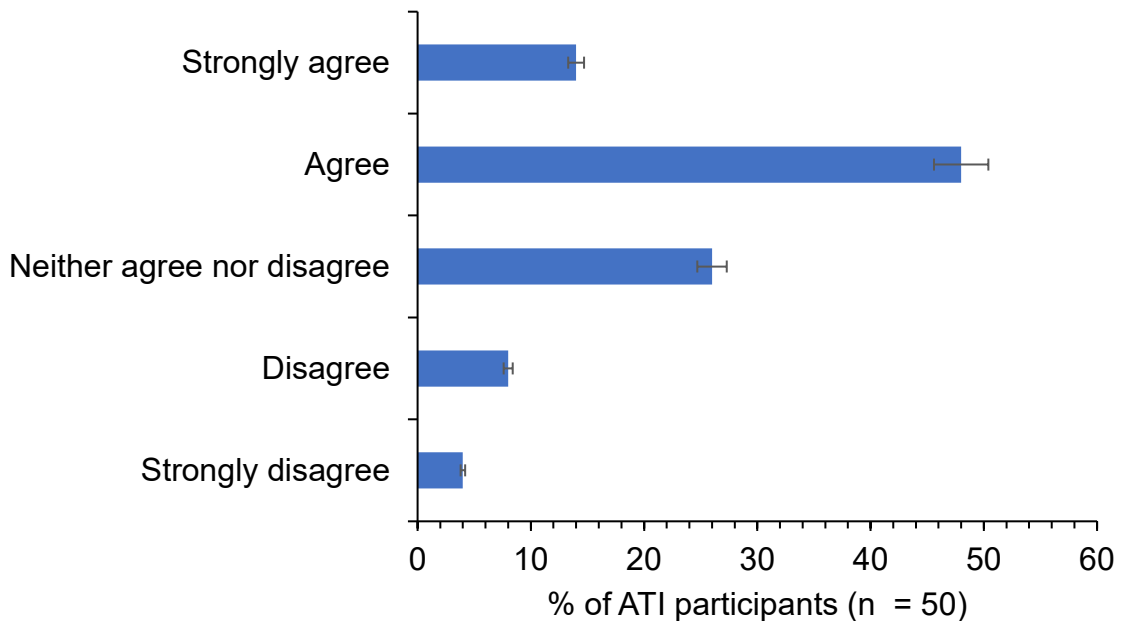
There were also a couple of minor negative perceptions, including a view that farmers respond better to anecdotes and trusted advisors (n = 2), and a belief that farmers won't make any changes in response to evidence (n = 1), and finally, due to farmers' scepticism towards academic research (n = 1). Most of these advisors did not, however, provide wholly negative views towards hard evidence, instead exhibiting concern about these narratives while agreeing it could be a useful way of promoting farmer engagement with DWPA advice.

7.4. Social media platforms for DWPA advice provisioning

In response to the statement *'I believe that social media platforms are becoming important sources of DWPA farming information,'* the average score was 3.6 both across all advisors and CSFOs separately (on a 5-point Likert scale). This indicates that most ATI participants at least somewhat agreed with the statement (figure 7.4). No clear relationships were identified between whether advisors agreed with the statement and any of the gathered respondent characteristics (see section 7.1).

⁵¹ Sediment fingerprinting is the use of various tracers to infer where fine-grained sediment present in landscape sources originated under the assumption that the tracers with both conservative and diagnostic behaviours reflect soil erosion and sediment mobilisation (see Collins et al., 2017 for further information).

Figure 7.4. ATI participants' (n = 50) reactions to the statement 'I believe that social media platforms are becoming important sources of DWPA farming information.'



Several ATI participants (n = 22) qualitatively agreed with the statement, with most providing little elaboration. Over half of ATI participants (n = 26) stated that while social media is becoming increasingly important for some farmers, other farmers are unlikely to use it at all. Situational factors were the most frequently cited reason for this (n = 19) and included age (n = 16), IT skills (n = 5), farming type (n = 3), and how progressive the farmer is (n = 2).

Several advisors (n = 16) referred to the age of farmers when discussing social media for providing DWPA information and advice:

'I think that's very much to do with the generation; younger guys are much more open to it... I'm a member of the pasture for life association, and you get internet chat all the time on that, which is really interesting, but the older guys are not engaged. And of course, when you look at the age structure of farmers in this country, many of them are arguably too old, but I think for the young ones, it's an excellent way of doing it' (ATI #23, CSFO).

Existing studies have already identified that the age of a farmer affects whether they use the internet (e.g., Butler & Lobley, 2012); thus, this finding was

unsurprising. This age-related gap in internet usage has lessened in the UK in recent years; however, this may not be the case in rural farming areas that continue to receive poor internet connections (Farrington *et al.*, 2015). In many instances, age and IT skills were mentioned simultaneously: *'the average age of farmers in Dorset is quite high, and their computer savviness is not particularly brilliant'* (ATI #14, water company).

Some advisors (n = 7) exhibited concern that farmers may be exposed to misinformation if they become more reliant on social media, thus threatening its ability to reach the credibility threshold:

'I think they are important, but they're almost becoming important sources of MIS-information as well (laughs) because there's so little regulation of them; anyone can put anything on them, and other people believe it. I think that's a bit worrying, actually! We need to use it, but we also need to be mindful of the limitations with it. A lot of farmers probably don't look at it, but the ones that do are not just getting useful stuff, they're also getting stuff that probably just isn't true or isn't correct; it's someone's opinion!' (ATI #31, CSFO).

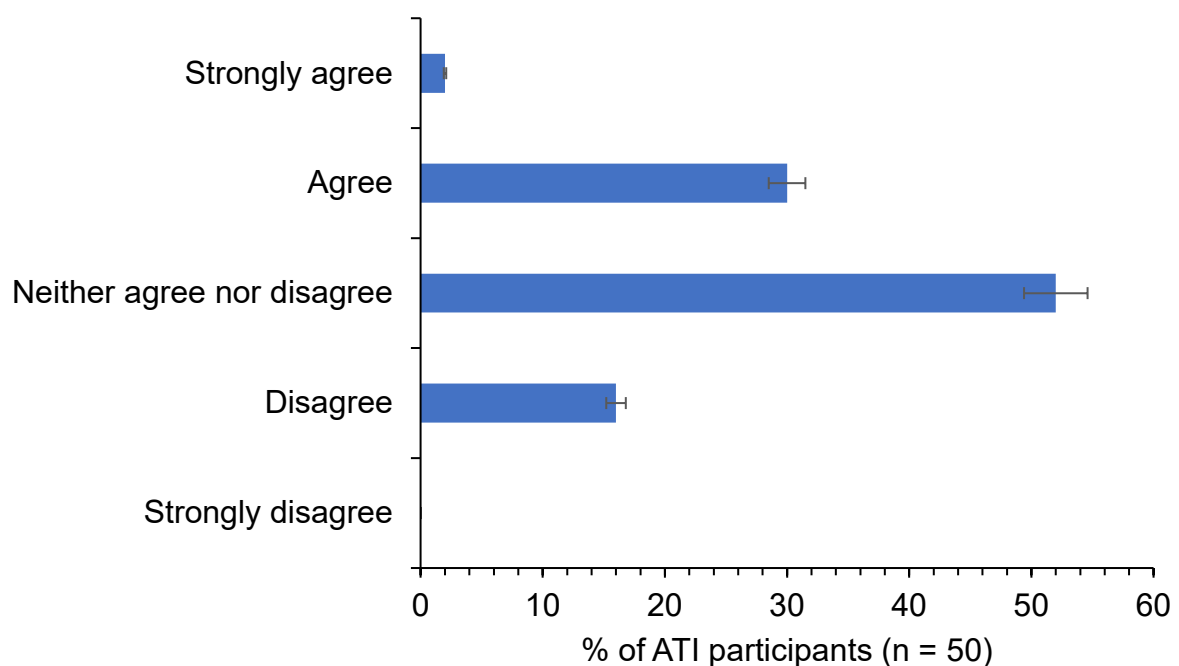
Of the advisors that agreed with the statement, the main sentiments related to how useful social media can be for enabling farmers to socialise and share experiences; *'I follow a lot of farmers on social media and I think they listen to each other a lot. As far as engaging with official things online, I've not witnessed that, but I see many discussions online between farmers, and I think they value that'* (ATI #49, CSFO). This quote indicates that while farmers may not necessarily use social media for 'official' advice, they appear to use it to give each other advice.

7.5. The potential of video content for DWPA advice provisioning according to farm advisors

When asked to respond on a 5-point Likert scale to the statement *'I believe that most farmers would engage well with short, informative videos about diffuse water pollution from agriculture,'* the average score was 3.13 (figure 7.5). This indicates that advisors are relatively neutral about whether this could offer a useful source of DWPA advice and information to farmers. Explanations for this

neutrality were revealed through the qualitative answers shared by ATI participants. Over half (n = 34) of ATI participants indicated that they responded neutrally due to the belief that while videos could be useful for some farmers, others are unlikely to engage. Moreover, no advisors answered ‘strongly disagree,’ indicating that all participants perceive videos as a potential source of DWPA information/advice.

Figure 7.5. ATI participants’ responses to the statement ‘I believe that most farmers would engage well with short, informative videos about diffuse water pollution from agriculture.’



Some (n = 7) ATI participants said that their entity has already begun to create video content to provide DWPA information and advice. Most of these advisors admit that they are unsure of how many views these videos receive.

7.5.1. Advisor agreement that videos could offer an additional source of DWPA information and advice

Over half (n = 33) of ATI participants provided sentiments which agreed with the notion of videos for providing farmers with DWPA information and advice, with many perceiving videos as a useful source of information: ‘They can be very compelling and short, and can convey potentially quite complex messages so it can work very well’ (ATI #27, CSFO); ‘That’s quite innovative, it’s something we’re

thinking about doing ourselves now, Tweets and blogs. I think you will reach a wider group of people, but I think it needs a bit of time to embed?’ (ATI #33, water company); ‘I think farmers will find them more and more useful’ (ATI #50, CSFO).

Almost half (n = 15) of these positive sentiments were on the premise that these videos are shown at events due to having a captive audience:

‘If you were expecting them to sit on their own and watch the video, then no, (...) but if they were at an event and they saw those videos, [and] were encouraged to watch them (...) then they would, and they would get something from it’ (ATI #16, Rivers Trusts).

‘If the videos are presented as part of an event (...) with the catchment advisor to highlight and illustrate the issues with regards to water quality and have some local context to them, they could be a good way in providing examples and case studies to that farmer to give them some context to the messages’ (ATI #20, water company).

Some advisors (n = 6) also indicated that videos are a promising approach for younger farmers: *‘the younger generation, well... that’s exactly what they do’.* (ATI #28, FWAG)

‘I would say 3, moving towards 4 as younger farmers take up the farm; I’ve got many farms where it’s son and dad, and the son is much more electronically engaged. I think that will become more so in the future as a bigger percentage of farmers have grown up and gotten used to using electronic things.’ (ATI #49, CSFO).

As indicated by the quote above (ATI #20), some advisors (n = 5) also agreed that videos are useful due to their ability to illustrate case studies and examples: *‘The idea of a practical demonstration through a video of what it means and what the ask is, is very good’ (ATI #35, CSFO).*

‘I think if you imagine on your 1:1 farm visit with your farmer and you could say this is what I’d like to do and bam, show them a video of it. On your phone!’ (ATI #25, Rivers Trusts).

ATI participants also referred to the preference of many farmers for visual information (n = 3)

7.5.2. The notion that videos may be useful for some farmers but not others

Again, over half (n = 34) of ATI participants suggested that while some farmers may watch videos, others would not utilise them. These sentiments mainly related to farmer characteristics and circumstances (n = 26), including time constraints (n = 15), age (n = 11), ICT usage (n = 11), internet access (n = 7) and farm type (n = 3).

Many advisors (n = 15) recognised that many farmers are busy and thus may not have time to dedicate to watching videos, particularly when at home: *'I would say the main problem is they're pushed for time'* (ATI #21, Wildlife Trusts); *'I just think the farmers have got a lot on their plates anyway'* (ATI #3, CSFO). This aligns with existing studies which have acknowledged the time constraints faced by farmers.

Where advisors (n = 11) referred to age as affecting which farmers will watch videos, this was due to concern that older farmers would not engage with video content: *'I think, particularly with the age demographic in the South West with farmers, a lot of them are fairly old, erm, I'm not so sure it's quite as relevant to them'* (ATI #7, CSFO). Related to this topic was the view by some advisors (n = 9) that some farmers may not possess the ICT skills or equipment to watch videos: *'A lot of the old boys don't even know how to use a computer, let alone (laughs) things like YouTube!'* (ATI #28, FWAG).

An additional barrier faced by some farmers is internet access, which was mentioned by 7 advisors. This was unsurprising given the unequal distribution of broadband connectivity in many rural areas of England; a survey of 430 farmers conducted by the NFU (2020) found that only 40% of participants felt they have sufficient broadband speeds for running their businesses. This lack of sufficient internet is of particular importance for videos as they often require a large bandwidth; while farmers may be able to access the internet for basic tasks (e.g., emails), watching videos may remain unfeasible for many: *'A lot of them still haven't got good enough broadband to sit and stream... I sat with a client the other night; we were watching BBC iPlayer, which kept stopping and circling and couldn't keep up with itself'* (ATI #48, ADAS).

Lastly, a few advisors (n = 3) referred to farm type as affecting whether farmers will watch videos, with these advisors suggesting that arable farmers may have more time available to watch videos than a small, mixed family farm may have: *'There's probably a difference between a large arable farmer who probably has time at certain times of the year and a mixed farmer who is just busy all the time and mostly can't be bothered with that kind of thing'* (ATI #12, agronomist).

Some advisors (n = 5) stated that to overcome the risk of some farmers failing to engage with videos, other forms of advice must be maintained as a mixture of approaches is the most likely way to engage with farmers with various characteristics.

7.5.3. Disagreement with the possibility of video content for providing DWPA information and advice

Some advisors (n = 8) disagreed with the idea that video content could be used to provide DWPA advice. Participants shared several reasons for this, including a view that farmers prefer 1:1 advice (n = 3), that they learn more from other farmers (n = 1), or that they would become overloaded with information (n = 1) (as evidenced by Rust *et al.*, 2020).

The view that farmers prefer 1:1 advice to alternative advice delivery approaches is well known in existing literature (see section 1.3.4). However, this thesis sought to explore whether videos may offer an additional delivery approach *in conjunction* with existing approaches rather than as a replacement for 1:1 advice, thus this is not of great concern.

7.5.4. How video content should be presented according to advisors

Several ATI participants (n = 20) provided insight into how they believe videos should be presented to maximise farmer engagement. The following key findings emerged:

- 1. Videos should be short (n = 12)**, both to respect farmers' time constraints and to maximise engagement by farmers with short attention spans:

'Yeah, I think short is very good because they've got enough on their plates already. I also think shorter is better because it's only one aspect of their business, so I don't think they want to spend... whilst a lot of them have got a lot

of interest in it and are quite driven, others are less so, and I think you've got to make most of their attention span' (ATI #2, Rivers Trusts).

2. Videos should relate to farm businesses as well as DWPA (n = 6):

'If you just say water pollution, they sort of glaze over, if you say no-till, erm, you know, more productivity, less chemical costs, then the video might work' (ATI #32, water company).

3. Videos should be informative (n = 5) by being pitched at an appropriate level, cover topics relevant to farmers, and be presented by a good communicator:

'It has to be pitched at the right level that farmers can appreciate and understand without it seeming to ...lay blame or antagonise them' (ATI #24, water company).

4. Videos should contain local information (n = 3):

'The farmers I've engaged with have welcomed local information, so what I would say is that if it's a national campaign where we are producing mass videos on a national scale to send out to farmers, I would probably strongly disagree with that because I don't think from my experience that farmers would a) potentially watch it in their own time, and b) connect the water quality issues with their locality.' (ATI #20, water company).

7.6. Conclusions

This chapter has begun to explore the views of farm advisors surrounding DWPA advice. When these results are viewed through the lens of CRELE (see chapter 2), clear preliminary conclusions can be drawn:

- Most interviewed advisors perceive the CSF initiative as credible and relevant on the face of it. Several issues associated with the initiative were, however, identified. These include concerns surrounding the bureaucratic loadings associated with CSF, a high turnover of CSFOs, and how the CS water quality priority boundaries are allocated.
- There appears to be regional variation in the quality of CSF delivery across England, with advisors in some areas (e.g., Devon) exhibiting concern surrounding the quality of CSFOs operating in their area, primarily due to the short-term nature of many officers.

- Most advisors responded positively to the prospect of having additional access to 'hard' evidence surrounding whether farmers' practices likely contribute to DWPA, with many positing that farmers respond well to evidence. This hard evidence must, however, be easily understandable, accurate, and relevant at local spatial scales.
- Advisors currently rely on a plethora of tools and resources, some of which are difficult to use or rely on outdated information. According to advisors, there appears to be a fragmented system of advisory tools and resources that is detrimental to the credibility and relevance of these tools.
- The majority of interviewed advisors believe that having alternative sources of advice and information, such as videos and social media, may play a larger role in the future in conjunction with existing advice delivery.
- According to advisors, informative videos providing DWPA advice and information should be concise, visual, and ideally shown at farmer events to maximise farmer engagement.
- Most advisors believe that social media platforms could play a larger role in DWPA advice in the future, with younger farmers with internet access likely to find seeking information online highly relevant.

Chapter 8 (AFGs) will build upon most of these conclusions to complement this chapter's findings and add further detail surrounding advisors' perceptions towards DWPA advice and how its credibility, relevance, and legitimacy may be improved in the future.

Chapter 8

Advisor focus groups: An in-depth qualitative exploration into the views of farm advisors surrounding DWPA advice

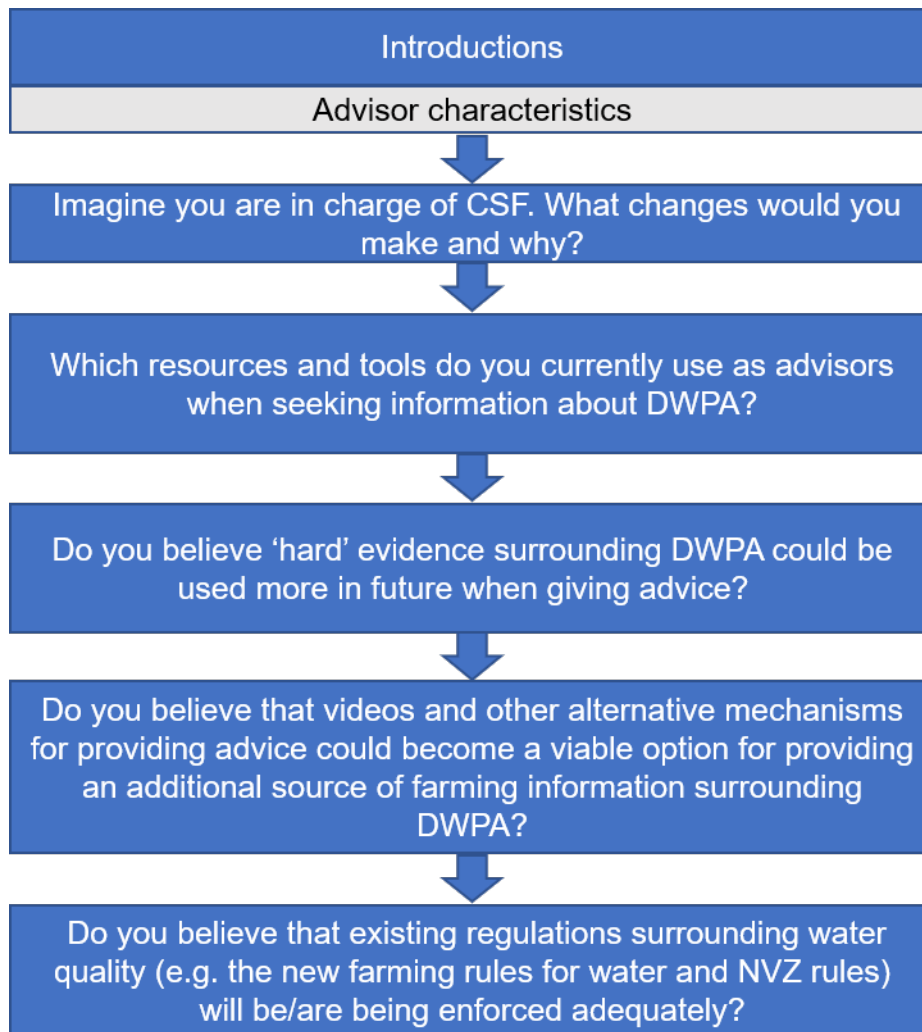
The AFGs were a cost-effective way of adding qualitative detail and context to the findings of the ATIs (chapter 7) and were carried out under the same rationale used for justifying the adoption of FFGs (see section 3.4). The first objective of the AFGs was to obtain in-depth narratives surrounding whether advisors perceive DWPA advice, including that delivered by the CSF initiative, as reaching the thresholds of credibility, relevance, and legitimacy. Secondly, the AFGs explored the potential of videos and 'hard' evidence for providing DWPA information and advice in conjunction with existing DWPA advice delivery. Finally, AFG participants were asked whether they perceive current delivery and implementation of underlying structures and realities (e.g., implementation of water quality regulations) as meeting the requirements of CRELE. This topic was added to the AFG protocol in response to the emergence of this narrative within the FTIs and FFGs (chapters 5-6) as posing a clear threat to the efficacy of DWPA advice itself.

This chapter begins by providing a detailed overview of the methods before providing a detailed overview of the findings.

8.1. Methods

Figure 8.1. provides an overview of the overarching topics covered during the AFGs, most of which were also covered during the other methods used during this research. The final topic was an amendment to that originally planned due to the recognition partway through the research that several farmers had referred to issues surrounding the enforcement of water quality regulations and farmer awareness of these regulations in the FTIs and FFGs (chapters 5 and 6). Again, advisors were given the opportunity to provide closing remarks and to sign up to receive project outputs if they so wished.

Figure 8.1. Structure of the AFGs. Spontaneous probing questions were also used where appropriate.



AFGs were held in three locations (Devon, Dorset, North Yorkshire (NY)), close to the FFG locations (see table 3.2). Carrying out FFGs and AFGs close together offered a cost-effective approach as they were carried out on consecutive days to minimise travel costs. A double layer design was used to incorporate the geographic regions and participant types (table 8.1). Comparisons, were, therefore, possible between each geographical layer and between participant types during analysis. A single AFG was held in NY as the advisors contacted by or met by the researcher often covered both Cumbria and NY; thus, it was unlikely that an AFG consisting of an adequate number of separate participants could be held in both areas. Two of the advisors who attended the NY AFG provide advice in Cumbria; thus, the landscape of advice in this region was gathered within the single NY AFG.

Table 8.1. The double-layer design of the FFGs and AFGs.

Participant type	Dorset	Devon	Cumbria	North Yorkshire
Farmers	X	X	X	X
Advisors	X	X		X

The AFGs were conducted following a similar approach to the FFGs, with the same ground rules introduced at the start of the research encounters (section 6.1).

8.1.1. Recruiting AFG participants

Table 8.2 provides an overview of the AFG participants and illustrates that all groups recruited 6-7 participants as planned. Most AFG participants were recruited by emailing publicly available contacts (see also section 7.1.1). Eventbrite pages were also created and shared on Twitter (appendix, section 8.1.1) to recruit advisors who may not have been encountered through search engines (e.g., independent agronomists). Some advisors (n = 3) were also recruited through word-of-mouth, primarily when an invited advisor requested to bring a colleague; this was encouraged as long as there was space remaining to enable effective facilitation. The AFGs lasted 2.5-3.5 hours and were rich in detailed discussion, thus illustrating that the topics covered were deemed relevant to the participants. The same advisor characteristics were gathered as for the ATIs (see section 7.1). These were collected upon arrival at the focus groups, with advisors asked to complete a short questionnaire alongside an informed consent form.

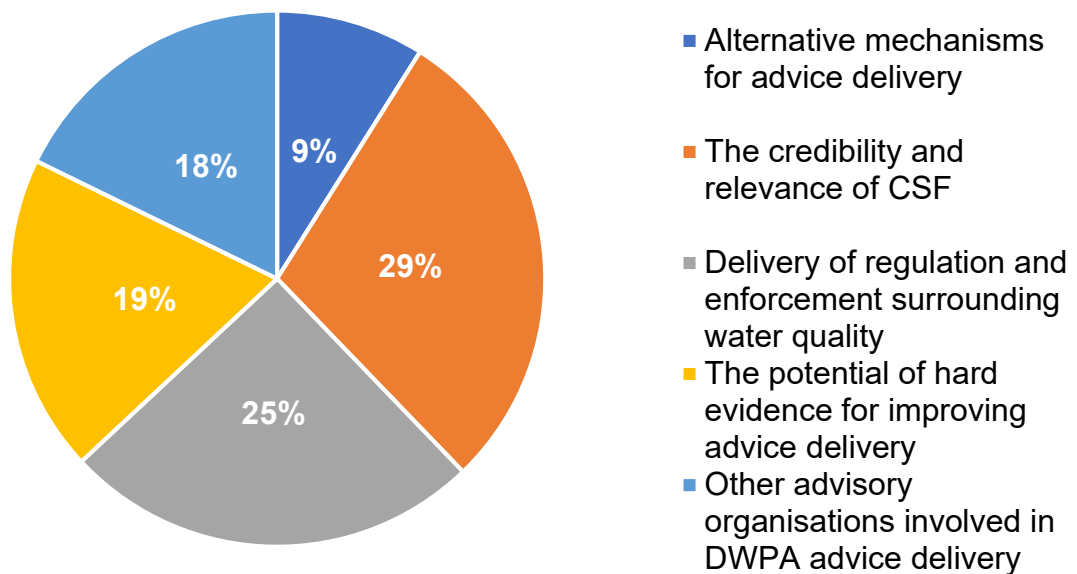
Table 8.2. Characteristics of the AFG participants.

Focus group location	Respondent no.	Organisation	Time as an advisor (years)
Dorset (n = 7)	1	Natural England (NE) CSFO	11
	2	Forestry Commission	20
	3	Agronomist	11
	4	NE CSFO	2
	5	Wildlife Trusts	12
	6	FWAG SW	10
	7	Water company	15
Devon (n = 6)	1	FWAG	10
	2	AHDB	5
	3	Wildlife Trusts	20
	4	Rivers Trusts	10
	5	NE CSFO	20
	6	Environment Agency (EA)	30
Yorkshire (n = 6)	1	Farmer Network	7
	2	Environment Agency	18
	3	NE CSFO	36
	4	Yorkshire Dales National Park (YDNP)	23
	5	YDNP/CSFO	10
	6	YDNP	15

8.2. Results

Of the main topics covered during the AFGs, advisors spent the longest discussing the credibility and relevance of CSF and whether the delivery of regulation and enforcement surrounding water quality is being delivered effectively (figure 8.2).

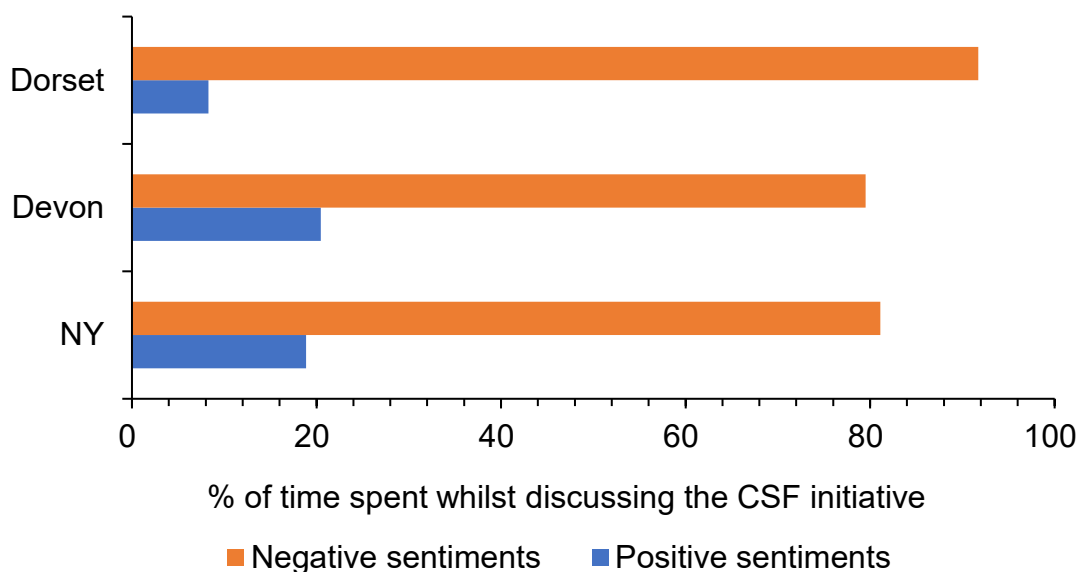
Figure 8.2. Percentage of the time (on average) spent discussing each of the main topics covered during the AFGs.



8.3. AFG participants' perceptions of CSF

The AFGs began by asking participants what they would change about the CSF initiative and why. This topic was characterised by mostly negative sentiments; on average, 84% of conversation during this topic related to problems with the initiative (figure 8.3). The wording used when introducing the subject (see figure 8.1) encouraged participants to discuss the limitations of CSF; however, the fact remains that all of the advisor participants, including CSFOs, shared several ways in which the initiative could be improved.

Figure 8.3. Percentage of the time spent by AFG participants sharing positive and negative views towards CSF when asked how the initiative could be improved.



8.3.1. What works well for CSF already?

The positive sentiments shared by AFG participants when discussing how they would improve CSF largely related to the structure of the initiative and the quality of its advice. According to the AFG participants, high-quality CSF advice appears to be carried out face-to-face and results in farmer learning rather than only resulting in obtaining grant funding:

‘One of the key successes of CSF and CSF delivery and it is, it’s a real stand alone as far as NE and Defra’s concerned is that it’s predominantly face to face and I think that cannot be under-estimated as a tool’ (Devon AFG, R5, NE (CSFO)).

‘There’s also quite a lot of farmers that will say it’s not just the grant anymore, I really value that advice that’s personal for me or the events or whatever, but it depends on where you are’ (Dorset AFG, R6, FWAG).

These findings align with existing literature, whereby a consensus remains that advice delivery on a 1:1 basis is the most effective approach for instilling trust

(Dwyer *et al.*, 2007, p30; Winter & Lobley, 2014; Environment Agency, 2019, p23).

According to AFG participants, the availability of advice surrounding the CS water quality capital items grant increases the relevance of CSF to farmers: *'Engaging with CSF is a step on the way to getting a CSFO endorsement on your grant application, so the capital grants [are] the end goal for the farmer'* (Devon AFG, R1, FWAG). Another aspect of CSF which AFG participants saw as increasing its credibility and relevance was its independent, voluntary, and confidential nature: *'It's really powerful to say it's confidential advice'* (NY AFG, R6, YDNP). The NY AFG also referred to the nature of the relationship between the Environment Agency and CSF:

R4 (YDNP): 'There is a good working relationship between the EA and CSFOs as well so if they see something or we see something and the farmers' comfortable, then we'll get advice from the EA.'

R2 (Environment Agency): Yeah! We've had the same on the coast, where CSF would go to the farm first, and whatever they couldn't fund and do, we would fund. So, that's us working together.'

This finding conflicts with views shared in the other AFGs and by some ATI participants (see section 7.2.2).

Some advisors within the NY AFG also referred to CSF advice as being of high quality and resulting in farmer learning:

R6 (YDNP): 'I am a big fan of CSF; I think just the educational side of it for farmers has been fantastic.'

R5 (YDNP): Yeah.

R2 (Environment Agency): Oh yeah!

R3 (NE, CSFO): I agree to a certain extent, but then they use CSF to get things done sometimes, but I do agree that it brings more people into it and shares that knowledge, which ultimately, means that you get more applications for doing you know, stuff on the ground, and does spread that advice very well.'

This view was not given in any detail within the other AFGs, indicating that there may be regional variation in the perceived quality of CSF advice delivery.

The NY AFG was the only group which discussed the positive impact CSF has had relating to persuading farmers to engage and uptake measures. In addition, no advisors referred to water quality improvement as a positive outcome of the CSF initiative. Admittedly, participants were not asked directly about this, however, all groups had in-depth discussions surrounding CSF and it was noted as a gap in the conversations.

8.3.2. How could CSF be improved in the future?

The negative sentiments shared by AFG participants surrounding CSF related to three main topics: the structure of the initiative itself (56%⁵²), the impact (or lack of) CSF delivery has had on water quality (32%), and the quality of the advice delivered by CSFOs (21%).

Negative sentiments surrounding the structure of the CSF initiative

Several negative views surrounding the structure of the CSF initiative arose during the AFGs. These themes include resource constraints, boundary issues, concern that CSF advice is too prescriptive, problems relating to the farm reports produced by CSF, a perception that the remit of CSF has become too large, problems with the CS water quality capital items grant scheme, perceived risk of the initiative moving towards a commercialised model, and issues with how specialist advice from outside of CSF is procured.

Firstly, participants within all three AFGs were concerned by the resource constraints faced by CSF. According to advisors, these constraints have resulted in some CSFOs being subjected to short-term contracts (box 8.1), a lack of coverage due to staff shortages, a lack of publicity, and a general lack of funding: *'We are limited because we can only spend the equivalent of €1500 on advice on a farm'* (Devon AFG, R5, NE, CSFO).

⁵² The average percentage of time spent on this topic during discussions about the negative aspects of the CSF initiative during the AFGs

Box 8.1. AFG participants discussing the impact of short-term CSFO contracts on the perceived credibility and relevance of CSF.

'R4 (YDNP): In the Lune catchment, there's been a turnover of 3-4 people and then people filling in and we've just got another person for 6 months and the farmers don't know what to do! They just disengage

R5 (YDNP): Yeah, we've come across that, where people don't know who it is anymore, they'll say well it was so and so and now I don't know, it just leads to confusion'

R2 (Environment Agency): I think, what I've seen through that and I don't think it's just at CSF, if you go into an area you have to build trust and a relationship first, and so if you're having a change the farmer will disengage because they keep changing these people, 'I don't know who they are, I don't know where they're coming from in terms of their experience'... a farmer wants to get to know you! They want to understand what do you know about me

R4 (YDNP): You gain their trust don't you

R6 (YDNP): Yeah

R2: And just walking in there and expecting farmers to fall at your feet cos you're giving advice whether it be free or whatever,

R3 (NE, CSFO): But to offer that advice you need to know a certain amount about their business, their economics, their entire livelihood, that's quite a big thing to tell someone you've never met before, so building that trust is important'

- NY AFG

R5 (Wildlife Trusts): I would invest more in my staff. I'm very lucky that I don't work for CSF directly so I've been in the same catchment for 12 years face to face with farmers and I have seen so many CSFOs come and go on short term contracts and it's really... it takes time to build up relationships and these people just aren't given that time because they're not given security in their job and I really think that's something that the programme needs to look at.

R7 (Water company): And that's the key, you can't build up trust.

R5: Not when you're given a 9 month contract and by the time you get 9 months in people start looking for a new job because they know it's coming, it's a really fast turnover'

- Dorset AFG

Secondly, in agreement with the ATIs (chapter 7), FFGs (chapter 6) and FTIs (chapter 5), AFG participants disagreed with the boundaries CSF operates within (within CS water quality priority areas). These participants posited that the current boundaries exclude farmers from gaining DWPA advice, with some assigned inappropriately, for example by placing land within a priority catchment but the holding outside, thus preventing the farmer from being able to engage with CSF. Some AFG participants also argued that recent changes to the boundaries have forced CSFOs to end long term relationships with farmers who were previously targeted by CSF. The following discussion summarises the sentiments of both the Devon and NY AFG participants:

R5 (YDNP): 'One thing I've found hard in the Dales is that we changed priority areas, it was the mapping... that area isn't a priority area anymore, but this area is, and that was really difficult because the farmers that used to be a priority and were engaged, we'd have to abandon and they felt a bit abandoned, and they had really engaged and come along on the process, and suddenly it was oh it's not mapped as a priority anymore, sorry, and that was really difficult'

R4 (YDNP): It was really challenging because you spent all that time building up those relationships, then suddenly they just feel like well... now what?!

R3 (NE, CSFO): I think that's an excellent point. So in South Yorkshire, it's very much water catchments. These waterbodies are priority areas, so you might have someone on this side of the watershed and one on the other side and this guy has got land in there, but because his stead isn't in there he can't get any funding. That's the biggest blocker!

R6 (YDNP): I think especially where those priority areas have changed, again, the Lune, it has completely swapped! It's gone from upper Lune to lower Lune (laughs) and people are going, but that's not fair!

- NY AFG

AFG participants also agreed that the CSF initiative is too prescriptive. They explained that this is, in part, due to the use of a set list of measures CSFOs can recommend. Participants argued that in many cases, this prevents advisors from being able to recommend the actions they believe are most likely to result in water quality improvements:

R6 (YDNP): 'One thing that I've come across that can be a bit of an issue sometimes, so when your watercourse has been prioritised for specific reasons, sediment and phosphate in our catchment there's a list of options

that corresponds with dealing with those things and there are things on the options list that you can't access because your catchment isn't prioritised for that reason, but if you come across a holding and think there's some sort of an issue going on there and you could solve that if you had access to that option... but you can't because it's not classed as dealing with the problem that we've got in our catchment

R2 (Environment Agency): It's too rigid, isn't it? Yeah, I agree

R6 (YDNP): Just because there's not an issue at the moment on one thing in that catchment doesn't mean there isn't an issue on that farm that you could solve quite easily if you had access to that solution

R2: Right!

R3 (NE, CSFO): And I guess that comes down to the scheme that we work with, doesn't necessarily value our advice on the ground, that we go there to give advice and say actually, this is the critical issue here! The system goes, well you're not allowed that.

R6: Yeah cos in the early days again, we could do things like that by exception

R2: Yep!

R6: And we got some excellent work done

R2: It gave you more control around it

R6: Yeah it did

R2: Because each farm is different!

R6: Yeah

R2: And that's the bit that gets me, is that it's very prescribed

R5: So, make it more flexible

R6: With the advisor's discretion'

- NY AFG

Some AFG participants also contended that CSFOs themselves have too much bureaucracy to contend with, indicating that alongside farmers facing excessive bureaucracy (see sections 4.3.2, 5.3.2, 5.3.4, 6.6.3), advisors face similar problems:

'There's a short window in the winter where you can deliver on-farm advice (laughs), and yes you're doing it the rest of the time as well but a lot of time is taken up with paperwork and ... new forms every year, always a new form...'

- NY AFG, R3 (NE, CSFO)

‘They’ll spend a huge amount of time producing something, and an inspector comes: ‘you got a nutrient management plan? Yep. OK, that’s fine, you got a risk assessment? Yep, that’s fine...’ it’s tick boxing, and that’s the problem, it’s just a tick box exercise at the moment.’

- Dorset AFG, R3 (agronomist)

Advisors within the NY AFG perceived the remit covered by CSF as having become too large and convoluted in recent years, in particular since the addition of air quality to the agenda of the initiative. Despite the expansion of CSF to include air quality resulting in increased funding for the initiative, these advisors remained concerned about resource constraints and held perceptions that there are too few CSFOs. Therefore, they argued that the initiative will fail to fulfil its original remit of improving water quality due to the increasing pressure to deliver advice on other topics:

‘CSF needs to focus on what they really want to achieve. I think sometimes, there’s so much out there that you need to do that it becomes confusing. So, strip it back to when CSF started in 2005, and it was about water quality impacts... we haven’t solved that yet, and yet we’re moving onto other things (...). We need to be back to steadings; we need to be back to clean/dirty water separation, just the basics, let’s get them nailed first and then we can move on (...), but the picklist is massive now, from what I see... has it started to run before it can properly walk?’

- NY AFG, R2 (Environment Agency)

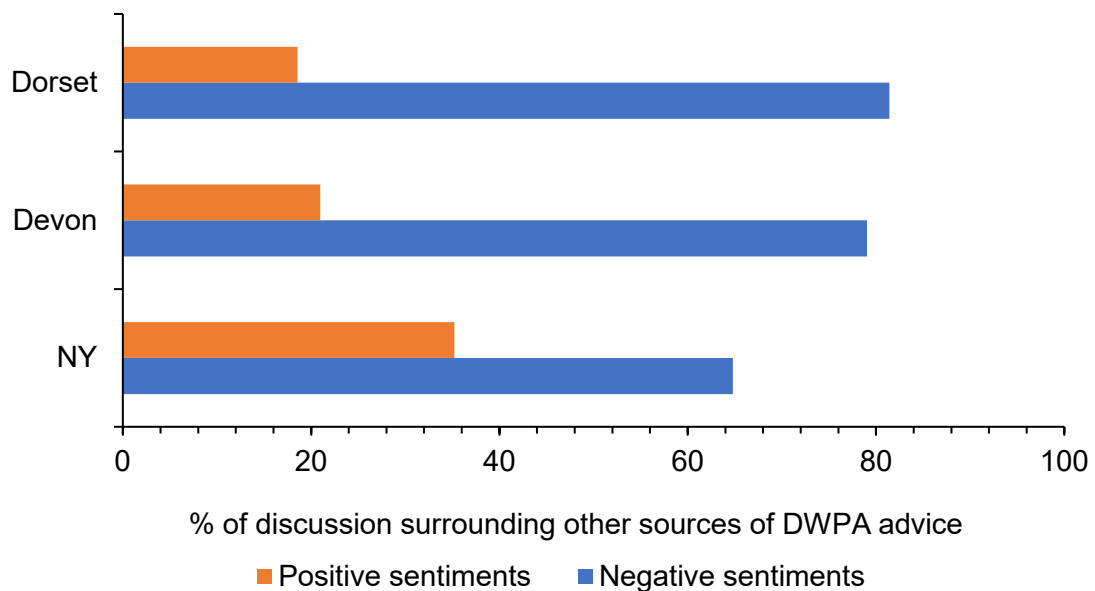
There were three minor negative sentiments which arose during the AFGs. Firstly, there was a perception amongst some advisors that the farm report templates used by CSF are too long, detailed, and inflexible. Secondly, some participants were concerned about how specialist advice is procured by CSF, with some stating that the appropriate advisors are not always selected. Lastly, similarly to some farmer participants, some AFG participants agreed that the CS water quality capital items grant is too complicated and inflexible.

8.4. Advisor perceptions of other advisory organisations providing DWPA advice

AFG participants were not explicitly asked about other organisations which provide DWPA advice (see figure 8.1). However, they referred to other organisations frequently when discussing the credibility and relevance of CSF

due to the recognition that there are several advisory actors involved in DWPA advice, including themselves. On average, 10.4% of the time spent discussing topics during the AFGs were spent conversing about sources of DWPA advice other than the CSF initiative. This varied between groups, with NY and Dorset advisors spending 13.5% and 14% of these conversations discussing this respectively, whilst the Devon AFG spent just 3.7% of the time discussing this topic. Most discussions surrounding other sources of DWPA advice, similarly to those about the CSF initiative, were dominated by negative sentiments (see figure 8.4; average = 75% of conversations).

Figure 8.4. Percentage of positive and negative sentiments relating to sources of DWPA advice other than the CSF initiative shared by AFG participants.



8.4.1. Negative sentiments surrounding other sources of DWPA advice

Based on the % of the time spent by AFG participants discussing each topic whilst providing negative sentiments surrounding the other sources of DWPA advice, three main themes arose:

1. The quality of advice provided by these sources of DWPA advice (38% on average)

2. Other potential sources of DWPA advice which aren't currently providing DWPA advice despite possessing some ability to influence farmers (30% on average)
3. The fragmented nature of the English AKIS (28% on average)

All three AFGs provided sentiments which suggest that other sources of DWPA advice vary in quality, in particular amongst agronomists, with several advisors claiming they give poor advice. The Devon AFG had the strongest views surrounding other sources of DWPA advice, spending 53% of these discussions claiming that other sources of advice lack quality. These sentiments largely related to a lack of local knowledge held by these sources of advice and a failure by these sources to build longstanding relationships with farmers:

R4 (YDNP): 'Not all Rivers Trusts have someone who actually knows the area

R2 (Environment Agency): I think one of the things around that is shipping in people from out of the area (...) it's about making it local, you want to engage with them then you've gotta spend time with them to build that trust and that relationship.'

- NY AFG

The following analogy conveys the feeling by some AFG participants that some advice is of low quality due to a lack of continued engagement whilst reiterating the issues with having a fragmented AKIS:

'SW Water has struggled to understand you can't just go and tell them everything and then bugger off... (...) if I come up your pathway, come in and tell you to refit your toilet, sort out the plumbing in your kitchen and you can't have your utility room there, then someone else comes in and says you need a garden shed, and you need to do this and that, and by the way the carpets in your living room are terrible, how would you react? But then we've gone, and you're expected to do it! It doesn't work. You have to start the conversation and find out where they're losing money because the insulation in the house is terrible and you can do all that, you can't do it in one visit, and that's the closest I've come to getting that message across.'

- Devon AFG, R4 (Rivers trusts)

Particular organisations including the NFU and water companies were referred to as failing to provide DWPA advice, with advisors perceiving this as them failing to fulfil their roles.

Meanwhile, one advisor remarked that the AHDB, a producer's body funded by levies which undertakes applied research and marketing amongst other activities, should step away from DWPA advice delivery as they are not independent of food supply:

'The problem with the AHDB is they've lost their way in terms of what the advice they're giving out is, they're very much sort of absorbed in their own self-importance and have forgotten what they're supposed to be doing, I think the simple way is to legislatively separate supply with advice, and that would solve the whole problem.'

- Dorset AFG, R3 (agronomist)

The NY AFG were particularly likely to believe that other sources of DWPA advice were failing to provide enough DWPA advice, spending 60% of the time, giving negative views discussing this sentiment:

'R2 (Environment Agency): Water companies should be doing that [giving DWPA farm advice] themselves! At the end of the day, it's their core raw material!

R4 (YDNP): The likes of AHDB also need to step up in a way, because there is a proportion of money from each farmer to those organisations

R2: (...) Thanks for bringing up the AHDB, they are not fulfilling their role as well as they could, and they have sort of chosen what they want to cover, what they want to do...'

- NY AFG

This view conflicts with another critical topic covered by both AFG participants and the other farmer and advisor participants in this study (see chapters 4-7) that the fragmented English AKIS is resulting in conflicting advice, confusion, and a lack of effective communication:

'I think we might be going back to the old days! I think there was a period probably 2008, 9, 10, 11 maybe where it was a bit clearer (...) but since the trust partnerships, CaBa⁵³ approach, all of that kicked off, it's confused the picture. Who's giving me advice now then?'

- NY AFG, R2 (Environment Agency).

⁵³ Catchment Based Approach (CaBa, 2020)

The Dorset AFG suggested a solution for this, identifying a need for a 'centralised hub' whereby both farmers and advisors could seek information and advice from a single website containing hyperlinks:

'R7 (water company): I think this whole conversation shows that there are just all these different organisations and all these different websites and they're not talking to one another!

(noises of agreement)

R7: If you could just have one website and find out everything you need to know; it would be so much simpler!

R6 (FWAG): Yes!

R7: I think it would be brilliant

R1 (NE, CSFO): Even if it just links to the relevant pages on other websites, just hyperlinks.'

This idea was built upon later in the AFGs whilst discussing alternative mechanisms for delivering DWPA advice, with participants suggesting that this hub should also contain the latest 'hard' evidence surrounding DWPA and links to videos:

R5 (Wildlife Trusts): 'I think there's a lot more information out there than I use, but it is, most of the time knowing where to find it, struggling through and picking stuff up on Google, so yeah, just having it there would be amazing

R7 (water company): Because again, googling it, you go in, look up something and end up with all these research papers and you have to pay for them! So that information isn't used (...)

R5: And if you're producing videos, having somewhere where it's straightforward to find them, so again, the website where we could have everything on there...'

Advisors within the NY AFG also suggested that having a single online location for accessing informative tools, resources, and information would be beneficial. This finding aligns with Coleman *et al.* (2010), who also recommended that an information hub should be established for linking agricultural advisors with emerging research.

8.4.2. Positive sentiments surrounding other advisory organisations involved in delivering DWPA advice

Some AFG participants referred to having advisors in their area who provide good quality advice and collaborate with themselves: *'We work closely with the Yorkshire Dales Rivers Trust don't we and it's, erm, yeah, they're brilliant actually'* (NY AFG, R1, Farmer network). An agronomist participating in the Dorset AFG also revealed that he had begun collaborating with another advisory entity (the Westcountry Rivers Trust, WCRT):

'I know [an advisor] from the WCRT, I work with him quite a lot (...), and on several farms there we've started to make good progress by rather than him going to the farmer, and then the farmer coming to me, I'll talk to the advisor and we'll both then say the same thing to them together, so we'll get farms now where they'll get a plan from me, and he [the WCRT advisor] will also get what he needs out of it, and we've got a plan ... I can influence what a farmer does more than [the WCRT advisor] can, so if you work together if you get more involved with the people who are on the farm whether it's commercial, there is a huge opinion that we're all evil commercial salesmen and we're not! I'm an ex-farm manager that's now an agronomist; I would be an independent agronomist if I could afford to be, but, I can't. The satisfaction I get is getting that farm efficient, getting it productive, and running it the right way, so with working more together, there's been other people who have been hopeless but this advisor, I can work brilliantly with, so erm there's a, there needs to be more involvement with agronomists if you like. It started, we met in a field initially, and we met up after separately and discussed it, and there's probably a dozen more farms where we're both acting on it. He will do some soil sampling, slurry testing and then when you've got both people involved, both discussing it with the farmer, they're happy generally for me to discuss it and speak to him about the results.'

- Dorset AFG, R3, agronomist.

Upon hearing the above, the Dorset AFG participants collectively recognised the clear need for increased cooperation between agronomists and other sources of DWPA advice. This conclusion was drawn because these advisors realised that farmers often trust their agronomists and make changes as a result of their advice. In fact, some farmers may be more likely to perceive an agronomist's advice as credible than if it came from an environmental NGO or governmental body.

Participants within the NY AFG also shared positive views towards the CS facilitation fund (see UK Government, 2020), claiming that it may have a more significant impact than CSF due to it being carried out at landscape scale:

R1 (Farmer Network): 'Facilitation funds seem to be gathering ground and it's on a landscape scale, so you're potentially making a more significant change (...)

R6 (YDNP): They are really giving some good headway into what's trying to be achieved, and we just had seven more applications

R1: We're kind of getting together aren't we to make sure we can run it for another 18 months because we're finishing in March and we've got all this money to spend, and we thought it would be great if we could run it along again, and put a project plan together and try to give it some legs to go, and I've got backing of the farmers as well, so

R4 (YDNP): Because the whole idea of the facilitation fund was that they could apply for other funding and try and stay together and they do seem to work well'

- NY AFG

8.5. Advisor perceptions towards the prospect of using more 'hard' evidence surrounding DWPA when delivering advice and information

8.5.1. Existing use of tools and resources for gaining information about DWPA

AFG participants were asked to discuss which tools and resources they use when seeking information about DWPA. Unlike within the ATIs, they were not prompted with a list of these resources, thus allowing the researcher to determine which tools participants chose to discuss. The main resource which was mentioned spontaneously was Magic Maps (see Defra, 2020), with advisors within the NY AFG stating that it is simple and easy to use, thus encouraging them to teach farmers how to use it themselves. Another popular tool amongst NY AFG participants was SCIMAP online (SCIMAP, 2020). Other advisors, however, stated that they don't currently use many existing tools and resources, primarily due to a lack of access, a lack of need for this information, or a lack of time for using these tools:

R6 (YDNP): 'But to be honest, because we've got our priorities and that's where you go if a farmer rings up, we go, and that's it really

R5 (YDNP): There's usually plenty to do without having to look for all this

R3 (NE, CSFO): Yeah, it's too much. There are too many other issues'

- NY AFG

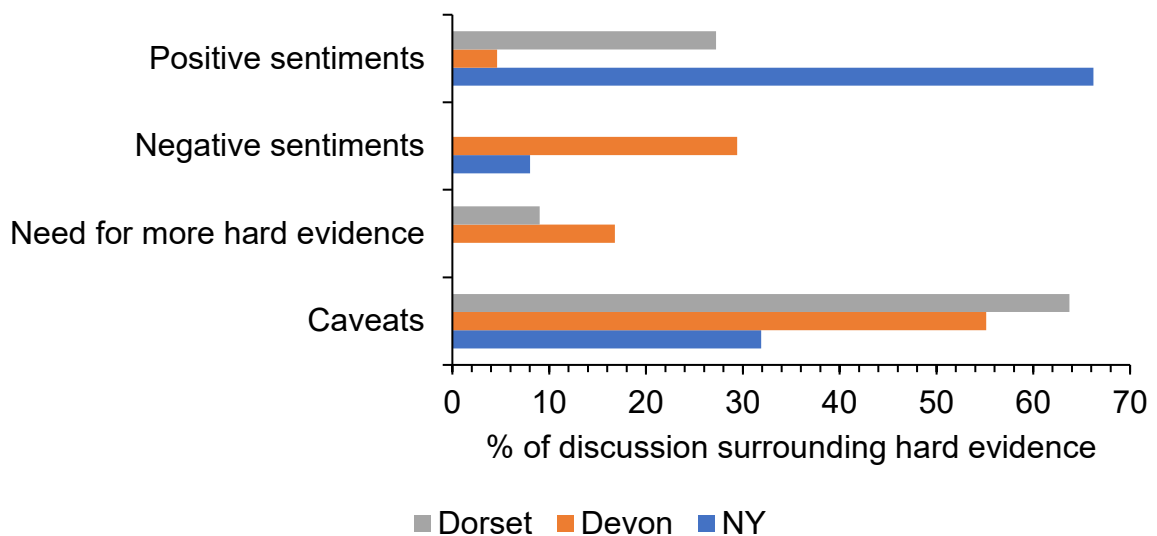
'Nothing beats going out there and taking a spade. You could use soil probes and scanners, that's something else I'm looking at, but it seems to be jumping too far ahead... we as advisors just need to connect to that individual farm and the visual evidence, really.'

- Devon AFG, R4, the Rivers Trusts

8.5.2. Advisors' perceptions towards using more 'hard' evidence in the future

AFG participants, similarly to the farmer participants of this research, typically interpreted the term 'hard' evidence as referring to 'scientific' evidence. Most AFG participants responded positively to the prospect in the future of being able to show farmers more 'hard' evidence relating to the likely contributions of their practices to DWPA. The majority of these sentiments were, however, heavily caveated (figure 8.5). Notable regional differences in advisors' views were found, with NY AFG participants responding positively to the topic with less strong caveats, whilst Devon AFG participants were most likely to provide caveats and negative sentiments. A single participant within the Devon AFG who was sceptical of academia and scientific research, however, contributed most of these opposing views.

Figure 8.5. A percentage breakdown of the conversations surrounding whether AFG participants believe they would like to disseminate more ‘hard’ evidence surrounding farmers’ likely contributions to DWPA during advice delivery.



8.5.3. Positive sentiments towards hard evidence

Some AFG participants, in particular those within the NY AFG, posited a belief that farmers would like to be shown more ‘hard’ evidence surrounding whether their practices are likely contributing to water quality problems. There, was, however, a consensus that relating this evidence to potential solutions or business benefits is likely to maximise farmer engagement. These advisors, similarly to the ATI participants (chapter 7), also believed that showing farmers hard evidence proving whether their practices are likely resulting in significant contributions to DWPA may result in their advice being seen as more credible and relevant:

R3 (agronomist): ‘I’d like more hard evidence, it’s easy to show farmers results especially if they’re on their own land, there’s no comeback is there? So, I use hard evidence a lot.’

R2 (Forestry Commission): (...) I think if the farmers have got that evidence, that proof that this is the problem, but there is a solution, then it would certainly help us.’

- Dorset AFG

Some AFG participants also provided examples of their previous usage of hard evidence to prove to particular farmers whether their practices are likely contributing to water quality problems:

R3 (NE, CSFO): 'So we've done DNA sampling, and it has been AMAZING! Because they can't say, oh well it's the sewage works because you can prove well it comes from sheep or it comes from...'

R4 (YDNP): Oooh that's interesting

R3: And we found a very small pig farm contributing to a lot of it which we didn't know existed before!!! We found there were pigs somewhere here. And that was really powerful to say we've done DNA testing

R4: Wow!

R2 (EA): So (...) we did walkovers, we paid people to go out and take 60 samples, we spent some serious time and money on it and then I took that then back to the farmers to say your phosphate levels are right up here and we need to be down here (...) if you can show and demonstrate what they're doing and then bring it back, you close off red herrings.'

- NY AFG

8.5.4. Caveats surrounding hard evidence

Once advisors began to delve deeper into the topic surrounding hard evidence, the relatively simplistic positive views shared initially (see section 8.4.3) were built upon, thus adding detailed context and caveats. The caveats surrounding hard evidence according to advisors related firstly to how the evidence is gathered, and secondly, how this evidence is presented. When gathering hard evidence, there was a consensus amongst AFG participants that hard evidence should be local if it is to be perceived as relevant by advisors and farmers:

R3 (NE, CSFO): 'The more local it is, the more ownership they take, and you get that better buy-in, so they're actually thinking of that in the future, whereas if it's a general, and they're thinking ah yeah we'll get a bit of money for this, they're not actually changing attitudes

(...)

R4 (YDNP): It's gotta be fit for the area that the farms are in as well, there used to be ADAS research farms years ago and they actually did a lot of good, there's a lot of interesting stuff that came out of that, and some of it was in quite extreme conditions for hill farming, so it's sort of learning from the past really, cos they only researched farms that had lowland situations and they very much focused on arable as well, so ... there's not much on uplands.'

- NY AFG

Advisors within the NY AFG also explained the importance of long-term monitoring and gathering baseline data to enable both farmers and advisors to know whether water quality improvements are being observed:

'There needs to be a baseline to this research, so if there are improvements it needs to be recorded doesn't it, on what a level playing field would be and then if you've moved up a level you can see that can't you? It's all very well saying you need to decrease your fertiliser usage by 90% if you don't know what the baseline is to start with.'

- NY AFG, R1, Farmer Network

The Dorset AFG participants exhibited scepticism towards certain types of evidence, thus emphasising the importance of robust hard evidence for achieving credibility:

'It's too much modelling and assumed data and a lot of it is not accurate, particularly when you're ground-truthing it. There's too much reliance on modelled data.'

- Dorset AFG, R1, NE (CSFO)

AFG participants also shared caveats surrounding how hard evidence should be presented to farmers, with the Dorset and Devon AFG participants spending significant time discussing this broad caveat. Firstly, advisors exhibited frustration about existing hard evidence which they have been unable to disseminate due to accessibility issues. These participants posited that there are swathes of existing research which they either haven't discovered or have been unable to use due to it only being accessible through journal articles or by particular advisory entities:

'It never gets disseminated! All that money and time, research should be useful! People have got to know about it, it's gotta be out there somewhere so that if someone wants more information on something they know where

to get it, people don't know where to get the information, the trouble is trying to find it, and you can even end up doing the same research twice.'

- NY AFG, R3, (NE, CSFO).

'Poole Harbour has a monitoring group made up of everyone gathering data or using data, but it's never even within the partnership, it's not readily available or easily accessible.'

- Dorset AFG, R1 (NE, CSFO).

Advisors from all three AFGs agreed that hard evidence should be presented in a simple, visual, concise way to maximise farmer engagement whilst recognising the heterogeneity of different farmers:

'If you do some sort of a straightforward traffic light system or something, this is good; this is red, green, orange, something very simple and visual or a little sort of erm, bar chart or something colourful and easy for them, simple.'

- Devon AFG, R3 (Wildlife Trusts).

'Illustrations are always the best aren't they, they can say 1000 words, but we're all different, we all absorb things in different ways.'

- Dorset AFG, R1 (NE, CSFO).

The Devon participants emphasised that whilst evidence should be presented simply, it should not be patronising and that the level of detail provided must be adapted depending on the farmer:

R4 (Rivers Trusts): 'It's important though not to patronise the farmers though saying ooh we put it into these nice easy forms... farmers in general range from the stupid to the stupidly intelligent and...'

R6 (EA): 'I've not met any stupid farmers; I think they're really sharp! They're good at acting stupid; they want you to believe they're stupid so you get off their back (laughs)'

R4: (...)' But yeah, the really intelligent ones and the less smart ones need the same information, but the level of complexity can change for their interpretation of it, and that makes our jobs really difficult, you've gotta make really quick assessments of how to disseminate the information'

against the intelligence levels you're assuming the farmer has, they could be much more intelligent than you! And you're gonna go oh shit, that's gonna sound like a grandma trying to suck eggs when they're not, but that's you having to make those assumptions, I have been caught out, and luckily for me, it was early on when people were claiming to be stupid as they like to test your boundaries and ... it happened a lot when I first started, you almost have to role reverse there and claim stupidity, to begin with so they gain confidence and start spouting to you, then from what they spout to you, you can assess what they need instead of just using assumptions, it's an interesting dynamic, but you have to do it in a way that doesn't patronise but is also readily available to a broader demographic.'

The Dorset AFG participants also posited that hard evidence should be presented so that it relates to finances as well as environmental implications: *'Especially if you can put a cost to it, economic stuff, farmers see that and that's what will give them the business case'* (Dorset AFG, R3, agronomist).

8.5.5. Negative sentiments surrounding hard evidence

The NY AFG participants did not share any wholly negative sentiments towards the prospect of using more hard evidence when delivering advice about DWPA, instead of exhibiting positive sentiments underpinned by caveats. Meanwhile, some negative sentiments were shared within the Devon AFG. These opinions were only held by two participants, who viewed hard evidence as failing to consider the heterogeneity of farms, thus exhibiting scepticism towards academic research:

'If I had to choose between a scientist's understanding of the soil and the farmer's understanding of his soil, I'd go with the farmer every time, because farmers are dealing with nature and variability. A lot of the controlled stuff is just... I've turned my back on a lot of research, I've lost total faith in the research, I don't do any R&D at the moment because I've just realised that the academics are not...you talk about educating farmers, I would want to educate academics, to be honest!'

- Devon AFG, R6, EA

A few of the advisors in the Dorset AFG were also concerned about the utility of hard evidence, arguing that farmers are driven by confirmation bias, thus will only believe hard evidence where it confirms their existing beliefs:

'If you look at things like metaldehyde or neonics or something, and generally speaking any decision that doesn't favour the agriculture sector, they will pick holes in the science until the cows come home. They banned neonics, 'oh Michael Gove; he doesn't know what he's talking about', but then he supports glyphosate, 'Michael Gove, he's brill, he's on the side of the farmers...' Why don't farmers trust neonics research, that massive body of global data? Do they think it's a political decision, but glyphosate is a different kettle of fish? I think, generally speaking, farmers only accept the science that confirms what they already think.'

- Dorset AFG, R1, NE (CSFO)

8.6. Advisors' perceptions of the potential of alternative mechanisms for delivering advice and information in conjunction with existing delivery

8.6.1. The potential of videos for providing DWPA information and advice

Most AFG participants shared heavily caveated views towards the potential of videos for providing information and advice, mainly relating to accessibility, the quality of the videos, video duration, and where they are presented. The consensus reached was that videos should be short, cover simple topics to avoid oversimplifying complex subjects, contain farmer presenters where possible, provide realistic solutions, and be used in conjunction with existing advice delivery.

A key concern shared by advisors within all three AFGs was how accessible these videos are:

R4 (NE, CSFO): 'There are some really good videos on YouTube, but most have less than a thousand views, and that's nothing. They're good, short, and concise, but farmers may not find them'

R5 (Wildlife Trusts): 'Yeah, but you need a good central resource to help you find what you need and like you say there is so much out there'

R6 (FWAG): Yeah, yeah

R5: As well as producing the videos, having somewhere where it's really easy to find them.'

- Dorset AFG

Alongside building upon the idea of having a centralised hub containing resources by suggesting that video content could be shared on this hub, some advisors also stated that informative videos should be posted on multiple platforms to maximise their impact:

'Put it on YouTube, share it on Twitter, send it in the newsletter, get the NFU to share at their branch meetings, send it out to the young farmers, email newsletters, send it off to dairy cow people, at the stand at ag shows.'

- Devon AFG, R1, FWAG

Advisors also emphasised the importance of these videos being of high quality, which was characterised by good quality footage and editing, having a credible presenter, and accurate, relevant content. The following conversation summarises this narrative:

'R4 (Rivers Trusts): 'My worst fear is being caught on video saying something wrong or stupid because that just... the same with data or models being wrong, as soon as you say something inaccurate then the rest of it is just... or yeah if you're wearing leopard print leggings or something, you know, the rest of it just isn't heard.'

R6 (EA): Often the video becomes about the person, you end up looking, and you think hang on, I want to look at the farm here, but it's also all fuzzy, you can't see a soil pit on a poor quality video, yeah, we've been thinking about doing videos, and I think maybe... maybe if we got better at it as a medium but then the next question is would farmers actually... I've no doubt that the environmentalists would look at it and that's why we're pursuing this, but would farmers see it as a useful medium?

R1 (FWAG): But if you actually had something worth talking about and a nice, well-presented video, my problem with the Natural England one was it was

the wrong picture for the wrong topic, the pictures didn't tell you anything useful so it was just like watching a PowerPoint presentation.'

- Devon AFG, R1, FWAG

8.7. Do advisors believe that the current delivery of regulation and enforcement surrounding water quality is adequate?

Advisors were asked whether they believe farmers are aware of existing regulations (NVZs and new Farming Rules for Water) and whether they think they are being/will be enforced adequately. This was an important topic to cover during the AFGs due to it spontaneously arising during the FFGs (chapter 6) and being covered during the ATIs (chapter 7), particularly due to its impact on whether farmers perceive engaging with DWPA advice as credible and relevant. Advisor participants spent, on average, 14.8% of the duration of the AFGs discussing this topic.

8.7.1. A perceived lack of enforcement of regulations surrounding water quality

Enforcement was the main topic covered by advisors within the NY and Devon AFGs when discussing the delivery of water quality policy (65% and 51% of discussions on this topic, respectively). A consensus emerged which indicates that there is a clear perceived lack of enforcement of regulations surrounding water quality, resulting in DWPA advice being perceived as less relevant by farmers who, as a result, perceive little risk of prosecution. Advisors tended to attribute the perceived lack of enforcement to a lack of resources, excessive bureaucracy, and the high costs associated with prosecuting. Participants within all three AFGs posited that the Environment Agency lacks enough staff to enforce current legislation (see table 8.3).

Table 8.3. Advisors' perceptions of a lack of Environment Agency staff for enforcing existing regulations surrounding water quality.

Devon	Dorset	NY
<p>R1: I don't think they will be enforced then because I don't think even EA staff understand them or know how to interpret them sufficiently (...) and they haven't got the staff to do it!</p> <p>R5: I think that's the problem, I think they think it has been rolled out, but there's a lack of resources to do it face to face or in workshops or anything else, they're just not there</p> <p>R7: They haven't got the staff to enforce current legislation have they! The rules could be a sensible thing coming out of the government, but they have no idea how to enforce it or anything like that (laughs)</p>	<p>I had this conversation in the Wessex team; they're doing 30 visits for the whole of the Wessex patch.</p> <p>R3: Just 30?!</p> <p>R6: Just 30 for the whole... and we have the resource in Wessex is 2.5 FTEs, now, when I first started in North and South Wessex, there would've been 30 FTEs, it was full time and so to now have 2.5, OK, and so we're just hoping that the partners are picking it up!</p> <p>R6: Yeah, because there's a real desire, but we just don't have....when you only have 3.5 FTEs covering the whole of Somerset, Dorset, Wiltshire... and we can't even deal with the serious stuff let alone, we just can't, so there's total frustration! But in theory, if we're on a farm now and there's a problem, we've got all the weaponry, we can service notices, fixed penalties, we can... we've got a full kit</p>	<p>R3: Exactly, yeah, and we all know why that's happening but then maybe that's a bit of a blocker in terms of funding for enforcement</p> <p>R2: You have to have the staff to do that</p> <p>R3: Oh no, right, that monster, fantastic.</p> <p>R6: If there were more staff, I think in more instances that I've seen where I've thought hmm that needs an EA intervention, but I know there isn't enough you know, enough resource there.</p> <p>R4: Yeah, just having the people on the ground</p> <p>R2: That'd be nice</p>

Advisors were concerned by a perceived lack of enforcement of water quality regulations due to the recognition that farmers themselves believe that they are unlikely to be prosecuted, and thus may take risks:

R2 (EA): 'I would say that those in NVZ⁵⁴s... they're getting close with their slurry storage and have now probably gone out and risked spreading something without talking to us... now, going back to your point, oh I got away with it, didn't get caught...well it's a risk worth taking!

R3 (NE, CSFO): But I think in terms of the farmers that's where I think resentment comes in, that some people are

R4 (YDNP): Getting away with it

R3: Pushing the limits and getting away with it and then we are coming around advising someone, and they go haven't you seen what's going on next door?!?! And usually, the answer is yes, we have, we're well aware of it, and we're monitoring it, but that's.... but yeah, if we're talking about resentment, I think that's a potential source of resentment

R4: I agree.'

- NY AFG

This perceived lack of enforcement and prosecution risk, according to AFG participants, is resulting in increasing resentment by compliant farmers, thus making them feel like it's unfair on them to engage with advice when they perceive their neighbours as polluting without consequences:

R6 (FWAG): 'I sense that people are getting increasingly frustrated with the rogue apples and I've been told, you know why aren't the Environment Agency prosecuting these people if it's blatant, and we all know that the Agency is pushed for resources and haven't got the resources to go and prosecute all the people.

R1 (NE, CSFO): Farmers are getting fed up with things which aren't enforced, like the neighbour down the road that... they do get to a point where they don't want to be given a bad name by the people who aren't hitting the standards.'

- Dorset AFG

⁵⁴ Nitrate Vulnerable Zones

8.7.2. Issues relating to water quality regulations according to AFG participants

The primary issue advisors from all three AFGs discussed surrounding water quality regulations was that farmers lack awareness of certain sets of rules. Advisors were explicitly asked about the 'New Farming Rules for Water', launched in April 2018 (Defra, 2018), and exhibited concern that the rules haven't been conveyed to farmers enough. AFG participants also showed concern about a lack of awareness of the SSAFO⁵⁵ rules (UK Government, 2018a), both from a farmer and an advisor standpoint. It was, however, recognised that whilst a farmer may not recognise the name of a regulation, they may be aware of what the rules consist of, and thus may be compliant despite not being able to name each regulation they are expected to adhere to. Other advisors contended that existing regulations are confusing, aren't applicable on certain farms, and those regulations aren't based on evidence:

R6 (FWAG): 'Most of them don't know they [the new farming rules for water] exist!

R4 (NE, CSFO): I had a meeting yesterday with 12 farmers and asked them whether they know about the new farming rules for water and had almost no response, it's been almost a year, and they're still not aware of them

R1 (NE, CSFO): Yeah, yeah. They're not very good rules, are they? There's no detail to them; they need detail

R3 (Agronomist): We had a meeting with the EA, and 'cultivated' was deemed as farmed, anything that was productive and that... cos at the time we thought cultivated land would be short term grass or anything intensively farmed... I completely agree with soil sampling, but the actual, how they get to what they do is so confusing that it just stops people doing it. If you had a very simple process, it would make the whole thing a lot easier for farmers, and that's the key to solving a lot of the problems

R7 (Water company): But again, your question was, have the EA done anything about them? No, and a lot of people don't even know they're out there, so it's getting that advice out there, surely a bit of information needs to be disseminated across everybody!

- Dorset AFG

⁵⁵ Storing silage, slurry and agricultural fuel oil rules

The Devon AFG, upon discussing a lack of dissemination of regulations and a lack of enforcement of these rules, concluded that the Environment Agency itself is failing to fulfil its multiple remits:

R3 (Wildlife Trusts): 'There was no campaign to raise awareness about the new farming rules?'

R6 (EA): No, nothing

R3: Because there seems to be so little, people know vaguely that something's come out, but there's no real uptake or anything...

R1 (FWAG): You can't even download a...

R6: No, there's nothing! I mean internally either! There's not even anything internally. The common denominator I've taken from this morning is that the Environment Agency is just not up to the mark at the moment, we're not involved in R&D, we're not communicating the problem, we're not doing the regulation, we're not doing comms, you know, the EA is just not there! (...) I find it totally frustrating to hear... we're just not there!!'

- Devon AFG

The above sentiments imply that the relevance of seeking advice may be declining due to a lack of awareness of regulations relating to DWPA; where farmers are unaware of the rules they need to follow, it is unsurprising that they then do not prioritise engaging with advice on the topic.

8.8. Conclusions

The AFGs were a highly successful way of adding qualitative depth to the findings of the ATIs (chapter 7) as they were characterised by lively conversation and strong opinions. Most AFGs resulted in clear conclusions due to the emergence of several consensuses. The key findings of the AFGs were:

- The CSF initiative is perceived as successful in terms of educating farmers about DWPA issues. AFG participants did, however, express concern relating to a lack of resources allocated to the initiative, how the CS water quality priority areas are assigned, and the use of short-term contracts for CSFOs resulting in a high turnover of staff. AFG participants were also concerned that the quality of CSF delivery varies depending on the advisor and that there has been limited evidence that the initiative has resulted in water quality improvements

- AFG participants frequently referred to alternative sources of DWPA advice, exhibiting concern that the quality of advice delivery varies between sources, that some influential organisations should be providing more DWPA advice, and that the fragmented AKIS in England may be leading to confusion
- Advisors exhibited mostly positive sentiments towards the prospect of providing farmers with more hard evidence which indicates whether farmers' practices are likely contributing to water quality problems; however, these sentiments were highly caveated and dependent on how this evidence is gathered and presented. The consensus was that evidence must be robust, locally relevant, and accessible, and should be delivered in a flexible, concise manner
- The prospect of using video content to deliver advice and information relating to DWPA resulted in mixed views from AFG participants, with caveats suggesting that video content should only cover relatively simple concepts, be easily accessible, relevant, short, presented at events, presented by a farmer, and be of high quality
- AFG participants were highly concerned that the Environment Agency is failing to fulfil its remit of inspecting farms, enforcing existing water quality regulations, and raising awareness of the existence of these rules. This has implications for the credibility and relevance of DWPA advice, with many farmers who perceive little risk of inspection unlikely to be concerned about seeking advice
- As a result of the topics covered during the AFGs, a centralised advice hub was proposed by several AFG participants to address the issue of the fragmented AKIS and to increase the accessibility of advice from various sources, video content, and hard evidence.

Chapter 9

Exploring the triangulated findings through the lens of a novel conceptual framework: introducing 'CREALITY'

As evidenced within each empirical chapter (chapters 4-8), each method conducted during this MMR study has contributed towards fulfilling the research aims of this study (section 1.6) by helping to build context and detail. The total number of participants was relatively large for a study of this nature (n = 376, comprising 307 farmers and 69 advisors). This chapter will triangulate the views of these participants to compare similarities and divergences between participants (i.e., farmers versus advisors).

This triangulation chapter consists of five sections. The first begins by iterating the CRELE framework introduced in chapter 2 based on the analysis already undertaken within chapters 4-8 of this study. This iteration results in the development of a novel conceptual framework for interpreting the triangulated findings of this MMR. The second explores the triangulated findings of this research, comparing and contrasting the views of participants from all methods combined in the MMR. Thirdly, farmers' and advisors' opinions towards the notion of advisors disseminating more 'hard' evidence surrounding the likely contributions of farmers' practices to increase the relevance of DWPA advice is examined. The fourth section explores another approach that may be useful in conjunction with existing advice delivery: video content. Again, the perspectives of both farmers and advisors are compared to allow conclusions to be drawn. The final section acknowledges the limitations which arose during this study to enable the reader to consider these whilst reading chapter 10, which provides the conclusions and corresponding policy recommendations based on the findings of this MMR.

9.1. Introducing CREALITY: a novel framework for interpreting the findings of this study

Social science research is both evolutionary and dynamic in nature, with insights gathered during new research often leading to modifications to the existing conceptual frameworks adopted or constructed before data collection. This approach allowed the researcher to reflect upon the preliminary conceptual framework for this study (CRELE, see chapter 2), throughout data collection. Whilst analysing the results of each method of this MMR (chapters 4-8), it became apparent that CRELE alone is inadequate for building a comprehensive understanding of what makes farmers consider DWPA advice useful and worth engaging with. CRELE was, therefore, iterated and then reconstructed prior to analysing the overall findings of this new research. The resulting framework, presented in this chapter, is used as the lens for understanding the key findings of the MMR. The following sections will explain how CRELE was iterated and reconstructed to develop a new conceptual framework for this study: 'CREALITY'.

9.1.1. Identifying two dimensions that affect the efficacy of DWPA advice

When analysing the results of each method applied in this research, several key factors which appear to affect the likelihood of farmers and advisors perceiving DWPA advice as CRELE arose.

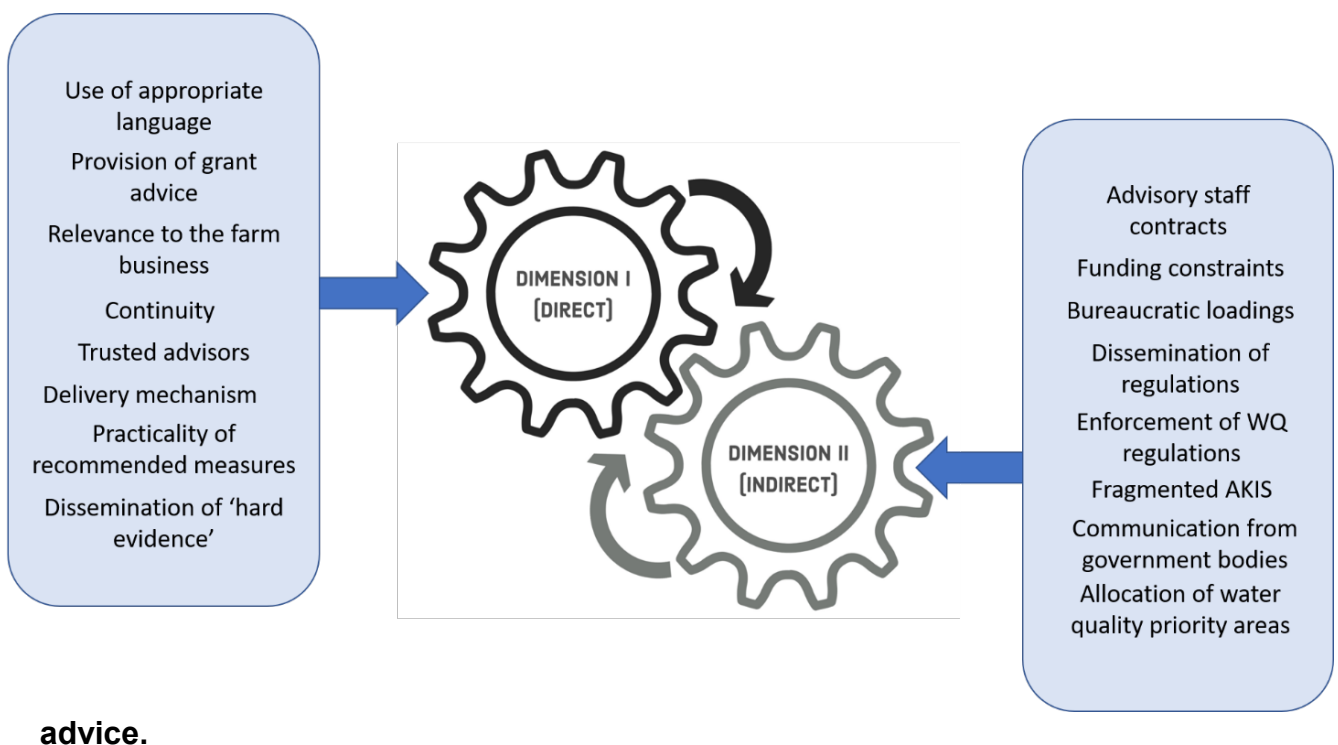
These key factors fit neatly into two distinct dimensions which provided a basis for iterating CRELE:

1. Dimension I, which constitutes the direct experiences of farmers and advisors; for example, the quality of advice delivery and whether farm advisors are well-trusted. This dimension is already relatively well-represented by the existing CRELE framework.
2. Dimension II, which represents the 'indirect' (or 'external') factors affecting the efficacy of DWPA advice; for example, the extent to which farmers believe they are at risk of being inspected by regulatory bodies (e.g., the Environment Agency) and their perceptions of the inspections and regulations themselves. Underlying realities include funding constraints facing wider government bodies which, in turn, have an impact on the perceptions farmers and advisors have of CSF itself. Another underlying

structure in the context of DWPA is the efficacy of water quality policy; for example, Thomas *et al.* (2020) found that the introduction of the 'New Farming Rules for Water' in 2018 (Defra, 2018) led to uncertainty, in part because farmers did not understand the reasons for these regulations. This uncertainty could, in turn, have implications for DWPA advice as farmers may not perceive engaging with advice as legitimate where they feel that the underlying regulations are unjust or inappropriate, or where they are unaware of the rules in the first place.

An overview of these two key dimensions is provided in figure 9.1 alongside a list of the factors identified in this study as important when evaluating whether DWPA advice is effective.

Figure 9.1. The key dimensions identified as affecting whether DWPA advice is perceived as effective. Dimension I relates to farmers' and advisors' direct experiences of advice delivery itself, whereas dimension II refers to the structural realities (mainly pertaining to water quality policy delivery) which affect farmer and advisor perceptions of current DWPA



advice.

9.1.2. Introducing a new conceptual framework: CREALITY

Based on the empirical findings of this research (chapters 4-8) and the identification of the two key dimensions which appear to contribute to the efficacy of DWPA advice, it was recognised that dimension I was not fully explored using credibility, relevance, and legitimacy alone. Based on the empirical findings of the MMR, the existing CRELE framework needed to be replaced or built upon to encompass more of the themes which emerged during this study.

Dunn & Laing (2017), in an attempt to consider the needs of policymakers, proposed an entirely new conceptual framework to replace CRELE, which consists of four components: accessibility, comprehensiveness, timing, and applicability (ACTA). Tangney (2017), in response to Dunn & Laing's new framework, argued that CRELE remains broadly applicable and contended that the attempt by Dunn and Laing to create an entirely new framework was unnecessary and potentially confusing. Thus, unlike Dunn & Laing (2017), the present study builds upon CRELE rather than attempting to replace it.

Some of the themes which arose during this study were not successfully evaluated by CRELE. For example, the finding that farmers and advisors emphasized the challenges associated with the pluralistic nature of the DWPA advisory system in England and associated difficulties faced by many farmers when attempting to seek DWPA advice was not fully addressed by CRELE. These narratives, amongst other minor themes, all relate to how easy it is for farmers to access advice.

An additional component, 'accessibility', was added to the existing CRELE framework to evaluate the above themes. Accessibility, in this context, is achieved where farmers can spend minimal time attempting to seek out and access DWPA advice. Examples where the accessibility threshold is unlikely to be met include where the pluralistic AKIS results in farmers wasting time attempting to identify which advisor(s) to engage with (see sections 1.3.4, 5.3.4, 6.4.1) or where advisory videos are not easy to locate and access (see sections 4.4.3, 5.4.3, 8.6.1). This component is of importance in the context of DWPA advice because DWPA is not a topic farmers are likely to dedicate significant time to researching. Despite research finding that co-designed strategies for increasing water quality may deliver economic benefits (Collins *et al.*, 2016), this is likely, in part, due to a lack of relevance caused by a perception that engaging with and adopting DWPA advice is unlikely to result in immediate business

benefits (see also section 2.4.2; Fish, 2014). This study hypothesises that accessibility is a vital component when farmers are considering whether to engage with DWPA advice, with the other components not considered until they are confident they can access information/advice with relative ease.

It may not be immediately apparent that DWPA advice is relevant to some farmers (e.g., due to their lack of recognition that they contribute to the problem; sections 5.4.1, 6.2.1). This study finds that the accessibility threshold is intimately linked with relevance; where farmers do not perceive something as particularly relevant, it can be expected that the accessibility threshold will be higher. For example, if a farmer hears of a video they believe is highly relevant to them, they are likely to spend longer searching the internet for it than they would if they had deemed the video as lacking relevance. Maximising the accessibility of DWPA advice delivery is, therefore, paramount in the case of DWPA advice as farmers may, by proxy, not believe it is of relevance to them. Full accessibility, according to this study, requires advice to be available both online (e.g., through useful video content and off-line (e.g., 1:1 farm visits, farmer events and on-farm walks), and backed up by credible and relevant 'hard' evidence.

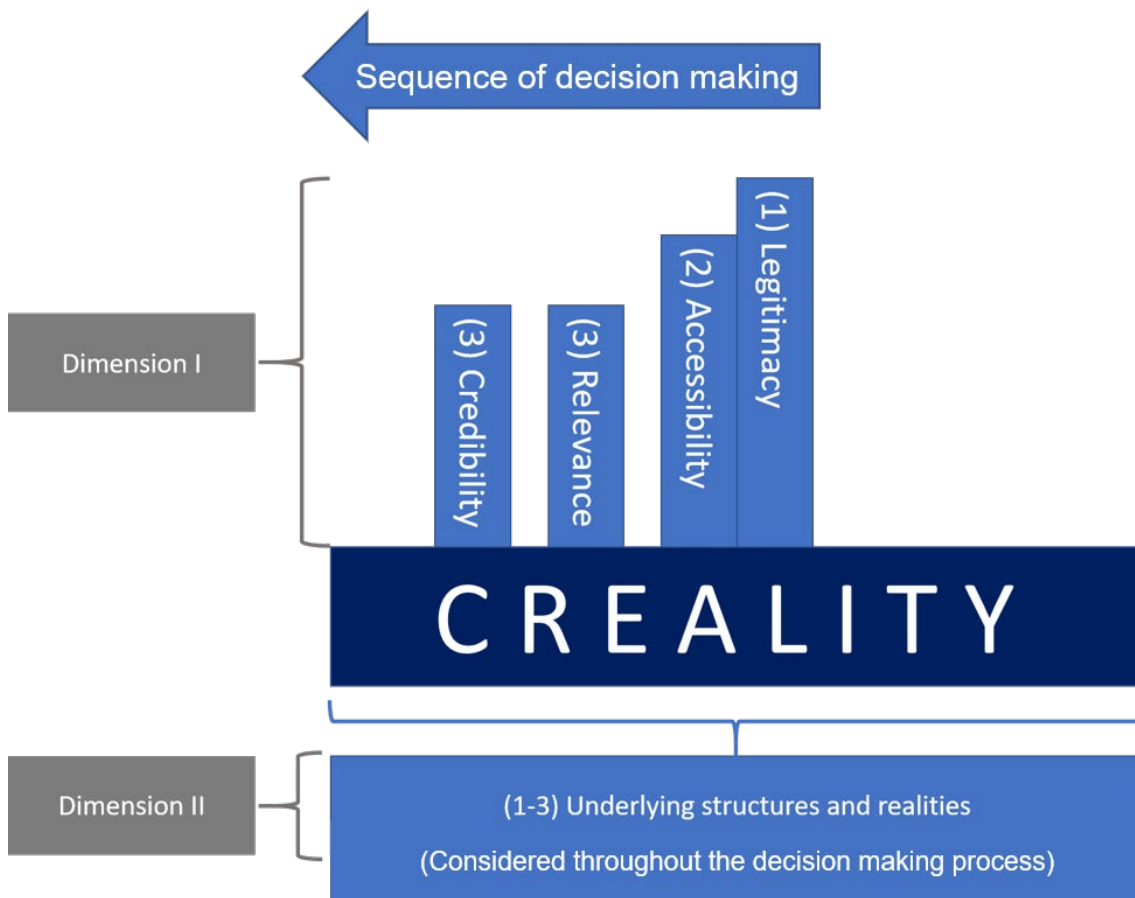
Critically, however, the findings of this research suggest that even where DWPA advice reaches the thresholds of credibility, relevance, legitimacy, and accessibility (CREAL), it may still not reach full efficacy according to farmers. This is because of the perceptions shared by farmers and advisors throughout this study that underlying structures and realities not necessarily directly related to DWPA advice (e.g., policies, enforcement, funding schemes) are ineffective. This led to the iterated 'CREAL' framework reaching its final name, 'CREALITY', where 'ITY' represents 'underlying structures and realities'. It was found that some farmers, when discussing DWPA advice, began discussing water quality regulations instead, arguing that their implementation is ineffective in terms of bureaucracy and enforcement. This narrative was built upon in greater detail during the FFGs and AFGs (sections 6.6, 8.7.1), revealing deep frustration towards bureaucratic loadings (section 6.6.3), issues with existing funding schemes which contribute towards reducing DWPA, and negative views towards existing regulations, mainly due to a perceived lack of enforcement and inspections (sections 6.6.1, 8.7.1). As a result, several FFG participants displayed disrespect towards governmental bodies, primarily including the

Environment Agency and the RPA (section 6.6.2). As a result of these underlying issues, these entities do not appear to reach the credibility or legitimacy thresholds according to farmers and advisors.

It was, therefore, recognised that dimension II needed to be incorporated into the iterated conceptual framework (CREAL) due to its prevalence in the empirical findings of the MMR herein (chapters 4-8). In fact, this was one of the most highly discussed topics by participants in the focus groups of this study, with 320 references accrued from across all of the methods. This dimension is named 'underlying structures and realities' and covers the indirect factors which affect the efficacy of DWPA advice. The new framework which emerged was named 'CREALITY' (figure 9.2). CREALITY posits that the thresholds of both dimensions (where dimension I is constituted by credibility, relevance, legitimacy, and accessibility and dimension II represents the underlying structures and realities affecting the efficacy of advice) must be met if farmers are to be persuaded that DWPA advice is useful and thus worth engaging with.

When the researcher reflected on each component of CREALITY, it also became clear that farmers may consider each component sequentially when deciding whether to engage with DWPA advice. Figure 9.2 illustrates the cascade of decision making as hypothesised by the researcher, whereby once the 'legitimacy' threshold is met, farmers will then explore how 'accessible' advice is before considering the 'credibility' and 'relevance' components simultaneously. Meanwhile, the 'underlying structures and realities' dimension of CREALITY is considered throughout this process and may discourage farmers from perceiving advice as credible, relevant, legitimate or accessible where these structures cause too many issues. This framework, whilst developed to explore the efficacy of DWPA advice, is likely applicable for future studies evaluating agricultural advice and extension alongside in several other contexts.

Figure 9.2. Schematic diagram of 'CREALITY', a conceptual framework constructed from CRELE to interpret the triangulated findings of this MMR. Each component of CREALITY is numbered (1-3) to illustrate the sequence used by farmers when making decisions (e.g., whether to engage with CSF advice).



The following sections are ordered according to the hypothesised sequence of decision making used by farmers according to CREALITY (figure 9.2). The sentiments of farmers and advisors surrounding both CSF and other sources of DWPA advice are combined to explore the extent to which each aspect of CREALITY is being met in the context of DWPA advice according to the farmers and advisors surveyed in this MMR. The factors which affect whether farmers are likely to engage with DWPA advice are identified by considering the time spent discussing each narrative, the emphasis placed on the topic by participants, and the number of participants who referred to each topic.

9.2. Triangulating the findings of this MMR

Data from all five individual research methods (chapters 4-8) were triangulated by merging the individual NVivo projects for each method into a single project. The resulting nodes were then compared and incorporated to enable the identification of divergent or convergent narratives. Some of the resulting nodes were quantized (see Tashakkori & Teddlie, 1998) to allow the researcher to identify the narratives which arose most frequently across all methods. Upon combining the data from the OQS, FTIs, and FFGs, the resulting sample size ($n = 306$) allowed robust chi-squared testing to be carried out as observed values in each cell were >5 (as explained in chapter 4).

The OQS gathered some quantitative data which provided some initial insights into overarching themes. This triangulation chapter will, however, place relatively little emphasis on this individual method during triangulation due to the limited detail provided by respondents. In addition, the sequential nature of this MMR meant that some of the questions posed during the OQS were not continued in future methods due to how the research evolved. The more qualitatively rich methods (telephone interviews and focus groups) are, therefore, discussed in the greatest detail as they provided more context and detail than the OQS.

The reader may note that importance is placed on certain themes despite relatively small numbers of participants referring to them. The reasons for this are three-fold. Firstly, the researcher wanted to take the views of all participants seriously; secondly, when researchers stick to major themes only, they risk overlooking emerging issues; and thirdly, the participants who referred to minor themes often gave high levels of detail, thus making these themes data-rich despite coming from just a few participants. This approach, where exceptional themes are recognised and interpreted, has been recommended in health science research to advance the utility of empirical research (McPherson & Thorne, 2006; Phoenix & Orr, 2017). Besides, many of the minor themes which arose during this study were mentioned spontaneously; had the researcher asked participants directly about these themes, they may (or may not) have become major themes.

9.3. Overall study samples

9.3.1. Farmer study sample

The overall distribution of farmer participants from the OQS, FTIs and FFGs spanned most of England (figure 9.3). There were, however, hotspots in Dorset, the Southwest, and North Yorkshire, primarily due to where the FFGs were carried out (see chapter 6).

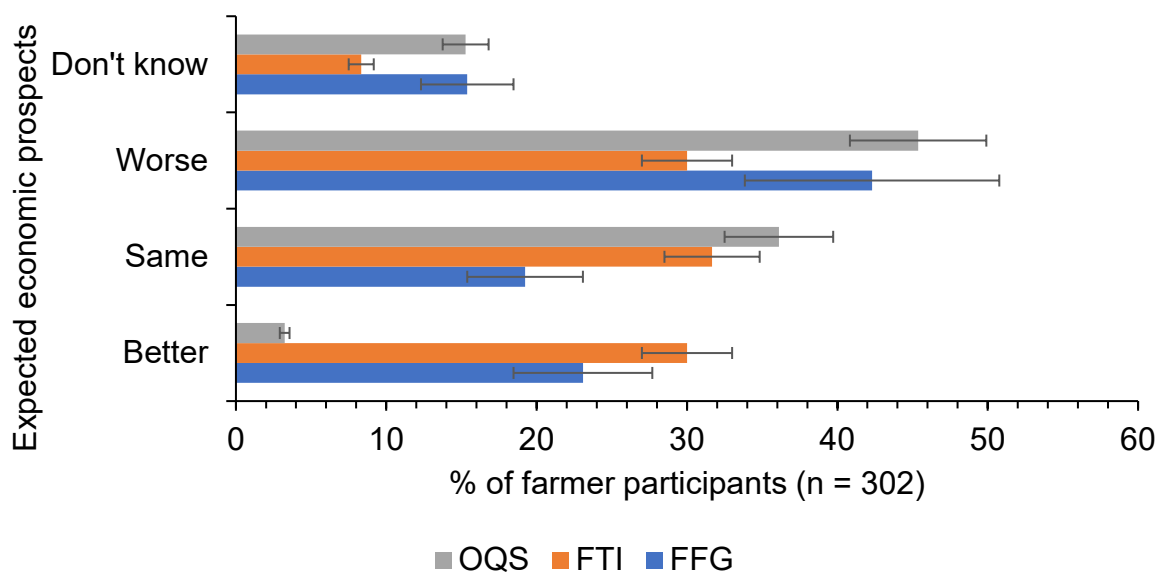
Figure 9.3. Distribution of all farmer participants (n = 307) across England.



Chi-squared testing revealed significant associations between the method used and some farmer characteristics. Firstly, farm type varied significantly between methods ($X^2(8, 21.125) = 0.007$), proving that the choice of methods and selection of study areas successfully reached various farming types. Secondly, whether farmers have engaged with CSF varied significantly between methods, with OQS farmers far less likely to have interacted with the initiative than those who participated in the FTIs or FFGs ($X^2(2, 46.313) = <0.0005$). This difference shows that using an MMR approach successfully reached some farmers who have engaged with CSF and others who haven't. Thirdly, farmer optimism about

the prospects for their farm businesses (over the next five years) was significantly associated with the research method used to gather their views ($X^2(43.673, 6) = <0.0005$). OQS respondents were more likely than FTI and FFG participants to believe that their prospects would worsen in the next five years (figure 9.4). This difference in optimism indicates that farmers who are pessimistic about their futures in farming may have been less inclined or able to participate in methods that require more of a time commitment (i.e., FTIs and FFGs).

Figure 9.4. Farmers participants' expectations of how they believe their economic prospects will change in the next five years.



Several farmer characteristics were, however, not significantly associated with which research method they participated in, including age, size of the farmed area, organic status, time spent in farming, and whether they rent in any land. It had been expected that age would vary between methods due to older farmers being less likely to participate in online methods (Matthews *et al.*, 2019). The lack of a significant association may provide further evidence that older farmers are becoming increasingly comfortable with using computers and the internet, in agreement with Defra (2019) and Butler & Lobley (2012), where most (74%) surveyed farmers were internet users. The increasing willingness of farmers to participate in online methods experienced here is, however, difficult to compare directly with previous literature. This is because most previous studies conducted online surveys in conjunction with postal surveys and did not report the findings of each method separately (e.g., Cresswell *et al.*, 2014; Peel *et al.*, 2016).

9.3.2. Farm advisor study sample

Table 9.1 provides an overview of the different broad advisory entities represented within both the ATIs and AFGs combined. On average, advisor participants from the ATIs and AFGs had been in an advisory role for 12 years (range = 0.5-36 years).

Table 9.1. Overview of the advisory entities reached during the ATI and AFGs combined.

Type of organisation	Number of advisor participants (n = 69)
Government bodies (including Natural England CSFOs; n = 21, and The Environment Agency)	25
Regional water companies (e.g., Wessex Water, Anglian Water)	11
Non-governmental organisations (e.g., FWAG, the Rivers Trusts, Wildlife Trusts)	23
Private companies (e.g., agronomists, ADAS)	10

There were not enough farm advisor participants to undertake robust statistical analysis to enable the identification of associations between advisor characteristics and their views. Simple counts and percentages are provided instead.

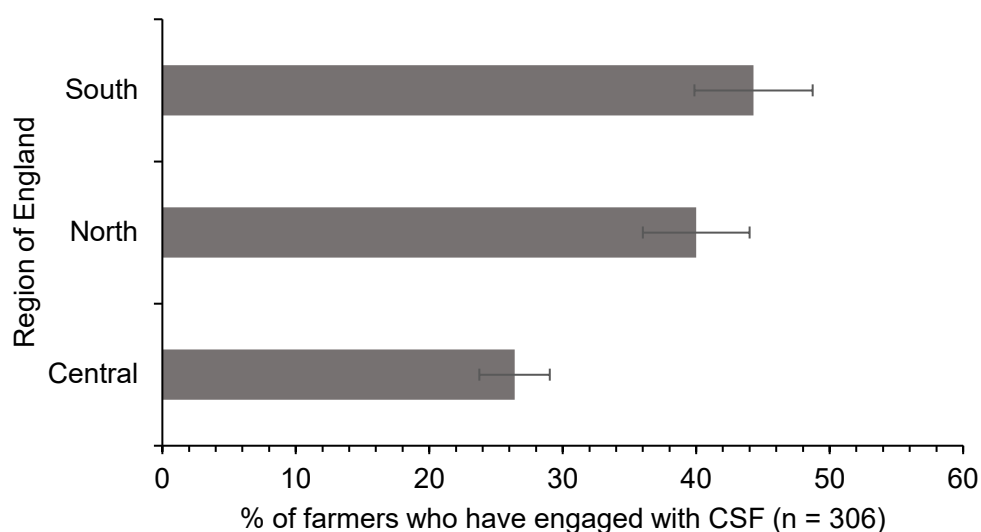
9.4. Triangulated results of this MMR

9.4.1. Current farmer engagement with DWPA advice for providing initial insight into whether it likely reaches the CREALITY thresholds

Most farmer participants claimed to have engaged with at least one source of DWPA advice or information (sections 4.3.2, 5.3). This finding indicates that the topic of DWPA likely reaches the CREALITY thresholds enough to persuade farmers to engage with the subject on at least one occasion. The following sections will explore the CREALITY of DWPA advice in detail based on the rich insights shared by both farmers and advisors during this study.

The OQS, FTI and FFG data were combined to explore how many farmer participants (n = 306) had previously engaged with CSF (38.9%; n = 119). Several significant associations were found between farmer characteristics and whether they had previously engaged with CSF, including dominant farming enterprise (X^2 (4, 15.123) = 0.004), region⁵⁶ within which their farm holding is situated (X^2 (2, 6.610) = 0.037) (figure 9.5), size of the farmed area (X^2 (5, 20.454) = 0.001), current business performance (X^2 (5, 16.902) = 0.005), and perceptions surrounding how farmers expect their economic prospects to change in the next 5 years (X^2 (3, 17.120) = 0.001) (see section 9.3.1, figure 9.4). Non-significant associations, including gender, age, organic status, time spent in farming, and whether any land is rented are shown in SI (section 9.4).

Figure 9.5. % of farmer participants from the OQS, FTIs and FFGs engaged with CSF by region. A significant association was found (X^2 (2, 6.610) = 0.037). The government regions⁵⁷ were not used here due to cells containing less than 5 data points. The regions were, therefore, amalgamated to ensure there were enough data for robust statistics⁵⁸.



9.4.2. Does CSF reach the thresholds of each component of CREALITY?

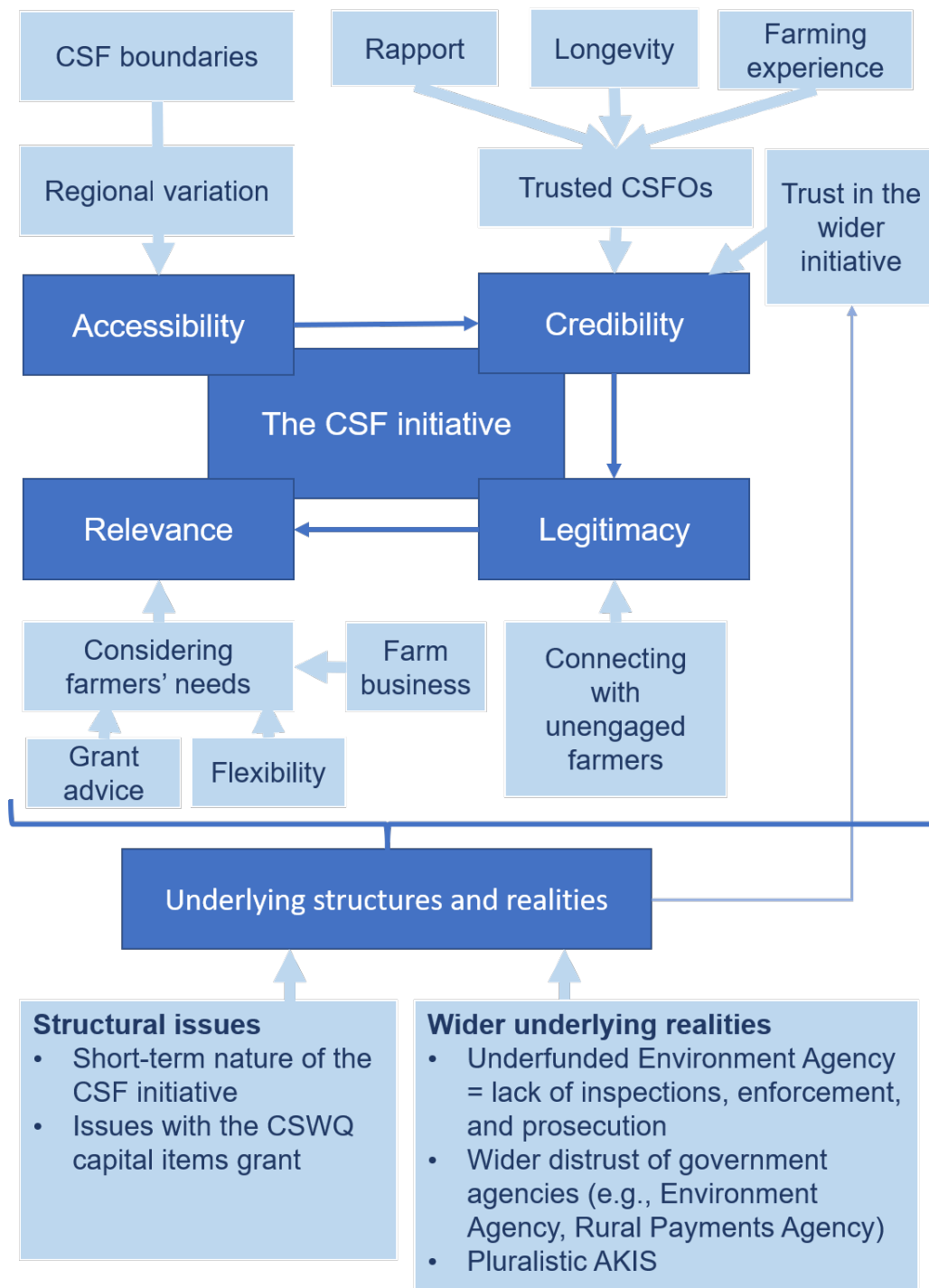
⁵⁶ The government regions were not used here due to cells containing less than 5 data points – the regions were, therefore, amalgamated to ensure there were enough data for robust statistics.

⁵⁷ The UK government regions are: South West, South East, East of England, Greater London, East midlands, West midlands, North West, North East, Yorkshire and the Humber (ONS, 2021).

⁵⁸ South consisted of the South West and South East, the West Midlands and the East Midlands, Central consisted of Greater London and the East of England, and North consisted of Yorkshire and the Humber, the North East, and the North West of England.

The following sections will explore each of the narratives which arose relating to CSF whilst linking them to the CREALITY framework (figure 9.6). This analysis will then determine the extent to which CSF is likely reaching the thresholds of each component.

Figure 9.6. Schematic diagram illustrating how the themes which emerged surrounding the CSF initiative relate to each component of the CREALITY framework.



9.5. The perceived 'legitimacy' of CSF

Whilst discussing the efficacy of CSF, some participants alluded that the initiative is losing legitimacy (and credibility) by only engaging with the 'usual suspects' within priority catchments, thus failing to engage with potentially significant polluters (see section 7.2.1). The perception that CSFOs are only approaching environmentally-aware farmers irritated some CSF-engaged farmers, who felt that unengaged farmers are 'getting away with it' (polluting), thus resulting in a lack of perceived legitimacy (see section 5.3.4). This issue may, however, be less of a problem than these farmers realise; whilst some may not engage with CSF and are perceived as unengaged 'polluters' as a result, they may be accessing information from elsewhere, including from other entities, other farmers, and online (Jansen *et al.*, 2010). The use of alternative (i.e., non-CSF) sources for advice is evidenced by the finding that some of the farmer participants who do not engage with DWPA advice or CSF believe they already possess enough knowledge themselves, for example, due to being FACTS/BASIS accredited. In addition, the discovery that several farmers already watch informative videos on DWPA (sections 4.4.3, 5.4.3) provides further evidence that some of the 'unengaged' may simply be gaining information elsewhere.

9.6. The perceived 'accessibility' of DWPA advice

The fragmented advisory system in England (see section 1.3.4; Oreszczyn *et al.*, 2010) and in other countries (Garforth *et al.*, 2003; Klerkx & Leeuwis, 2008) appears to affect the accessibility of DWPA advice. A significant association was found between broad English regions and whether farmers have engaged with CSF (figure 9.6). The plethora of sources of DWPA advice, perceived as excessive within particular regions (e.g., as explained by Dorset FFG participants) appears to be leading to disengagement and frustration amongst many farmers (see section 6.4.1). These farmers were irritated by constant engagement from multiple organisations offering the advice, which is, at times, conflicting due to their differing agendas. For example, whilst environmentally-led NGOs (e.g., FWAG and the Rivers Trust) may attempt to reduce DWPA through natural means and reducing inputs (i.e., source control measures), some agronomists may continue to provide advice that achieves compliance with water

quality regulations but goes no further, continuing to recommend the usage of inputs as much as possible. Meanwhile, other farmers (e.g., within the NY FFG), stated the opposite, with these participants stating that they receive little to no DWPA advice from any entities at all (section 6.4.1). In some cases, this appeared to be due to a lack of awareness of the existence of advisory services, and in others, due to a lack of perceived relevance (e.g., due to being an upland grazing livestock farmer). Further research is needed to explore the extent of regional variation in fragmentation across England, ideally at county-scale rather than using the megaregions used here.

The findings of this study echo Lobley & Butler (2007), who found that fragmented advice can make it challenging to determine where to go for advice. These findings indicate that the lack of connectivity between advisory sources identified by Sutherland *et al.* (2013) and Klerkx & Proctor (2013) remains present in England, at least in the context of DWPA and using the sample for the MMR undertaken in this new research.

Advisors indicated that the multiple entities within the DWPA advisory landscape do not always collaborate effectively (see sections 7.2, 8.4.2). This issue has been previously acknowledged in a French and Dutch context, often due to competition between advisory entities (Leeuwis, 2000; Klerkx *et al.*, 2006; Labarthe, 2009). This study proposes that this is likely also the case in England, with private organisations (e.g., ADAS) and agronomists least likely to collaborate due to the need to remain commercially competitive. This finding also aligns with Klerkx & Proctor (2013) who found that advisors are concerned about collaborating due to the risk of being encroached upon, and with Garforth *et al.* (2003) who argued that the private nature of extension could result in 'wasteful competition'. Some farmers and advisors also posited that governmental entities are failing to collaborate due to bureaucracy, with CSF and the Environment Agency apparently failing to liaise with each other to maximise their impacts on water quality. Many ATI and AFG participants did, however, believe that their entities collaborate effectively with other advisory entities. Thus, some DWPA advice may be more 'joined-up' than farmers appear to realise (section 7.2.2, 8.4.2).

Regarding the accessibility of CSF itself, the perception that CS water quality priority areas are allocated unfairly was a prominent theme, with several farmers

feeling excluded from gaining advice (and grant funding). Table 9.2 presents quotes from each method relating to this narrative.

Table 9.2. Examples of quotes relating to the boundary issues relating to the accessibility of CSF advice from each method.

Method	No. quotes	Quote relating to issues with the accessibility of CSF advice
OQS	10	<i>'I don't think that we are in a CSF area, so I am not really aware of their work as it doesn't feel very open to us.'</i>
FTIs	7	<i>'We've received very little advice on pollution and how to reduce it. Erm, we're not in a red area for the bad pollution areas, we're in an NVZ, but we're in, we're not quite in the red catchment area, we're in the orange, so we don't seem to get looked after very well.'</i> (FTI #11, arable, 1200ha, Hampshire).
FFGs	25	<i>'The targeting is unfair, that's the main thing with CSF, and it's not very logical as to why they choose the regions, (...) I don't think anyone outside would even be aware of what CSF is really because you only get sent it if you're in the area.'</i> (Devon FFG, R1) <i>'I don't know enough about CSF in the past to know what it was, only that I couldn't get to it!'</i> (Dorset FFG, R4)
ATIs	5	<i>'Obviously, you have to focus the funds where they're most needed but by having such vast areas of surface water catchments that are now not in priority areas for CSF it meant that advice fell away.'</i> (ATI #33)
AFGs	12	<i>'It would be fantastic if it could be nationwide, it would be fantastic and just do it on need per holding.'</i> (NY AFG, R6). <i>'I would take away the catchment targeting (...) there was a dairy farmer in a catchment whose yard was overstocked, he didn't have enough storage (...) CSF wanted to help him solve the problem but because it was that side of the fence it was like sorry, I can't get involved in that.'</i> (Devon AFG, R1).
Total	59	

Some surveyed farmers felt that those they perceive as contributing more significantly to DWPA than themselves are being rewarded for their lack of investment in infrastructure (e.g., slurry storage). This perception, alongside the existing finding that 32% of CSF-engaged farmers have engaged with the

initiative on five or more occasions (CSF evidence team, 2014) and the view of several farmers that CSF is failing to reach polluting farmers, leads to the question as to whether CSF is *too* accessible to certain farmers. Farmers felt it was unfair that multiple grants were being awarded to the already engaged whilst excluding other farmers who may be harder to build a relationship with.

'Spaced'⁵⁹ repetition has, however, long been recognised as a powerful approach for fostering learning (Kang, 2016; Tabibian *et al.*, 2019). Thus, the finding in a more recent CSF evaluation report (Environment Agency, 2019) that 53% of CSF-engaged farmers have engaged three or more times is likely positive as long as these repeated engagements are not making the initiative inaccessible to others. The importance of advisors making follow up visits was also emphasised by advisors (section 7.2.3). This aligns with the findings of Dwyer & Reed (2014), who upon recognising that behaviour change takes time, stated that multiple encounters with advisors are important.

9.7. The perceived credibility of CSF

By combining the positive and negative views of farmers and advisors towards CSF, the following factors were identified as key to reaching the credibility threshold of CREALITY:

1. **The quality of advice delivery**, where 'good quality' advice is defined by both farmer and advisor participants as being delivered by long-term, trusted advisors who are effective at communicating with farmers, take a non-judgemental approach and provide farmers with reliable information and practical solutions
2. **The potential impact of advice uptake**, in terms of farmer awareness and knowledge surrounding DWPA and tangible water quality improvements as a result of CSF delivery
3. **Trust in the advisory entity**, whereby farmers may initially decide whether an advisor is credible by proxy, based upon their pre-existing views on the entity from which the advisor derives

⁵⁹ 'Spaced' repetition: Where visits are repeated over a prolonged period of time

Where these criteria are not met, this MMR research suggests that a farmer will be less likely to engage with CSF.

The importance of advice being perceived as 'high quality' for achieving credibility

The 'quality of advice' (as defined in tables 7.3, 9.3) was the central theme relating to credibility which arose during this research, with both positive and negative sentiments contributing to the identification of the factors which constitute 'good quality' advice according to farmers and advisors (table 9.3). These factors are not mutually exclusive, with many participants naming several of these components when discussing DWPA advice.

Farmers and advisors had similar perceptions of what makes DWPA advice 'good quality', with a single component relating to credibility identified by a single participant type (table 9.2). Whilst some farmers believed that advisors should be from an agricultural background to be seen as credible, advisors did not share this view, instead believing that advisors from environmental or agricultural backgrounds can deliver credible advice where they are experienced. This view is likely due to farmers' tendency to perceive direct experience as more credible than abstract 'scientific knowledge', referred to by Latour (1987) as lacking contextual references so it can be applied at broader spatial scales.

Advisor participants within this study did not refer to their backgrounds when discussing the credibility of DWPA advice. This is likely because almost half of these advisors (46%, $n = 23$) specialised in the environment during their education rather than in agriculture. Having an agricultural background is, however, unlikely a 'deal-breaker' for achieving trust with farmers because the credibility of advisors is clearly multi-factorial (as shown by table 9.1). Gorman *et al.* (2019) also undertook a case study in Ireland and found that duration as an advisor was an indicator of technical expertise alongside agricultural experience.

Despite most farmer and advisor participants across all five methods agreeing with the statement '*I believe that CSF is a successful initiative*', once they were asked to elaborate on their answers, an average of 64% of conversations within the FTIs, FFGs, ATIs, and AFGs surrounding CSF were categorised as negative. This inconsistency suggests that the initial quantitative answers may not reflect the actual views of participants. It is unlikely that many of these answers were

deliberately misleading. Instead, because the Likert-scale questions offer no opportunity to elaborate, participants, not wanting to be too critical of CSF and other topics may have been more inclined to give neutral or slightly positive answers than disagreeing with the statements without explaining why. Besides, participants typically spend little time answering quantitative questions so they may not have dedicated much thought before selecting an answer. Meanwhile, when probed on their answers, participants may have felt more comfortable providing negative views due to the ability to explain them and provide evidence.

Participants were asked to '*Imagine you are in charge of CSF. What would you change and why?*'. This question led to several suggestions for improving the initiative so that it is more likely to reach the CREALITY thresholds (sections 4.3.2, 4.4, 5.2, 5.4, 6.3, 6.7, 8.3.2). The wording of this question admittedly encouraged participants to focus on the negative aspects of CSF. Regardless, the prominence of impassioned views makes these narratives important to consider as tackling these issues may increase the efficacy of DWPA advice. Besides, participants were more likely to use negative sentiments when discussing the quality of CSF advice than when talking about alternative sources of DWPA advice. This finding indicates that CSF advice may be further away from meeting thresholds of CREALITY than other advisory entities are; thus, the initiative may be able to learn from their approaches to improve. Alternatively, it may be likely that advisory entities focusing on productivity or business-related advice are naturally more likely to reach the CREALITY thresholds due to the likelihood that they will be seen as substantially more relevant than those delivering environmentally-led advice.

Table 9.3. The components of 'good quality' DWPA advice according to farmer and advisor participants within this MMR. The OQS was excluded from this analysis, as there was no opportunity for participants to elaborate on their quantitative answers.

Components of 'good quality' CSF advice	% of files
Farm business aspects considered*	33.3
Trusted advisor	28.1
Advice results in learning	22.8
Experienced advisor	19.3
Repeated interaction	14.0
Practical information*	8.8
Agricultural background	7.0
Locally relevant*	5.3
Communication skills	5.3

* This component affects both credibility and relevance.

The importance of trust for achieving the credibility threshold

Trust, as found throughout this study, is a crucial component for achieving credibility. Where there are underlying realities that impede the ability of an advisor to gain a farmer's trust, this may reduce the likelihood of a farmer engaging with the advisor in the first place regardless of how trustworthy her/himself may be. This finding echoes existing studies surrounding wider agricultural advice which also found that trust is crucial for advice delivery, both in terms of farm advisors themselves (Russell *et al.*, 2020) and the entities from which they derive (Sutherland *et al.*, 2013). The MMR study outlined in this thesis, however, goes further and identifies trust as a key factor affecting the credibility of engaging with advice in the first instance.

Certain entities and advisors (e.g., long-term independent agronomists) appear to be trusted by 'proxy' whilst others are subject to distrust. This study found that several entities, including FWAG and the Rivers Trust, were trusted sources of DWPA advice in the regions where they are active (see appendix, section 9.3.3). A few farmers, however, stated that certain environmental NGOs, despite being well-trusted, tend to focus solely on the environment, ignoring the needs of farm businesses. This indicates that whilst these NGOs are perceived as credible and well-trusted, this does not necessarily mean they are seen as relevant.

Some FTI (n = 9) and FFG participants (Devon FFG) exhibited scepticism towards certain advisory entities for being too agenda-driven. For example, farmers were sceptical of agronomists due to the perception that they will oversell agrochemicals. This lack of trust inevitably leads to a loss of credibility for these entities. This research also found that some farmers appear unable to differentiate between government bodies, often confusing NE, the EA, and even CSF with each other (e.g., see section 6.6.2). Where the other entities seen as associated with CSF are perceived negatively, this appears to affect how farmers feel about the CSF initiative itself. For example, participants shared several negative sentiments about the Environment Agency (sections 6.6, 7.2.2, 8.7.1), most of which arose during discussions about the efficacy of CSF.

Longevity was a key factor affecting the perceived quality of DWPA advice (and therefore, its credibility). Both farmers and advisors saw longstanding DWPA advisors as necessary due to existing research which has argued that there is a need for ongoing support and contact with farm advisors in general (Winter *et al.*, 2000b; Smallshire *et al.*, 2004; Environment Agency, 2019d; Gorman *et al.*, 2019). Having long-term advisors is, therefore, essential due to its powerful effect on fostering trust (Sutherland *et al.*, 2013), with resulting repeated interactions promoting learning and measure uptake.

Where farm advisors deliver information (e.g., hard evidence, see section 9.10) that is not useful to the farmer in some way, it is unlikely to be deemed credible. 'Practical' information was defined by advisors and farmers in this study as advice that is solution-based, straightforward, realistic, and feasible on-farm.

Farmers and advisors also referred to 'impartiality' as a component of trusted advice. Sligo & Massey (2007) interviewed dairy farmers in New Zealand and found that the uptake of new practices may be perceived as less risky when information about these practices has derived from a trusted source. Sutherland *et al.* (2013) found that farmers and advisors were more likely to trust advisory entities which are perceived as either impartial or pro-agriculture rather than as pro-environment. This finding is potentially problematic because where advisors are forced to be pro-farmer to elicit trust, they may not feel able to recommend the measures most likely to result in water quality improvements (Sutherland *et al.*, 2013).

Gorman *et al.* (2019) found that communication skills alongside expertise are vital for successful advice delivery in Ireland. This thesis finds that this is also the case in England, with both farmers and advisors placing importance on an advisor's ability to communicate at an appropriate level and in a friendly manner (sections 5.2.2, 6.4.2). It also finds that first impressions are critical, with a poor introduction from an advisor likely to result in an immediate lack of credibility.

9.8. The perceived relevance of CSF advice

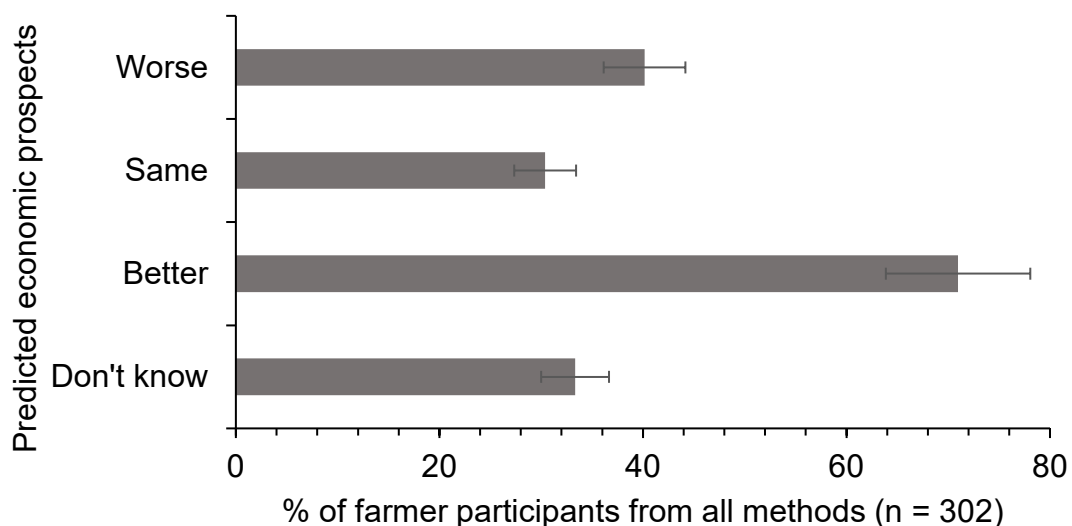
Combining the positive and negative sentiments shared by both farmers and advisors revealed several factors affecting whether farmers perceive engaging with DWPA advice as relevant:

1. Advisors consider the individual needs of farmers
2. The perceived potential benefits of engaging, e.g., the availability of grant funding and associated advice
3. The ability of the farmer to engage with and uptake advice
4. The perceived local relevance of delivered advice and information
5. Whether the uptake of measures or practice change is likely to result in tangible water quality improvements
6. Flexibility in terms of the measures recommended for reducing farmers' contributions to DWPA based on their individual circumstances

Advice delivery by CSF, based on this research, is likely to meet the relevance threshold where it is seen as considering the individual needs of farmers due to their size, dominant farming enterprise, and personal circumstances. This study found that several primarily grazing livestock and arable 'small-scale' farmers (<100ha) felt that advice lacked relevance due to failing to consider their needs. This finding echoes Sutherland *et al.* (2017), who found that small-scale farmers perceived advisors as lacking knowledge relating to their circumstances. Deane (2016) argued that reaching unengaged farmers may be achieved by reconsidering how and when these farmers are delivered advice. For example, current efforts by advisors to engage with farmers may be occurring during hours that are inappropriate for smaller farmers or those with livestock, or through approaches that are not inclusive for all types of farmers (e.g., farm events that require travel).

As introduced above, a significant association was found between whether farmers engage with CSF and how they believe their economic prospects may change in the next five years. Farmer participants were significantly more likely to have engaged with CSF if they believe their financial prospects are likely to improve. Meanwhile, those who think their prospects will worsen were less likely to have engaged (figure 9.7). This finding indicates that farmers who are less optimistic about their futures in farming see engaging with CSF as less relevant than those who are more optimistic. This may be due to the view shared by several farmers that they are unable to engage with CSF as the associated CS water quality capital items grant requires a 50% investment by themselves (see below).

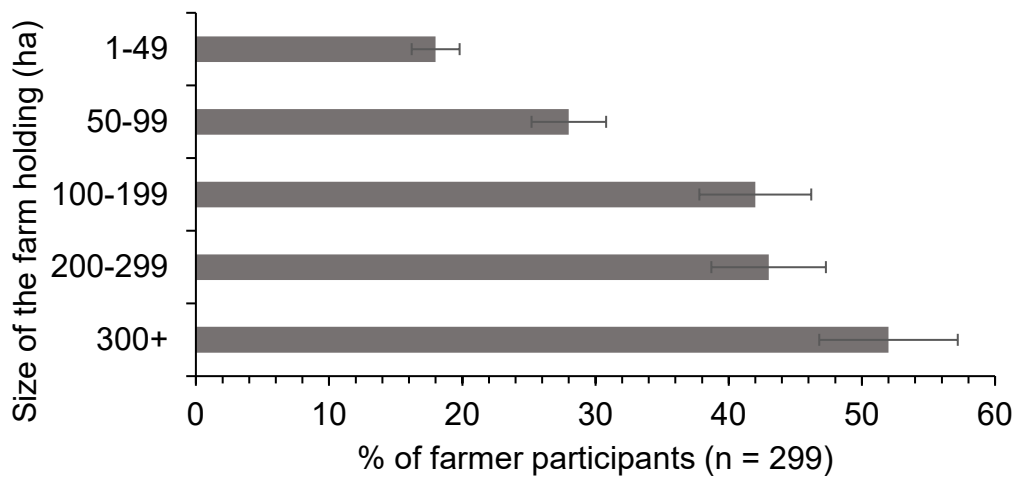
Figure 9.7. Farmers' perceptions of how they believe their economic prospects are likely to change in the next five years versus whether they have ever engaged with CSF.



The size of a farmer's holding was also significantly associated with whether they have previously engaged CSF, with larger farms more likely to have engaged than smaller farms (figure 9.8). This finding was somewhat unsurprising as the researcher also gleaned information from farm advisors (outside of the AFGs and ATIs) that CSFOs often prioritise visiting larger farms which may contribute more significantly to DWPA. In addition, smaller holdings may not seek out advice from CSF and other entities which deliver DWPA advice due to a perception that it isn't

relevant to do so due to a belief that they are not contributing significantly to the water quality problem at scale or further downstream.

Figure 9.8. Size of farmers' holdings (ha) versus whether they have previously engaged with CSF.



The Environment Agency (2019) reported that 92% of surveyed CSF-engaged farmers found the advice they had received from the initiative as relevant to their needs. The present study explored this further to define precisely what farmers mean by 'relevant' DWPA advice and to determine whether allowing farmers to elaborate on whether they see advice as relevant revealed any areas where this component of CREALITY is not being met.

9.8.1. The potential benefits of engaging with CSF advice

Farmers and advisors both emphasised the need for DWPA advisors to recommend measures which alongside improving water quality, may deliver tangible benefits for the farmer, usually in relation to the farm business (sections 4.3.2, 6.2.2, 8.5.3). This emphasises the importance of DWPA advisors considering the needs of farmers to remain profitable when delivering advice for reducing DWPA; thus relaying the potential 'win-win' scenarios associated with measures for reducing DWPA is crucial. The recognition that advice must be relevant to the farm business is unsurprising as many farmers in England adopt environmental measures for non-environmental reasons (Marr & Howley, 2019). For example, some farmers may not be inclined to grow cover crops to reduce runoff but may be persuaded by the prospect of them for improving soil health, thus reducing input costs.

An obvious business benefit of engaging with CSF is the availability of the CS water quality capital items grant. Both farmers and advisors within all five research methods recognised the increased relevance given to CSF due to its involvement in the CS water quality capital items grant scheme and the grant advice given by CSFOs. This further demonstrates the importance of ensuring the uptake of advice is likely to result in tangible benefits for the farm, whether through increasing productivity, reducing input costs, or installing capital items to support farm operations and compliance. The increased relevance of CSF due to the CS water quality capital items grant may not, however, be solely due to farmers wanting financial support. This study finds that the use of a 'carrot' approach (i.e., a grant) may also encourage farmers to place trust in their CSFOs: *'I think CSF works well because it gives the carrot option rather than stick'* (OQS, #30, arable, Devon, 25ha), thus increasing the credibility of the initiative alongside the relevance.

9.8.2. The agency of farmers to engage with CSF

According to the findings of this study, farmers are unlikely to perceive CSF (or wider DWPA advice) as relevant where they do not feel able to engage or uptake recommended measures. The triangulated data identified several key barriers which affect whether farmers feel they can engage with advice, including their financial situations, age, tenure, and other personal circumstances (table 9.4).

Table 9.4. Quotes from across this study surrounding personal barriers affecting the agency of farmers to engage with DWPA advice.

Factor	Quotes from this study
Financial constraints	<p><i>'If you haven't got money behind you to get through a couple of bad seasons that can throw any farmer, you need to be able to get through that before you do anything else...'</i> (R4, Devon AFG, Rivers Trusts)</p> <p><i>'There's the financial part where people can't afford to do anything.'</i> (R1, Devon FFG, grazing livestock, 150ha, Devon)</p> <p><i>'The financial constraints on farming are pretty heavy, so that's the first priority.'</i> (FTI #14, arable, 580ha, Hampshire)</p>
Age	<p><i>'Within ten years I'll be thinking of pulling out and retiring, handing over, so the responsibility has to pass to the next generation. Farming is too loaded with rules, it becomes too stressful really,</i></p>

	<p><i>and we're busy farming.'</i> (FTI #39, grazing livestock, 140ha, Cumbria)</p> <p><i>'I'm the wrong age to know how to do everything properly'</i> (FTI #59, mixed, 380ha, Bedfordshire)</p>
Tenure	<p><i>'Tenancies are a nightmare! If you get a 10-15 year tenancy, how can you invest...you can't!'</i> (R3, NY AFG, CSFO)</p> <p><i>'The landlord has to be on board as well; people think because you're a farmer, you own the land, bollocks. A lot of people are constrained.'</i> (R8, Dorset FFG, grazing livestock, 135ha, Dorset)</p> <p><i>'Being a land squatter means that it's up to the landowner to take responsibility, but it's a difficult conversation because all they want is money!'</i> (FTI #1, grazing livestock, 2500ha, Gloucestershire)</p>

As explained in chapter 1, many farmers in England are financially constrained. It was, therefore, unsurprising that financial constraints were the most frequently mentioned barrier to engaging with DWPA (table 9.4, sections 4.3.1, 5.2.4, 6.2.2.). This barrier is further evidenced by the quantitative finding that farmers who believe their economic prospects will improve in the next five years were significantly more likely to engage with CSF advice (section 9.4) Financial limitations are crucial considerations to make when considering whether DWPA advice will be perceived as relevant.

Advisory entities who are unable to offer grant funding may be aware that attempts to persuade farmers to take up measures that cost money may make them less relevant; thus, they tend to advise farmers on measures included in AES (Vrain & Lovett, 2016). Meanwhile, entities with grant availability, thus reducing the issue of farmers' financial circumstances recommend measures that are not already covered by existing regulations and BPS, typically going above and beyond these structures with the aim of making substantial improvements to water quality. The present study also suggests that the availability of grant funding must be clearly articulated by advisors to ensure that seeking initial advice is deemed relevant by farmers.

Several farm advisors also referred to financial constraints, but to a far lesser extent than farmers. Instead, advisors seemed more concerned about the time constraints faced by farmers. Paradoxically, advisors within the Dorset and NY AFGs explained some farmers do not engage with CSF or other sources of free

DWPA advice but are, despite being financially constrained, willing to pay a land agent or independent advisor for advice (see appendix, section 9.7.2). This finding indicates that whilst financial constraints affect whether a farmer engages with DWPA advice, if a source is perceived as credible and sufficiently relevant, farmers may be willing to engage regardless. In addition, it suggests that DWPA advice is seen as less relevant than the business-focused advice provided by agronomists and land agents. This finding aligns with Fish (2014), who found that a failure to align with their business priorities was a critical reason for farmers not engaging with CSF.

Even where grants and business benefits are available as a result of engaging with DWPA advice, some farmers posited that they are still unable to engage. This is due to having a lack of capital to invest, particularly where capital items are match-funded (as is the case with the CS water quality capital items grant):

‘Sometimes the guys that need the most advice are those with the least free cash, so although there might be a long-term gain, if they can’t invest then they won’t do it’ (R5, Dorset FFG)

‘If you get a 50% grant, there’s still that other 50%, and sometimes this money takes finding when you’re not making vast amounts of profit. We may not even bother with a grant where we have to put up 10-20% at the moment’ (FTI #40, grazing livestock, 380ha, Cumbria)

The inability of certain farmers to seek grant funding appears to be creating a paradox, whereby those who can afford to invest a certain amount towards capital items continue to receive grant funding, whilst those unable to invest at all perceive engaging with advice as irrelevant.

Both farmers and advisors mentioned age as a barrier to engaging with DWPA advice in this study, with older farmers perhaps less likely to engage (sections 4.3.1, 5.2.4, 7.3.3). This finding aligns with Kinsella (2018), who found that older farmers (especially those without a successor) have little motivation to change. Advisors, however, only tended to refer to age as a barrier when discussing the use of ICT for advice (including videos) rather than DWPA advice in general.

Tenure posed a barrier to farmer engagement with DWPA advice due to the lack of ability of some tenant farmers to make autonomous decisions on investment

without consulting their landlords. In addition, tenant farmers face the complexity of who pays towards capital items; they are unlikely to pay for these themselves unless they are confident that they will be reimbursed at the end of their tenancy based on the value they've added to the farm holding. Advisors within the NY AFG were particularly concerned by this, arguing that this has led to a lack of investment in dairy infrastructure (see appendix, section 9.7.2). These farmers who are unable or unwilling to invest are likely less inclined to engage with DWPA advice due to the knowledge that they are unlikely to uptake recommendations. This is likely, in part, because implementing informal environmental measures is unlikely to result in a financial reward for tenant farmers (Mills *et al.*, 2013).

9.8.3. The importance of local, practical advice for ensuring DWPA advice is relevant

Several farmers and advisors throughout this study contended that DWPA advice should be local and/or practical to be deemed relevant. Interestingly, however, farmers appeared more concerned about this narrative than advisors. Of the farmers who referred to local advice as being of importance, most were grazing livestock farmers, with arable farmers less likely to mention this when discussing DWPA advice. Though arable farmers have to adapt significantly across the country based on their soil types, with specific measures for reducing DWPA appropriate in some areas but not others, livestock farms are more variable in terms of their structures (e.g., size, type, intensity, capital items e.g., slurry storage). In addition, many livestock farms are situated in culturally distinctive remote areas so are likely to seek advice which aligns with the practices used in their local area.

9.8.4. A threat to relevance: a perceived lack of evidence that CSF has led to tangible water quality improvements

Conservationist attitudes are embedded in the identities of many farmers, even those who are primarily motivated by productivism (McGuire *et al.*, 2013; Wheeler *et al.*, 2018). For example, Mills *et al.* (2017) found that many farmers who engage with advice show a genuine interest in achieving environmental outcomes. It was, therefore, unsurprising that farmers perceived engaging with CSF and other sources of DWPA advice as more relevant if recommended measures are likely to result in tangible water quality improvements. In this

context, farmers may be concerned with achieving tangible water quality benefits due to their awareness that the upcoming ELMs scheme may operate on a 'payment by results' basis. These farmers are likely to want to prove their environmental contributions to secure financial security.

Farmers have previously been found to exhibit scepticism about whether their changes resulting from CSF advice have impacted water quality. For example, around half of farmers who adopted measures after engaging with CSF believe they've made little to no impact on water pollution (Ipsos MORI, 2015). As discussed in chapter 1, this is, in fact, likely due to landscape-scale measures relevant to the local processes driving DWPA being needed to make significant improvements to water quality (e.g., Biddulph et al., 2017).

This scepticism does, however, have significant implications for the relevance of the initiative, as farmers are expected to be more likely to engage where they feel they will be shown tangible evidence that they have contributed to solving the water quality problem (sections 4.4, 5.4.2, 6.5.1, Rogers 1975, 1983). Most participants in this study, however, either did not mention the extent to which they believe the efforts of CSF have led to water quality impacts or stated a belief that it has failed to achieve significant water quality improvements. The only method where some participants believed CSF has achieved tangible water quality improvements was within the ATIs (sections 7.2.1 (n = 4)), although others (n = 7) were sceptical as illustrated by the below quote:

'CSF are very clever at choosing the KPIs that they know will prove their success, things like number of farms engaged and that's simple enough. I think having CSF in the catchment is very beneficial, but if you actually equate the amount of money spent on it to the actual change in water quality ... I then start to wonder whether it actually does make a great deal of difference in the short term, but I think it would in the long term'. (ATI #17, Rivers Trusts).

The Water Research Centre (WRc, 2019) estimated that water quality has improved by 1.2-6.5% across waterbodies within phase 1 CSF target areas. Participants of this study were clearly unaware of these findings. Several farmers and advisors felt they had not seen enough evidence that the CSF initiative has led to water quality tangible improvements, with some claiming that there has

been a lack of water quality monitoring and dissemination of results. Several studies (see section 1.4.2.) have, however, claimed that CSF has resulted in water quality improvements. This lack of awareness suggests that there has been a lack of dissemination of this report. Other studies have, however, found that CSF has not led to water quality improvements, for example, in the Ingbirchworth catchment (South Yorkshire) (Kay *et al.*, 2012). Even where tangible impacts on water quality from CSF are reported, critically, they are unlikely to be of the magnitude needed to deliver an improvement in water quality status (Collins and Anthony, 2008).

It is, however, futile to consider whether CSF alone has contributed to water quality improvements due to the difficulties which arise when attributing water quality improvements to a single effort where several exist within a catchment. This study contends that efforts should be made to gather and disseminate data indicating whether CSF and other sources of DWPA have led to tangible and sustained water quality impacts at a catchment scale as this may increase the perceived relevance of engaging with advice. This research must, however, consider the timing of monitoring carefully due to its profound effect on the results (Mellander *et al.*, 2018).

9.9. Underlying structures and realities affecting the efficacy of DWPA advice

A narrative surrounding underlying structures and realities emerged spontaneously within the OQS and the FTIs. This emergence led to the researcher using probing questions within the FFGs to allow this rhetoric to develop. This narrative, whereby the efficacy of DWPA advice is not based solely on its delivery but also on underlying structures, has not been articulated in previous studies, yet appears to have a profound impact on whether farmers will perceive engaging with DWPA advice as credible, relevant, and legitimate. The key topics which arose relating to CSF include the boundaries within which DWPA advice (primarily CSF advice) operates, the inflexibility of measures CSFOs can recommend, and the short-term nature of many CSFOs.

In terms of both CSF and other entities which deliver DWPA advice, the main topics relating to this narrative included funding constraints, excessive bureaucracy associated with grant funding, and a perceived lack of enforcement,

inspection, and dissemination of regulations by the Environment Agency resulting in farmers perceiving engagement with DWPA as lacking relevance. The perceived lack of inspection by the Environment Agency is likely of substance; a recent report claimed that farm inspections in England have fallen by two thirds since 2018 (The Times, 2020). Besides, the Environment Agency themselves, in response to a recent report by The Times, acknowledged their inability to enforce regulations and prevent DWPA, citing the loss of over half their funding since 2010 as a reason for this failure (The Times, 2020). As a result of this lack of funding, all 243 documented violations of the NFRW (section 1.3.2; figure 1.5) have been left unprosecuted since they were instated in 2018, with many further violations likely left undetected (The Guardian, 2021).

9.9.1. Structural issues and underlying realities specific to CSF

The main structural issue which arose relating to CSF throughout this study pertained to how the CS water quality priority areas within which CSF operates are allocated (table 9.2), with both farmers and advisors believing that the current boundaries are unfair. Information gleaned from CSFOs whilst attending farm events to recruit farmer participants also suggests that the boundary edges often cut across farm holdings. For example, one CSFO explained that if a farmer's land is situated inside a CS high priority zone, but the holding itself is outside of the boundary, they are unable to apply for CS water quality capital grants. These boundaries are set by Natural England rather than by CSF itself, making this an underlying structure which impacts the efficacy of the initiative.

Secondly, several advisors stated that the measures which CSFOs can recommend are not always the most appropriate for individual farms (section 8.3.2). This is because CSFOs are restricted to recommending a set list of measures which are decided upon by Natural England and prioritised by officers at a catchment scale rather than on a farm-by-farm basis. Flexibility appeared to be a key aspect of ensuring CSF advice is perceived as appropriate; where farmers are recommended prescriptive measures that may not apply to their farms, they will perceive the advice they receive as irrelevant. Several advisors (e.g., within the NY AFG) stated that they believe their advice would be more effective if they had more autonomy to decide on the most appropriate measures

for each farm. Where these measures are seen as inappropriate by farmers or CSFOs, this impedes the ability of CSF to be perceived as credible or relevant.

The use of short-term contracts by the governmental bodies which manage CSF had a strong negative effect on the perceptions of both farmers and advisors towards the initiative, as where an advisor is not present in a catchment for an extended period of time, they are unlikely to build rapport and trust with farmers. For example, Thomas *et al.* (2020) found that relationships between CSFOs and farmers became increasingly productive over time. These long-term relationships contribute to trust, and therefore, credibility; however, this trust built over time can be undermined by a single negative encounter where another component of 'good quality' advice is not met (see Gorman *et al.*, 2019).

Sutherland *et al.* (2013), similarly to this study, found that a lack of continued advice and the use of contracted advisors on a short-term basis is unlikely to result in engagement by farmers due to a lack of credibility. Several advisor participants, including CSFOs, were frustrated by temporary contracts due to the recognition that farmers are likely to see unfamiliar CSFOs as lacking credibility and due to the effect on their own job security. Across Europe, fixed-term employment across various industries has been shown to result in a high turnover of staff (Blanchard & Landier, 2002) and can have adverse effects on health and wellbeing (Gash *et al.*, 2007; Pirani & Salvini, 2015). However, even if CSFOs had high job satisfaction and thus the health implications are minimal, these short-term contracts still affect the credibility and relevance of seeking advice according to farmers, thus making them inappropriate for the nature of the scheme. These findings imply that there may be an underlying issue surrounding the high turnover of CSFOs. Whilst these advisors reported that the temporary nature of their positions was the primary reason for their frustration towards CSFO, there may be underlying job satisfaction issues exacerbating their perception that this is a problem.

Farmers and advisors repeatedly recognised the availability of grant funding as increasing the relevance of DWPA advice throughout this study. It is, therefore, important that funding schemes for improving water quality are, themselves, seen as reaching the CREALITY thresholds. Several farmers and advisors throughout this study, however, made comments about the bureaucracy associated with

grant schemes that aim to improve water quality, including the CS water quality capital items grant which is endorsed by CSFOs. This finding suggests that if CSF and other DWPA advice is to maintain relevance, the structure of grant schemes themselves needs to be evaluated and adjusted as necessary to avoid farmers disengaging with advice itself.

9.9.2. An underlying reality relating to DWPA advice in general: A perceived lack of enforcement of water quality regulations

The perception that there is a lack of farm audits and inspections was shared by both farmers and advisors. This perceived lack of enforcement of water quality regulations has a knock-on effect on the CREALITY of DWPA advice. Underlying water quality regulations may be considered by farmers before they even begin the sequence of considering how legitimate, accessible, credible and relevant DWPA advice is (figure 9.2). This is because where farmers are concerned that they may not be compliant with regulations, they may be too nervous to even consider engaging with advice. However, whilst some dairy farmers were fearful of being prosecuted for failing to comply with water quality regulations (e.g., R4, NY FFG), most farmers were adamant that there is little to no risk that the Environment Agency will either inspect their farms or prosecute them. Advisors, on the whole, agreed with this sentiment. This has serious implications on the relevance and credibility of DWPA advice to farmers; as aptly put by one farmer: *'Why bother with advice to make us comply when there's no pressure to comply?'*

The lack of enforcement of water quality regulations has also led to several pro-environment farmers feeling this is unjust. These farmers exhibited extreme frustration (see chapter 6, Dorset FFG) towards polluting farmers who are 'getting away with it' whilst they are left unrewarded for investing in capital themselves to ensure they are compliant with water quality regulations. This problem is compounded by the view that these polluting, uninspected farmers are also the farmers who are then perceived as 'rewarded' with capital grant items whilst the 'good' farmers remain unacknowledged. This, again, will prevent DWPA advice from reaching the credibility and relevance thresholds as these pro-environment farmers may eventually disengage if they continue to experience these 'unjust' situations.

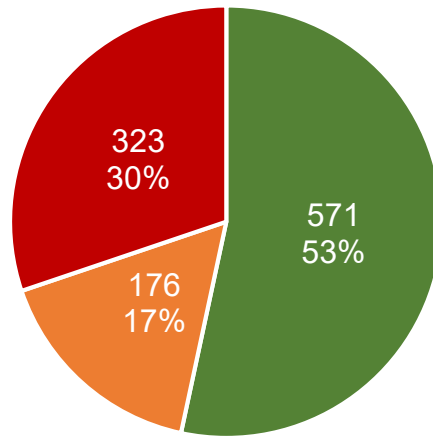
9.10. The CREALITY of video content as an alternative advice delivery approach for providing DWPA advice

Farmer and advisor participants within the OQS, FTIs, ATIs, and AFGs were asked to discuss whether they perceive videos as a potentially useful way of receiving and delivering DWPA information and advice. Figure 9.10 provides an overview of the narratives which emerged during this MMR and illustrates how they feed into each component of CREALITY.

The prospect of farmers being shown more video content providing DWPA advice and information was generally accepted positively subject to several caveats (see figure 9.9); Over half of farmers within the OQS and FTIs and advisors within the ATIs and AFGs stated that they believe video content could become a more useful approach for advice delivery where it is used in conjunction with other methods (e.g., 1:1 advice). Most of these caveats (summarised below) are, however, relatively simple to address. OQS participants, being internet users, were particularly supportive of the idea of video content, with several stating that they prefer videos to written content (n = 52).

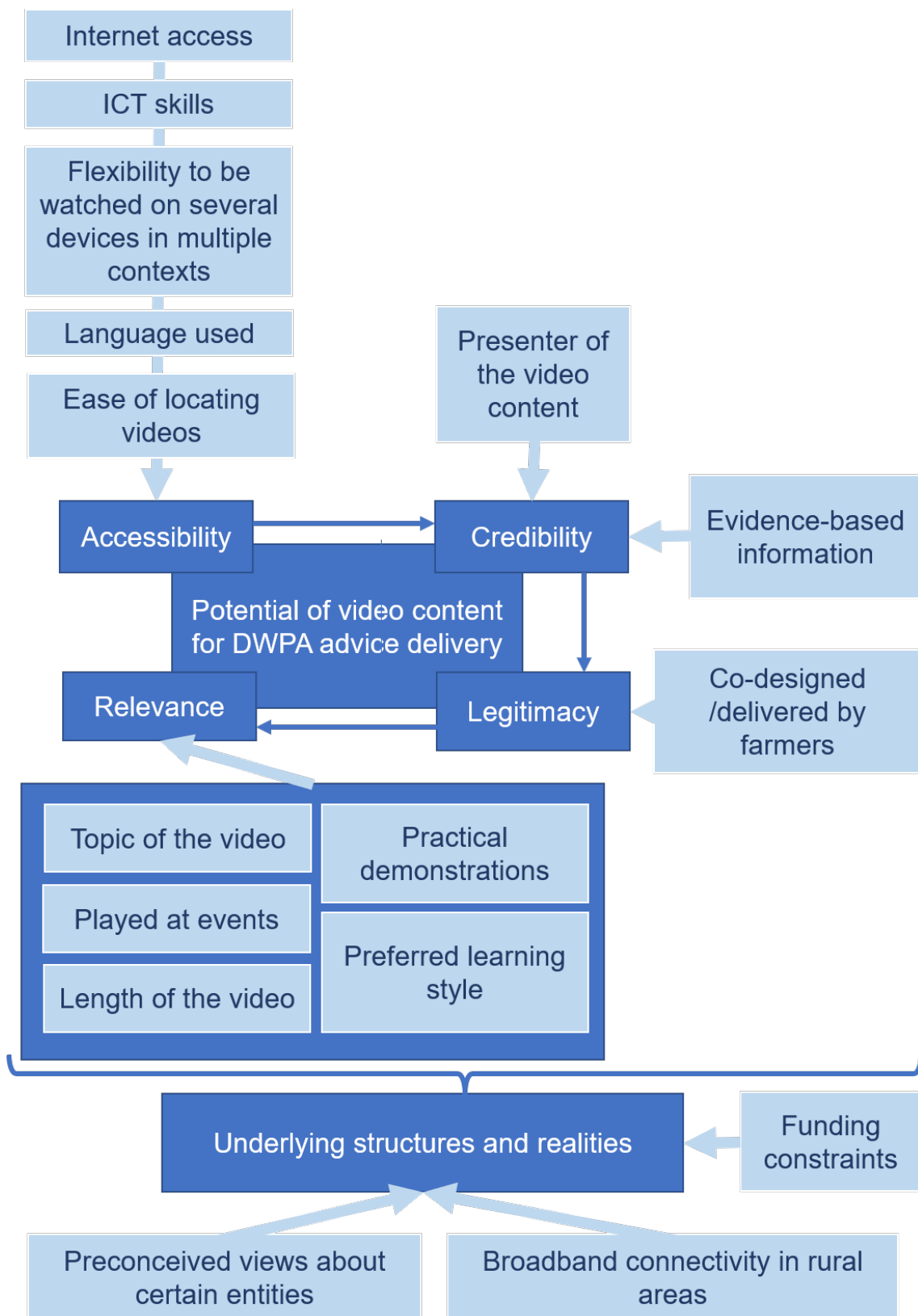
The following sections will combine the findings from chapters 4-8 to explore whether video content may offer a practical advice delivery approach in conjunction with existing methods (e.g., 1:1 advice). The section concludes by presenting a novel toolkit that outlines how to ensure video content containing DWPA advice and information reaches the CREALITY thresholds.

Figure 9.9. Number and percentage of quotes which were categorised as positive, positive subject to caveats, and negative for all research methods where participants were asked about video content as a means of DWPA advice delivery.



- Positive sentiments
- Positive sentiments with caveats
- Negative sentiments

Figure 9.10. Schematic diagram illustrating how the themes which arose during topics surrounding video content relate to the CREALITY components.



9.10.1. Legitimacy of video content

As shown in figure 9.10, farmers indicated that the legitimacy of video content is likely to be increased where farmers have been involved in the video creation process, for example, by acting as presenters themselves. This increases legitimacy as co-developing videos is more inclusive than adopting a traditional approach whereby traditional ‘experts’ (e.g., advisors, scientists) create videos before disseminating them.

9.10.2. Accessibility of video content

Accessibility, in this context, refers to how easy it is for farmers to locate video content. The wealth of information available online can make it difficult for people to find relevant information (Holton & Chyi, 2012). Despite only being mentioned by a few farmer and advisor participants, information overload is important to consider here as this is a recognised problem in several contemporary contexts (Bawden & Robinson, 2020). Information overload can result in people using rapid, potentially irrational means of identifying whether they believe a source is credible, for example by clicking on the first search result without checking whether the source is reliable (Kammerer & Gerjets, 2012). Moreover, under information overload, farmers may also become increasingly prone to confirmation bias⁶⁰; something which some advisors believed farmers are prone to when discussing whether farmers would respond well to ‘hard’ evidence surrounding DWPA.

This study finds that this problem occurs for farmers seeking out video content too, with farmers and advisors consistently discussing information overload and difficulties associated with locating relevant information (table 9.5). This study finds that posting content on YouTube alone is inappropriate for disseminating video content. YouTube as a standalone dissemination approach is ineffective because some farmers do not appear able to search for videos themselves (section 7.5.2); according to this study, they should instead be shown them or directly signposted to them.

⁶⁰ Confirmation bias is the tendency to believe information which aligns with existing views and knowledge

Table 9.5. Quotes evidencing the importance of video content providing DWPA advice and information being easily accessible to farmers

Method	No. Quotes	Example quote relating to the importance of video content being easily accessible to farmers
OQS	9	<i>'If it's presented on a plate via social media like Facebook.'</i> <i>'Should be easy to access and view, especially when sitting on the loo.'</i>
FTIs	4	<i>'I wouldn't know that they're there to go and watch them...if it's stuck online, I'm not gonna see it because I, I'm 52, I'm not gonna go... I'd probably end up with some dodgy video instead (laughs)'</i> (FTI #17, arable, 400ha, Hampshire).
ATIs	19	<i>'Farmers have got a lot on their plates anyway, and they get targeted by a lot of people from different places, and I think it's quite confusing.'</i> (ATI #3) <i>'The biggest question I have is where would they be available?'</i> (ATI #40) <i>'Some farmers I've worked with prefer things in the post because finding things online takes so long.'</i> (ATI #50)
AFGs	8	<i>'Videos are great, but it's how they're shared isn't it; the EA produce videos but then how many farmers are gonna follow them!'</i> (R5, NY AFG) <i>'I don't think they're disseminated enough. There are some really good videos on YouTube, but most have <1000 views, and that's nothing really, and farmers aren't finding them.'</i> (R4, Dorset AFG)

This is the first known study in a developed country that has explored where videos should be shown. Similarly to studies in developing countries, it was found that English farmers are keen on watching videos in a group setting, largely because they are a captive audience at group meetings and don't have to locate the video themselves (section 7.5.1). In addition to sharing video content across various social media platforms and by sending content in newsletters, many farmers and advisors believed that showing videos as part of a farm walk or event would increase the accessibility of videos (see sections 5.4.3, 7.5.1). This aligns with previous research which found that watching videos in a group setting encourages discussion and knowledge sharing (Karubanga *et al.*, 2016). Whether these discussions need facilitating by an expert (i.e., an advisor) likely

depends on the video content; Bentley *et al.* (2014) found that certain videos did not require an expert if the content 'speaks for itself'. The aforementioned studies on videos were, however, conducted in developing countries (Uganda and Benin respectively), where videos may have more novelty attached to them. This approach does, however, risk excluding farmers who do not attend events, thus having content available online remains essential (in particular since the onset of Covid-19). Recent farmer interviews by Short *et al.* (unpublished) found that 100% of interviewed farmers (n = 20) are enjoying webinars whilst the Covid-19 lockdown is in place; thus, video content delivered in this way may become increasingly relevant under current circumstances.

9.10.3. The credibility of video content for providing farmers with DWPA advice and information

The views of farmers and advisors relating to the credibility of video content for providing DWPA advice and information related primarily to their quality (see table 9.6). Both farmers and advisors suggested that videos will not be seen as credible where they are perceived as being of low quality (as defined below). This was unsurprising as studies in developing countries (e.g., Kenya: Van Mele, 2011) have already found that high-quality videos are likely to be seen as more credible, and thus more likely to result in farmer learning. The view that videos must be of high quality was also found by the PLAID project (2017), which recommended using an external headphone and appropriate filming equipment when producing agricultural videos.

High-quality video content, as defined by farmers and advisor participants from this study, consists of believable information which is presented by a (ideally well-known) farmer or expert with clear audio and visuals. 'Believable' information is interpreted as pertaining to credibility here, with farmers stating that videos should contain locally relevant demonstrations, examples of good practice, and farmer case studies.

Table 9.6. Quotes relating to the credibility of video content from each method.

Theme relating to credibility	Method	No. Quotes	Example quote(s)
Quality of video content	OQS	25	<p><i>'If the quality of info is good'.</i></p> <p><i>'They can be much more explanatory than an article, showing exactly how best to use a product, for example'.</i></p> <p><i>'Watching other people do things is good because you can see if it will work with your own system.'</i></p>
	FTIs	10	<i>'I think a good half-day of somebody telling you what to do properly is more useful, so I mean looking at a video we saw last week, it was very poor quality.'</i>
	ATIs	16	<i>'The devil is in the detail isn't it? It has to be pitched at the right level that farmers can appreciate and understand without it seeming too ...lay blame or antagonise them.'</i>
	AFGs	12	<p><i>'If you end up looking, but it's all fuzzy... you can't see a soil pit on a poor-quality video.'</i></p> <p><i>'If you had a well-presented video on something worth talking about, my problem with the NE ones is that they used the wrong pictures for the wrong topics, it was just like watching a PowerPoint.'</i></p>

As aforementioned, several farmer participants indicated that they already watch informative videos, indicating that as a mechanism seen as credible by many. Where videos are of high quality, it is, therefore, likely that videos can offer an effective advice delivery mechanism in conjunction with existing advice as many farmers have already begun using them for wider agricultural information and advice.

9.10.4. Relevance of video content

There are three key factors that appear to affect whether video content for providing DWPA advice was deemed as relevant to farmers: the length of the video, how applicable the content is to individual farms, and how practical the advice delivered during the video is (table 9.7). This aligns with several existing studies which recommend using clear, easily understandable language in videos (Dai *et al.*, 2009; Van Mele, 2011; van Campenhout *et al.*, 2017). Where presenters use jargon or overly complex language, this is likely to threaten both the relevance and legitimacy of video content.

Many participants indicated that videos must be relatively short to maximise engagement. These findings broadly align with existing research: Van Mele (2011) states that videos should last 5-15 minutes, whilst Thomas *et al.* (2018) produced a 6-minute informative video for farmers which was identified as being equally as effective as a 22-minute pre-recorded slideshow. Meanwhile, Bliss *et al.* (2019) found that a 20-minute video on weed control was perceived as too long. It was also mentioned by a couple of advisors that video 'series' could be produced for farmers who wish to receive further information or if a complex topic is being discussed.

A few advisors suggested that videos should be filmed locally if farmers are to perceive them as relevant (see section 7.5.4). This conflicts with existing research in developing countries (Van Mele, 2010; Van Mele *et al.*, 2010; Bentley & Van Mele, 2011), who posit that whilst video content should be regionally *relevant*, this does not necessarily mean they have to be filmed in a local context. Bentley & Van Mele (2011) found that farmers in Nigeria found videos filmed in Bangladesh and Mali credible as the content itself was still relevant to their practices. Besides, farmers in this study seemed more concerned with the information being relevant to their farms rather than necessarily being filmed locally.

Table 9.7. Quotes illustrating the themes relating to relevance when exploring the potential of videos for delivering DWPA advice.

Theme relating to relevance	Method	No. Quotes	Example quote
Length of videos	OQS	16	<i>'Short, snappy and a few words. Subtitles would draw farmers attention whereas long boring videos would make them not want to watch'</i>
	FTIs	13	<i>'The only problem is time... boredom factor, if it's not over in 3 minutes people have switched off, so it has to be short' - FTI #44, grazing livestock, 240 ha, North Yorkshire.</i>
	ATIs	14	<i>'I think short is very good because they've got enough on their plates already. (...) It's only one aspect of their business, so I don't think they want to spend too long... whilst a lot of them have got a lot of interest in it (...) others are less so you've got to make most of their attention span'. – ATI #2</i>
	AFGs	3	<i>'I think there's potential there to use videos more as a tool, erm, but not very long videos, short, concise...' – Dorset AFG, R4</i>
Local information	OQS	0	
	FTIs	1	<i>'If it's succinct and has relevance to what you're doing, but the official bodies that have offices a very long way away need to put their information into where it's actually relevant'</i>
	ATIs	3	<i>'The farmers I've engaged with have really valued local information, so I would probably disagree with mass videos on a national scale because I don't think they'd watch them or connect the water quality issues in their locality' (ATI #20)</i>
	AFGs	0	
Practical information	OQS	23	<i>'Hope it would be practical, targeted advice'</i>
	FTIs	9	<i>'They'd be good, but they would need to make sure that they're sort of a bit more solution-focused if you know what I mean'.</i>
	ATIs	16	<i>'They would be more engaged if it were something to help them farm better that included a subliminal message about water quality; if you start with water pollution they glaze over, but if you say no-till or something which is good for productivity and lowers chemical costs, then the video might work' (ATI #32)</i>
	AFGs	0	

9.10.5. Underlying structures and realities which may affect the efficacy of video content for providing DWPA advice and information

The underlying structures which are likely to affect the ability of video content to provide DWPA advice and information include a lack of trust in the entities posting the content and funding constraints which limit the ability of advisory entities to produce and disseminate high-quality videos. This indicates that these underlying structures (i.e., funding constraints) have undermined the ability of these entities to achieve legitimacy.

As posited by Cash & Belloy (2020), the 'post-truth' world is a stressor affecting the credibility, relevance, and legitimacy of the information. In addition, YouTube and other video platforms are saturated with information, some of which is misleading. This may prevent videos from becoming a reliable source of DWPA advice as farmers may find them inaccessible or lacking credibility if they do not trust the platform they have been shared on.

9.11. Farmers' and advisors' perceptions towards the concept of providing farmers with more 'hard' evidence surrounding the likely contributions of their practices to DWPA

This study explored how farmers and their advisors react to the concept of advisors disseminating more 'hard' evidence deriving from academics surrounding DWPA. This was an important line of enquiry for the 'CREALITY' of DWPA advice as many farmers placed blame on other sources of pollution throughout this study (with particular responsibility placed on STWs; see figure 9.11). Providing these farmers with evidence was, therefore, expected to increase the relevance of them seeking advice. Both farmers and advisors referred to scientifically derived information when discussing this topic, reiterating that they interpreted the term 'hard' evidence as referring to science.

Figure 9.11. Farmers' views surrounding whom they hold accountable for contributing the most significantly to DWPA (data from the OQS, FTIs and FFGs).

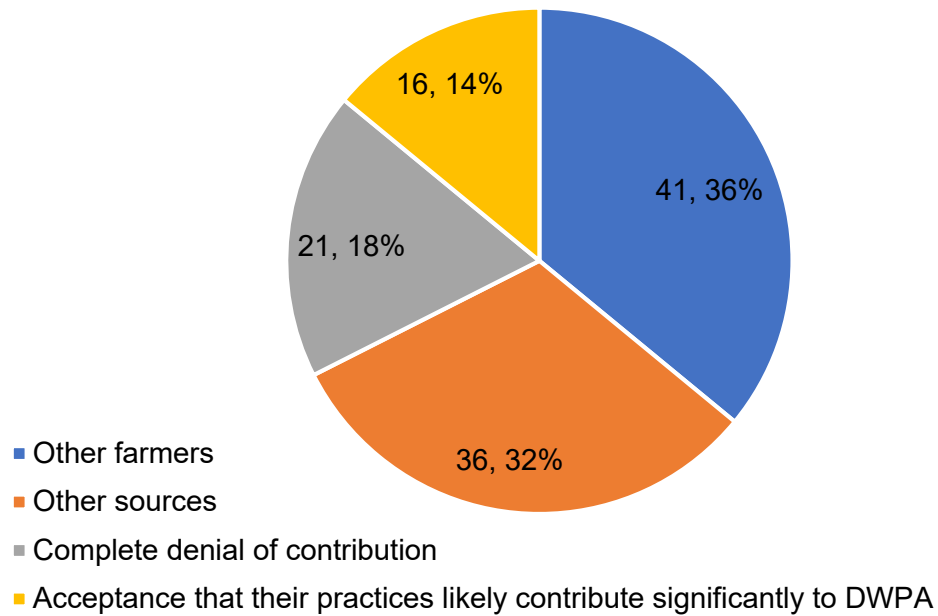
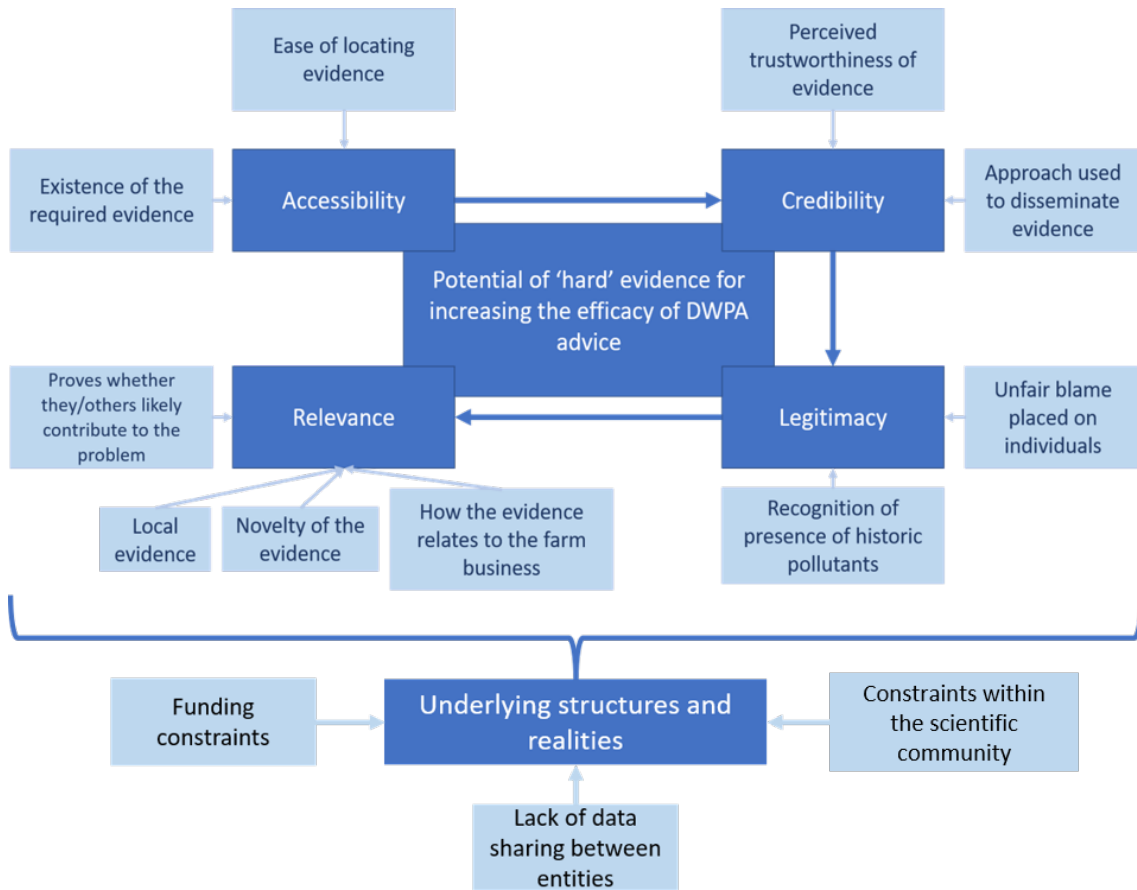


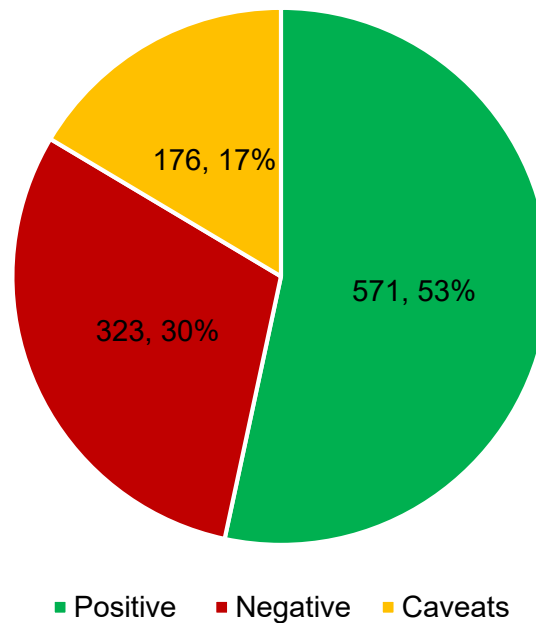
Figure 9.12 provides an overview of the narratives provided by farmers and advisors through the lens of CREALITY. Most of the sentiments shared by farmers and advisors related to credibility (102 references) and relevance (120 references), whilst accessibility (45 references) and legitimacy (28 references) were mentioned slightly less. Participants were not asked specifically about accessibility; however, it arose several times spontaneously.

Figure 9.12. A schematic diagram displaying the key narratives shared by farmers and advisors when discussing the extent to which the dissemination of ‘hard’ evidence surrounding the likely contributions of farming practices to DWPA is likely to be perceived as achieving the thresholds of CREALITY.



Most farmers responded positively to the idea of being shown more ‘hard’ evidence on the premise that certain caveats would be addressed (figure 9.13). Both farmers and advisors agreed that farmers should be shown evidence that their practices likely contribute to a problem before that problem becomes relevant to them. Advisors were also broadly receptive to this idea as long as the evidence itself is reliable and relevant to the farms they’re delivering advice to.

Figure 9.13. General sentiments surrounding the proposition of farmers being shown more hard evidence proving whether their practices likely contribute significantly to DWPA.



No participants gave wholly negative views surrounding the prospect of farmers being shown more hard evidence relating to whether their practices are likely making a significant contribution to DWPA. Farmers, in particular, shared few negative views when discussing this topic.

9.11.1. Legitimacy of hard evidence relating to the likelihood of farmers' practices resulting in DWPA

Several advisors claimed that they already use 'hard' evidence tools, primarily to identify areas or holdings which need their attention. This ability to identify key areas requiring advice appears to offer advisors a legitimate, fair way of determining which farmers to approach. Many advisors expressed that showing their clients this evidence is useful for persuading the farmers themselves that they need DWPA advice.

Both farmers and advisors agreed that 'hard' evidence surrounding the likely contributions of farmers' practices to DWPA needs to have been gathered impartially (section 5.4.2). In addition, findings should be disseminated fairly; if there were a lack of evidence that a farmer contributes, advisors should be honest about this.

9.11.2. The importance of accessibility for encouraging engagement with hard evidence surrounding the likely contributions of farmers' practices to DWPA

Several farmers and advisors lamented that it is often difficult to access hard evidence surrounding DWPA, with a total of 45 coded references gathered across all methods. Accessibility issues were experienced due to evidence being published in pay-walled journals or due to a lack of dissemination by agricultural researchers or other extension entities. The lack of dissemination of certain research is, in part, likely due to the fragmented AKIS in England which demands that entities maintain a competitive advantage. This may, in turn, discourage certain entities undertake research and gather information alongside delivering advice from sharing this knowledge with other advisory entities.

9.11.3. Credibility of hard evidence relating to the likelihood of farmers' practices resulting in DWPA

When farmers are shown evidence by advisors relating to the likely contributions of their practices to DWPA, credibility was expected to be a key component of CREALITY. This research identified two main factors which affect the credibility of 'hard' evidence surrounding DWPA:

1. The approach used when disseminating evidence (e.g., use of appropriate language) (58 references)
2. The extent to which the evidence itself is trusted (i.e., robust, believable) (44 references)

9.11.4. Disseminating hard evidence surrounding DWPA to maximise its credibility

This research finds that even where hard evidence is robust and believable in itself, it is unlikely to be perceived as credible by farmers if their advisors do not present it in an appropriate manner. The main caveat surrounding the potential of advisors presenting more 'hard' evidence surrounding the likely contributions of their practices to DWPA which arose consistently was the view that evidence must be presented using appropriate terminology by minimising the use of technical language and jargon. Several FTI (n = 9) and ATI (n = 8) participants alongside attendees within three of the four FFGs and in all three of the AFGs

referred to this theme. As described by one farmer, '*[It should be] put across in a very simple way. I don't want to be baffled by science; I want simple, clear advice.*' (FTI, #11, arable, 320ha, Wiltshire). As evidenced in the AFGs, this evidence must not, however, be presented in a patronising manner, with different farmers having different needs (see section 8.5.4). Several participants also argued that hard evidence should be presented in a visual way to maximise engagement (see sections 5.4.2, 8.5.4). The suggestion that presenting hard evidence should begin by sharing results before elaborating with methods and detail upon request is one way of meeting some of these needs (e.g., section 6.5.4).

Trust in hard evidence and scientific knowledge was an essential component of credibility which arose during this topic. 'Trust' in the context of hard evidence surrounding DWPA refers to how robust the evidence itself is, farmers, predetermined opinions of how trustworthy science is, how the data was collected, the level of scientific uncertainty, and whether the results are perceived as realistic.

Interestingly, FFG participants were not particularly concerned about the presence of scientific uncertainty and instead appear to recognise that uncertainty is inherent to scientific data (or 'hard' evidence). These farmers referred to the uncertainty they face in their own lives (e.g., weather, yield fluctuations), suggesting that where uncertainty is acknowledged and transparent, this may not have a profound impact on the credibility of this evidence (see appendix, section 9.10.4).

Several farmers and advisors were concerned by how reliable and accurate existing evidence surrounding DWPA is; in the case of farmers, this was typically due to them having their own views on the subject whilst with advisors it was often related mainly to the knowledge that the receptor-source-delivery pathway of DWPA pollutants is highly complex; thus it is challenging to gather robust evidence identifying the likely sources.

Both farmers and advisors largely agreed that farmers are likely believe and act upon hard evidence which indicates that they are causing a problem, as long as the proof is perceived as robust (sections 5.4.2, 7.3.3). Only a couple of advisors in the Devon AFG referred to confirmation bias when discussing the potential of

disseminating 'hard' evidence, stating that there is a risk of farmers only believing evidence that aligns with their prior beliefs.

Many advisors purported that they have previously shared 'hard' evidence with farmers, thus implying that these advisors themselves perceive this as a credible way of sharing information. They also reported having positive encounters when presenting this evidence, with many claiming that farmers engaged well.

9.11.5. Relevance of hard evidence relating to the likelihood of farmers' practices resulting in DWPA

The most common theme relating to the relevance of 'hard' evidence was the importance of it proving whether or not the practices of individual farmers, or others, contribute to DWPA. Where evidence can provide farmers with evidence that they contribute significantly, this can be expected to make advice following this dissemination more relevant, with farmers more likely to act on advice where they believe it directly relates to them.

Another critical theme which arose relating to the hard evidence topic was the importance of this 'hard' evidence being locally derived. Advisors, however, placed more emphasis on this than farmers. This implies that as with video content farmers may perceive non-local evidence as relevant where the location of the research was carried out is deemed as similar enough to be directly comparable.

The importance of local information was expected to be essential for encouraging farmers to perceive advice as relevant, in part because farmers' knowledge is closely linked to place (Wojcik *et al.*, 2019) and characterised by local, tacit knowledge. This local knowledge, may not, however, refer only to farmers' personal knowledge, but can also include experts' knowledge, including reliable scientific evidence ('hard' evidence) (Raymond *et al.*, 2010). The study in this thesis, however, found that whilst some advisors placed importance on this, most farmers did not refer to how locally derived hard evidence was and were more concerned about whether the findings applied to their practices rather than to their local area. This may, however, indicate that farmers are less aware of the differences in the delivery of pollution (e.g., drained or undrained land) to watercourses in local catchments than they are about topics such as soil health (where they place far more importance on locally derived information).

9.11.6. Underlying structures affecting the CREALITY of hard evidence

Both farmer and advisor participants expressed concern about how much (or rather little) hard evidence is being collected under current circumstances due to recognition that the scientific community is facing fiscal constraints. These concerns were expressed in 21 references across all methods. The fragmented nature of data sharing also led to advisors airing frustration that whilst some entities have access to useful water quality data (e.g., from water companies), others are unable to access the same information despite their remit being to help reduce DWPA contributions. This was particularly prominent in the NY AFG, where a group of advisors stated that CSFOs are unable to exchange data and information with the EA despite CSF being a government-led initiative.

In terms of gathering this hard evidence, a key caveat that appeared across multiple methods included the view that evidence must be robust, based on long-term monitoring, and should be locally derived. Conducting small-scale long-term water quality monitoring is, however, costly. Current financial constraints placed on research institutions and the Environment Agency are, therefore, likely to hinder this caveat from being fully addressed.

Some farmers felt that current research efforts are extractive (AFG chapter) which discourages them from allowing researchers onto their land in the future. This is, however, partially due to the structural constraints faced by academics who find themselves lacking the time and resources to disseminate their findings, whether to advisors or farmers. These constraints faced by academics were, however, recognised by several participants (12 references).

Contrary to concerns expressed by Cash *et al.* (2020), surrounding the emergence of 'post-truth' attitudes, only a single farmer in this study shared deep-rooted scepticism towards science (section 6.5.3). Further research is, however, needed to explore this further, particularly as Rust *et al.* (2020) recently found that many farmers and advisors (n = 82) continue to distrust academics due to a failure to recognise farmers' needs.

9.12. Acknowledging the limitations which arose during this study

The limitations of this study are provided here to allow the reader to consider them when reading the overall conclusions and policy recommendations in chapter 10. It is fair to say that most researchers, in hindsight, would identify things they would change about at least some of their studies. This is, of course, the case here; a doctoral thesis is a learning process whereby a final year researcher is (or should be) far more experienced than when they initially planned the study. Whilst these limitations are important to consider, none of them are, however, considered serious enough to undermine the findings of this MMR.

All research methods are prone to limitations. For example, the OQS lacked in-depth findings but provided a relatively large dataset of quantitative data. The FFGs and AFGs, meanwhile, offered in-depth qualitative context but consisted of fewer participants (see table 9.8). The FTIs and OQS were expected to offset the difficulties farmers face when discussing DWPA (see Thomas *et al.*, 2019), whilst focus groups consisting of relatively open questions were expected to encourage participants to help each other to articulate their views. The findings, when triangulated, were anticipated to reveal complex, nuanced narratives due to the heterogeneity of farmers, regional differences in advice delivery, and the multitude of factors affecting the willingness and ability of farmers to seek CSF advice (see chapter 5).

Table 9.8. Key limitations of each research method adopted during this MMR.

Limitation	OQS	FTIs	FFGs	ATIs	AFGs
Lack of quantitative breadth			X		X
Lack of qualitative detail	X				
Logistically challenging			X		X
Financially costly to undertake			X		X
Remote (i.e., lack of visual cues)	X	X		X	

The CSF evaluation report (2019) found that 14% of farmers in England have engaged with CSF, whilst 38.9% (n = 119 of 306) of farmer participants in this study have engaged in the past. This indicates a potential limitation of this study, with CSF-engaged farmers overrepresented; the potential issues relating to the

accessibility of the initiative may, therefore, be worse than this doctoral study suggests.

Despite gathering some clear initial narratives, the scoping nature of the OQS provided limited opportunity to gather detail unless farmers chose to do so in the qualitative answer boxes. Moreover, the OQS excluded farmers who are not active internet users. These limitations are, however, offset by conducting other research methods alongside the OQS. In addition, upon reflection, certain structural characteristics could have been posed differently to make them directly comparable with national Defra data instead of requiring a proxy; however, the proxy findings allowed relatively strong comparisons.

Whilst the data gathered during the OQS was suitable for multivariate analysis, a bivariate approach was used. Multivariate analysis examines several variables to determine whether one or more predict a particular outcome. These tests take dependencies between participant characteristics into account, whilst bivariate tests assume that these characteristics are independent of each other (Kendall, 1957). The decision to use bivariate testing at the time of analysis was largely due to the relatively small sample sizes gathered; at the time of analysis, the researcher believed that multiple regression analysis was unlikely to result in meaningful results. According to Bujang et al (2018), the minimum sample size for logistic regressions, a commonly used multivariate test, is 500, which is over double the sample size here ($n = 221$). However, since conducting the bivariate statistics here, the researcher recognises that other studies have found that smaller sample sizes are, in fact, sufficient for multivariate analysis (e.g., Forcino et al., 2015). This approach could, therefore, have been adopted for this study. However, the bivariate tests used here remain an acceptable approach to use and the resulting statistics continue to be useful.

A crucial learning process which occurred during this doctoral study related to the importance of carefully contemplating the wording used in interview protocols. In hindsight, for example, the researcher would, in future, use the term 'scientific' evidence rather than 'hard' evidence. Besides, the statements within the OQS surrounding 'hard' evidence should have reiterated that the survey was exploring whether advisors should disseminate these findings rather than scientists themselves; regardless, most respondents appeared to realise this as shown by their qualitative answers.

In addition, the detailed and often passionate statements given by the participants who spontaneously introduced sub-themes were essential to consider during this thesis as the emphasis used by these participants may suggest that these themes would have been significant if participants had been asked about these topics during the study. Future research should, therefore, aim to build upon the minor themes introduced in this thesis which were not explicitly asked about during the MMR protocols.

The FFGs may have been particularly prone to recruiting environmentally aware farmers, thus causing a risk that the researcher may exclude the views of less engaged farmers. Emphasis was, therefore, placed on occasions where farmer participants referred to how they perceived their peers as feeling, and the researcher used probing questions wherever possible to encourage participants to share negative views.

Lastly, in retrospect, the highly empirical approach taken for this study could have been simpler and potentially more effective. Whilst the focus groups provided exceptionally valuable insights into farmer and advisors' perceptions towards DWPA advice, the success of the telephone interviews varied. Whilst some telephone interviews lasted over an hour, others took just 10 minutes and thus did not contribute greatly to answering the research questions in section 1.6. If the study were to be repeated, the researcher would, therefore, have replaced the telephone interviews with further focus groups.

9.13. Conclusions

This chapter has triangulated the findings of this empirical MMR study through the lens of a newly constructed conceptual framework, CREALITY, which appears to frame the findings of this research successfully. Through discussing the results from each research method simultaneously, several key factors affecting the efficacy of DWPA advice delivery were identified. The potential of alternative delivery approaches, including video content and the dissemination of hard evidence, were explored, with the findings determining how to ensure these approaches are perceived as credible, relevant, legitimate, and accessible to farmers all whilst considering the underlying structures and realities which may impede these components from being reached. The following chapter concludes this highly empirical thesis by providing final policy recommendations and making suggestions for future research.

Chapter 10

Conclusions and policy recommendations

The overall research question addressed during this study was:

How effective do farmers and advisors believe DWPA advice (including that which is delivered by CSF) is for encouraging farmers to engage, and how could it be improved?

This final chapter demonstrates how the research objectives of this study (see section 1.6) have been met by summarising the findings before discussing their implications. An overview of the broader applicability of the new conceptual framework developed during this study, CREALITY (section 9.1), is provided to demonstrate the broader contribution of this study to rural social science. Lastly, policy recommendations are made and several avenues for future research are identified.

The objectives of this study (section 1.6) were achieved by adopting MMR consisting of an OQS of farmers (chapter 4), FTIs (chapter 5), FFGs (chapter 6), ATIs (chapter 7), and AFGs (chapter 8) to gather the views of both farmer and farm advisor participants. The triangulated findings of these methods through the lens of a new conceptual framing, CREALITY, enabled the identification of clear narratives that contribute to answering this study's research objectives (chapter 9).

As readers of this thesis may have already observed, the approach taken by the researcher developed throughout the project, largely due to the journey undertaken whilst transitioning to a new discipline. The researcher came from a natural science background and has, over the course of this project, transitioned towards becoming a social scientist. As such, the researchers' inclination at the start of this project, through the eyes of a natural scientist, was to use a deductive approach to answer the research objectives. As the project progressed, however, the approach became increasingly inductive as the researcher realised how new themes and lines of enquiry can arise whilst gathering qualitative data. This then led to the realisation that the chosen conceptual framework, CRELE, which was

identified deductively at the start of the project, needed to be iterated to ensure that the findings of the project were fully explained.

This study has successfully delivered insights into how effective CSF and other DWPA advice in England is and identified ways of improving its delivery. The potential approaches for increasing the efficacy of DWPA advice which were explored included the potential of placing more emphasis on disseminating 'hard' evidence to farmers surrounding the likely significance of the contributions of their practices to water quality problems, and whether providing DWPA advice and information through video content may offer a useful delivery format in conjunction with existing approaches.

This thesis has added significant knowledge surrounding the efficacy of DWPA advice alongside contributing wider debates surrounding agricultural extension by gathering extensive empirical data to gather the views of farmers and advisors. While previous studies relating to DWPA advice have explored farmer behaviour in an environmental context (Thomas, 2020) and the factors which affect whether farmers engage (Fish, 2012) or uptake measures (Vrain, 2015), there was a scarcity of research surrounding what both farmers and advisors think about DWPA advice delivery itself (aside from the annual CSF evaluation reports based on arguably subjective audits carried out by CSFOs alongside qualitatively limited postal surveys; see CSF, 2019).

The overarching findings and policy recommendations which follow are relevant at a national and European scale. Agricultural policy in England is about to undergo the largest shift since after WWII due to the onset of Brexit. Advice will be key to ensuring farmers adapt to this shift, and the support scheme which will replace those operating under the EU's Common Agricultural Policy (namely BPS, ELS, HLS), the Environmental Land Management scheme, will need to be supported by advice delivery, including from CSF (Defra, 2020). Changes are already afoot in relation to DWPA advice; since writing this thesis, Defra have announced that CSF funding will increase by £16.6m a year so that its delivery can cover the entirety of England's farmland (Defra, 2021). This decision aligns with the finding within this research that the boundaries within which CSF delivery operated within were threatening its accessibility, credibility, and relevance.

At a wider scale, European policymakers can reflect on these findings when considering how future advisory services may support the delivery of environmental benefits. Advice is a key instrument used across Europe and many of the findings of this study are likely relevant in other geographical contexts, particularly as the agricultural advisory systems of several other European countries share characteristics with the English system (see Laurent et al., 2006; Ingram & Mills, 2018). Common Agricultural Policy (CAP) is currently undergoing a reform to ensure it contributes to achieving the objectives of the European Green Deal and the Farm to Fork strategy (European Commission, 2021b,c,d). As a result, the new CAP, which will launch in 2023 is expected to be more environmentally ambitious than the current programme (see European Commission, 2021e). This will likely mean that EU countries, when developing their national CAP strategic plans, will consider ways of ensuring that advice delivery helps farmers to comply with CAP legislation. The findings of this research, though based in England, may provide lessons on how to ensure that this advice reaches the CREALITY thresholds and is thus engaged with by farmers.

10.1. A summary of the key findings of this research

The first contribution made by this thesis is methodological (chapter 3). Both advisors and farmers were interviewed as part of a multi-MMR, resulting in detailed views from both of the key actors in the context of DWPA advice. This study reiterates the argument for carrying out several methods for a single project due to its ability to gather varying levels of qualitative depth and quantitative detail. This study provides evidence that similar approaches should be used for future research which includes multiple key stakeholders and complex debates.

The second contribution of this study is the empirical data itself, an overview of which will be provided during this chapter. Whilst some of this data builds upon and reiterates existing knowledge (e.g., from CSF, 2019), several narratives and complexities are introduced or built upon. The richness of the data presented here makes a strong contribution to knowledge as the highly empirical approach used has led to the collection of large amounts of qualitative data which can continue to be unpicked going forward.

A third contribution is the development of a novel conceptual framework based on findings of this highly empirical multi-MMR. Upon analysing the findings of this study, this new conceptual framework based upon CRELE (chapter 2) became necessary for building a full understanding the empirical findings. The resulting framework, 'CREALITY', incorporates the components of CRELE (credibility, relevance and legitimacy) and adds 'accessibility' as an additional component, alongside 'underlying structures and realities'. This framework was then used to explore the triangulated findings of this study (chapter 9).

10.1.1. Farmers' and advisors' perceptions of DWPA advice

Through the lens of CREALITY, the key findings of this study relating to DWPA advice in general are:

Legitimacy: This study identifies three overarching factors which appear to affect the legitimacy of DWPA advice: firstly, whether the advice is seen as meeting the needs of a heterogeneous farming population (e.g., through providing locally relevant information and recommending flexible measures), secondly, that engagement with DWPA advice is unbiased with information not only derived from environment-centric entities (section 9.3.1), and finally, whether advisors recognise the contributions made by alternative sources of water quality problems (e.g., sewage outfalls).

Accessibility: This study agrees with Sutherland *et al.* (2013), who posited that fragmented AKIS' are likely to result in '*duplication, gaps in provision, information overload, confusion, and contradiction*', in particular where these advisors are attempting to achieve different goals. The fragmented AKIS is restricting the ability of DWPA advice to be equitably distributed to all of the farmers who contribute to water quality problems. Besides, certain sources of advice and information (e.g., online, videos) are currently difficult for farmers to locate due to the information-overloaded internet. The accessibility of DWPA advice appears to vary regionally (section 9.3.2) with the fragmented advisory system in England, preventing advice from reaching the 'accessibility' threshold.

Credibility: Achieving credibility, according to this study, is constituted by good quality, trusted advice from longstanding advisors (see section 9.3.3). Most ATI

participants stated that they are able, at least to an extent, to revisit farm holdings, thus increasing farmers' trust in advice (section 7.2.3). This did, however, vary between entities, primarily due to resource constraints. The credibility of DWPA advice is also affected by whether engaging with advice is likely to have an impact on water quality.

Relevance: Whether DWPA advice is perceived as relevant consists of several factors. These factors include whether farmers believe they contribute significantly to the problem, the potential benefits of engaging, the ability of a farmer to engage, the perceived local relevance of the advice and information, the risks associated with engaging, whether uptake is likely to result in water quality improvements, and how flexible the recommended measures are (section 9.3.4). The importance of grant funding and advice was a key finding within the other methods within this thesis (chapters 4-6), with both farmers and advisors recognising the increased relevance given to advice where it can result in grant funding beneficial to farmers.

Underlying structures and realities: Several underlying structures and realities arose which make the likelihood of DWPA advice reaching the other thresholds of CREALITY less likely. The other realities threatening the success of DWPA advice itself include resource constraints, a perception of excessive bureaucracy (for both farmers and advisors), and a perceived lack of enforcement and inspections associated with water quality regulations (section 9.3.5).

The fragmented DWPA advisory system in England is an underlying reality affecting the efficacy of advice delivery by lessening the ability of DWPA advice to reach the credibility, relevance, and accessibility thresholds. For example, several farmers stated that they don't know whom to approach within their catchments; this may begin as a simple accessibility issue but over time may threaten the credibility and relevance of advice too. Several FTI and AFG participants referred to this as an issue, with some farmers within both methods arguing that there should be a more centralised approach to DWPA advice (section 5.3.4, 8.4.1).

10.1.2. Farmers' and advisors' views towards CSF

When FTI participants were asked whom they engage with for DWPA advice, CSF was the main source, followed by water companies, agronomists, and FWAG. According to the OQS (chapter 4), dairy and mixed farmers are the most likely to have engaged with CSF (see section 4.3.1), with arable and grazing livestock most unlikely. Meanwhile, the FTIs found that mixed farmers alongside grazing livestock farmers were the least likely to have engaged with the initiative (section 5.2.1). Whilst dairy farmers often contribute significantly to DWPA, arable and intensive grazing livestock farmers can also contribute in a significant way; it may, therefore, be necessary for CSF to consider increasing their efforts in approaching these farmers alongside their existing clients. When all farmer-based methods were combined, several characteristics were significantly associated with whether they had engaged with CSF in the past, including dominant farming enterprise, region, and business performance (section 9.3.2).

ATI participants quantitatively shared the most positive views towards CSF (section 7.2.1), with no participants disagreeing that the initiative is successful. CSFOs shared the most positive thoughts surrounding the initiative. The positive sentiments surrounding CSF shared by ATI and AFG participants related to it being of high quality (whereby the CSFO is longstanding, trusted, and provides informative, practical information), the availability of funding and grant advice, the perceived impact of CSF, and how the initiative is structured. AFG participants emphasized the success of the face-to-face interactions offered by CSFOs (section 8.3.1). Some ATI participants did, however, reveal that the quality of CSFOs varies in certain areas. Positive sentiments shared by OQS participants, however, were generally broad and gave little insight.

The main positive sentiments gathered during the FTIs and FFGs related to the quality of advice, the availability of grant funding, and the presence of trusted CSFOs (section 5.2.2). According to farmer participants, 'Good quality' advice provided by CSF according to farmers consists of useful events and educational information which is impartial. Some FFG participants also stated that high-quality CSFOs are, ideally, from an agricultural background. Again, most farmers who referred positively towards CSF made generalised comments. 'Trusted' CSFOs,

according to FTI participants, are long-term in their catchments and provide impartial advice.

Once participants shared their qualitative thoughts, however, several threats to the CREALITY components emerged. For example, AFG participants spent most discussions surrounding CSF sharing negative sentiments (section 8.3). These negative sentiments referred to the structure of the initiative, the perceived (lack of) impact on water quality, and the varying quality of CSF advice (section 8.3.2). The issues relating to the structure of the initiative related to resource constraints, boundary issues, a concern that CSF is inflexible and unable to fulfil its growing remit (i.e., through air quality being added to the agenda), perceived risk of the initiative become commercialised, and issues with how specialised advice is procured to CSF.

The following section explores whether CSF appears to reach the thresholds of each CREALITY component:

Legitimacy: On the whole, it appears that the 'legitimacy' component of CREALITY is broadly met by CSF, with most farmers and advisors exhibiting little concern surrounding whether the advice given by CSFOs derives from a fair background.

Accessibility: The main factor limiting the accessibility of CSF was how the boundaries it operates within are allocated; participants within all methods across this study stated that these allocations lead to frustration. Most CSFOs said that they can revisit at least some of their farmer clients (section 7.2.3), with many of these officers recognising the importance of doing so. This is likely to help the initiative to reach the credibility and accessibility thresholds.

Relevance: The lack of recognition by farmers that their practices likely contribute significantly to DWPA reduces the relevance of CSF. In addition, the view that CSF has not resulted in tangible water quality benefits is also likely to have prevented the initiative from reaching the relevance threshold.

Credibility: Just half of OQS participants agreed that CSF is a successful initiative indicating that there is room for improvement (section 4.3.2). Farmers who had previously engaged with CSF were, however, more likely to agree, indicating that the credibility of the initiative is increased with familiarity. Of the qualitative answers provided by OQS respondents, most were negative, with answers relating to the quality of advice in terms of the experience and longevity of CSFOs and the limited distribution of CSFOs which led to a perception of unfairness. These sentiments were built upon in the FTIs, with several more farmers referring to the quality of CSF advice, with a few participants arguing that CSFOs provide 'obvious' advice or lack experience. This appears to vary between advisory entities and advisors; for example, some CSFOs are well-trusted whilst short term officers are not.

In addition, several participants exhibited scepticism towards CSF due to a perceived lack of impact. FTI participants continued to build upon structural issues with the initiative, including the boundaries within which CSF operate alongside a perception of excessive bureaucratic loadings and a high turnover of CSFOs. FFG participants shared similar views to the OQS and FTI participants, with their negative opinions mainly surrounding how the initiative is structured rather than its advice delivery (section 6.3.2).

Underlying structures and realities: Echoing some farmer participants, several ATI and AFG participants recognised that there are structural issues with the initiative, resulting in a high turnover of CSFOs and 'unfairly allocated' boundaries. Firstly, the boundaries within which CSF operates within is governed by the wider government (under CS); the current allocations are placing clear threats on accessibility and legitimacy of the initiative. Secondly, ATI participants were concerned about aspects of the CS water quality grant, primarily due to the associated bureaucratic loadings. Thirdly, some ATI participants argued that CSF is unable to reach unengaged farmers, and is perhaps targeting the 'low hanging fruit'.

9.1.3. Does DWPA advice meet the thresholds of CREALITY?

As illustrated in this chapter and chapter 9, farmers and advisors appear to share broadly similar conceptions of what makes DWPA advice credible, relevant, legitimate, and accessible and towards which underlying structures and realities are likely affecting these components. The only area where advisors shared slightly different conceptions of 'relevance' occurred when discussing the potential of hard evidence and video content for delivering DWPA advice and information, with advisors placing more importance on this information being locally derived than farmers themselves did.

Most FTI participants who have engaged with DWPA advice in the last three years said they found it at least 'somewhat' useful. No participants, however, said they found it 'extremely' useful, indicating that the CREALITY thresholds may not be entirely met. Most views surrounding DWPA advice shared by FFG participants were negative. The positive sentiments which were shared by FFG participants related to specific advisors whom they had found credible due to having an agricultural background, making on-farm visits, being long-term, and providing simple, trusted advice.

Several barriers were identified during the OQS that limit the ability of farmers to engage with DWPA advice. The main factor identified was financial constraints, whilst time constraints also appeared as a minor sentiment (see section 4.3.1). An additional barrier, age, was identified during the FTIs (section 5.3), with these farmers stating that they felt like they were 'too old' to make changes, thus saw little need to engage with advice. In addition, some farmers said they were suffering from information overload (section 5.3.2). Alongside contributing to the barriers mentioned above, the FFGs introduced farm size, internet connectivity, and stress levels as factors affecting whether farmers can or will engage with DWPA advice (section 6.2.2). Despite these threats to relevance, most OQS participants have previously engaged with at least one source of DWPA advice (section 4.3.1), indicating that most farmers may be at least somewhat engaged with the challenge.

The research presented throughout this thesis suggests that whilst DWPA advice is maintaining efficacy to an extent, there are several ways in which it is failing to fully reach the CREALITY thresholds, whereby farmers will be more inclined to engage with advice. In general, DWPA advice appears to broadly achieve the thresholds of CREALITY in terms of farmers and advisors responding positively to initial questions about whether they find it useful. Once probed, however, both farmers and advisors shared predominantly negative comments highlighting that there remain ways in which DWPA advice could be improved.

10.2. Videos as an additional source of DWPA advice

Three-quarters of OQS respondents claimed to watch informative farming videos already. This was, however, expected to be an overrepresentation due to all OQS respondents clearly being active internet users. Most FTI participants also claimed to use the internet for DWPA advice and information, although they did express concerns surrounding the accessibility of relevant information online.

According to the OQS, whether farmers will watch video content appears to be affected by age, gender, current business performance, and economic prospects. Reasons for wanting to watch videos given by OQS respondents included a personal preference for visual materials, convenience, and the ability of videos to provide practical demonstrations (section 4.4.3). Half of the FTI participants shared explicitly positive sentiments on this topic, expressing a preference for videos over other methods (section 5.4.3). ATI participants were relatively neutral about the potential of video content for delivering DWPA advice, with most stating that whilst some farmers will engage well with this format, others would not (section 7.5). Over half of ATI participants did, however, provide positive sentiments towards video content for advice (section 7.5.1), primarily due to them being seen as a useful source of information.

Participants within all methods shared several caveats which affect the perceived CREALITY of these videos. These caveats related to the content of the videos, the length of videos, how they would be accessed, and the quality of the videos (i.e., whether the presenter is credible, how good quality the filming/editing itself is). Based on these findings, a toolkit has been developed to provide practical

guidance on how videos providing DWPA information and advice should be produced and disseminated (figure 10.1).

Caveats shared by participants across the methods related mainly to their content, with farmers stating that informative DWPA videos should be short, specific, and high quality. AFG participants placed particular emphasis on ensuring that the content is relevant and presented by a credible presenter (section 8.6.1) alongside being easy to locate and access (section 8.6.1). ATI participants shared their views on how video content should be created, with several arguing that videos should be short, be relevant to the farm business, communicate at an appropriate level by a good communicator, and contain local information (section 7.5.4).

OQS farmers who responded negatively to the prospect of video content for providing DWPA advice said it was due to personal preferences and distrust in video content. Age and time constraints were also mentioned by FTI and ATI participants alongside personal preferences. In addition, several ATI participants argued that many farmers might not possess the necessary IT skills or internet access to access these videos (section 7.5.2).

Figure 10.1. Toolkit on how to produce advisory videos which are likely to reach the CREALITY thresholds based on the findings of this research.



10.3. The potential of using more 'hard' evidence for improving DWPA advice

No participants within this study gave wholly negative views towards the prospect of showing/being shown more hard evidence relating to whether a farmers' practices are likely making a significant contribution to DWPA.

Most farmer and advisor participants agreed that farmers would like to be shown more 'hard' evidence surrounding whether their farming practices likely make a significant contribution to DWPA, regardless of their characteristics (section 4.4.2; 5.4.2; 6.5.1; 7.3; 8.5.2). Most ATI participants agreed with the statement without elaborating. The few advisors who did elaborate stated that they would like to use this evidence to show farmers whether they are likely making a significant contribution, echoing the views of the OQS, FTI, FFG, and AFG participants. Besides, some ATI participants contended that this evidence might lead to further engagement with advice and practice change, and some AFG participants shared stories about their successes when sharing this evidence with their farmer clients. Only a few negative sentiments were shared during the AFGs, most of which came from a single participant (section 8.5.5). Some ATI

participants did, however, state that they already have enough 'hard' evidence available to present to farmers (section 7.3.4), whilst others were concerned about the costs involved in obtaining such evidence.

The FTIs revealed reasons why farmers are interested in being shown evidence, including to prove that other sources contribute to the problem in conjunction with farming, to prove that other farmers contribute to DWPA, or to prove that their practices likely make a significant contribution to the problem. Farmers within all four FFGs agreed that they would like to be shown this evidence, again, primarily to determine whether their practices likely contribute to water quality problems. Devon FFG participants were exceptionally positive, with some participants suggesting that this evidence may make them more likely to act (e.g., by seeking further advice or by changing practices).

Several caveats were, however, revealed during the FTIs and FFGs (section 5.4.2, 6.5.2) surrounding the dissemination of hard evidence which indicates whether farmers' practices contribute to DWPA. FTI and FFG participants argued that this evidence should not be used to make farmers feel persecuted, that the evidence should be explained in a way which makes it relevant to their businesses, and the view that the evidence should be robust, balanced, and unbiased. (the main arguments). FFG participants shared additional caveats, including the belief that evidence should be shared alongside solutions to enable them to reduce their contributions. In addition, it was argued that effort should be made to elicit trust in science and that evidence should consider the heterogeneity of farming.

Similarly to farmer participants, advisor participants shared a few caveats surrounding 'hard' evidence. A caveat which hadn't previously arisen when interviewing farmers arose in the ATIs and AFGs, with some participants stating that evidence should be locally derived wherever possible (section 8.5.4). AFG participants also noted that evidence should be derived from long-term monitoring and must be robust. There was also great concern surrounding how accessible this evidence is to advisors, with several stating that they struggle to access certain information and data from research. Regional differences

occurred within the AFGs, with Devon AFG participants most likely to provide strong caveats and some negative sentiments.

Presenting 'hard' evidence

Farmer and advisor participants shared their views about how this evidence should be presented within the FTIs, FFGs, ATIs, and AFGs. In combination, the findings indicate that appropriate, clear language must be used and that the evidence should be presented in a clear, inclusive, concise and visual way (section 5.4.2, 6.5.4, 7.3.3, 8.5.4). AFG participants also reiterated the importance of ensuring the approach used when sharing evidence is not patronising towards farmers.

10.4. The applicability of CREALITY for wider research

Despite being developed as a result of the empirical findings of this study, CREALITY was not designed simply as a way of framing this study. In fact, CREALITY has potential to be used as a lens for future studies exploring and improving the efficacy of boundary-spanning interfaces between various stakeholders. It can likely be used in the same contexts as CRELE, for example, within the science-policy interface. Also, CREALITY could be used in future efforts to evaluate the efficacy of advisory efforts or to explore reasons why stakeholders are or are not compliant with regulations. Future research should, therefore, test its applicability in various contexts.

10.5. Policy recommendations based on this research

A key aim of this thesis was to guide and inform policy surrounding DWPA advice to make it more able to contribute to water quality improvements. The finding that policies which indirectly affect advice delivery impact the perceived credibility, relevance, legitimacy and accessibility of DWPA advice makes this research able to make recommendations surrounding both advice delivery itself and broader policies relating to water quality.

10.5.1. Policy recommendations for improving DWPA advice according to CREALITY

- This research, upon the suggestion by several advisors and farmers, proposes that a centralised hub consisting of high-quality evidence and links to respective advisory entities should be developed for both farmers and advisors to utilise. This finding could be helpful to policymakers developing ELM alongside those planning the future of CSF.
- Produce high-quality video content which is widely disseminated and easily accessible (including at farm events) to provide farmers who find this approach accessible and relevant to their needs. This may be of particular importance under current circumstances (i.e., the onset of Covid-19).
- More 'hard' evidence should be made available to both farmers and advisors and should be disseminated by advisors in an accessible manner to their clients. Farmers are likely to be expected to deliver more environmental goods once ELM is introduced, thus making it particularly important that they are shown why they are being asked to do so.
- Separate advisory entities should make further attempts to collaborate to avoid duplicating efforts and to share more data. This will be of particular importance in coming years as farmers' advice needs are likely to increase after the ELM scheme is introduced.

Recommendations for improving the CSF initiative

- The finding that many farmers and advisors saw CSF as broadly useful despite several barriers and threats to CREALITY affecting whether farmers engage with CSF (see chapters 4-9) indicates that ensuring that the initiative continues to receive long-term funding is paramount, particularly if some of these barriers and constraints are addressed. This recommendation was also made by Vrain (2015), indicating that there is strong evidence for continuing the initiative once agricultural policy in England changes upon leaving the EU. Garforth *et al.* (2003b) also argued that advice should continue to be free to farmers where it contributes to policy objectives.

- There was substantial evidence throughout this thesis that the current boundaries within which CSF operates are limiting its accessibility and legitimacy, with excluded farmers feeling frustrated. This study, therefore, recommends that the CS high priority water quality areas are either removed to enable CSF to operate on a national scale, or reallocated to cover more of England.
- As recommended by Vrain (2015), all CSFOs should be given permanent contracts to reduce the rate of officer turnover in some regions. This will significantly increase the credibility of the initiative.
- Ensure advisors from across England are consistently able to dedicate enough time revisiting farmers to build rapport, foster farmer learning, and to check whether their advice has been taken up (see chapter 6). CSFOs should, however, also be encouraged to engage with unengaged farmers and should be allowed to use their initiative to determine which farms need revisiting.
- Continue delivering 1:1 advice and farm events but ensure alternative approaches are available in conjunction, including video content
- Translate and disseminate more 'hard' evidence surrounding the likely contributions of farmers' practices to DWPA when attempting to convey the importance of them taking up advice

Recommendations for improving the underlying structures and realities which have implications on perceptions of DWPA advice

This empirical study provides evidence that there is a link between the perceived efficacy of CSF and underlying structures and realities. It was found that the efficacy of CSF advice delivery is likely impacted by the extent to which the Environment Agency and other governmental bodies (including Defra and the RPA) are fulfilling their respective (as regulators of water quality policy and as sources of financial support). Despite the CSF initiative and the Environment Agency being distinct entities with different remits, both farmers and advisors appear to associate the (largely resource-related) struggles faced by the Environment Agency with the credibility of CSF delivery. Further research is required to explore this further as this emergent narrative as participants were not asked direct questions about this topic during this study.

Both farmers and advisors gave strong views surrounding a perceived lack of enforcement surrounding water quality regulations. This arose spontaneously during the FFGs, indicating that farmers view this problem as connected to the credibility and relevance of DWPA advice, as where rules are not enforced, the relevance of engaging with advice appears to be reduced. This lack of enforcement has clear consequences according to farmers and advisors, resulting in a lack of compliance and a view by more environmental farmers that polluting farmers are 'getting away with it'. The Environment Agency, in response to a report by The Times in October 2020, have even recognised their inability to enforce regulations and prevent DWPA, citing the loss of over half their funding since 2010 as a reason for this failure (The Times, 2020).

This study finds that the Environment Agency is perceived as severely underfunded by both farmers and advisors, thus leading to a loss of credibility. The view that the agency has suffered from funding cuts in recent years appears to be true to an extent; the Environment Agency been subjected to cuts in their water quality monitoring remit (Unearthed, 2019) and staffing numbers have decreased from 13,114 in 2006-2007 (Environment Agency, 2008) to 10,229 in 2018-19 (Environment Agency, 2019c). A key recommendation made by this study is that existing regulations need to be better run if they are to result in any water quality improvements. The 'new farming rules for water', introduced in April 2018 was the first national UK policy focused on water alone. This study found that many farmers appear unaware of existing policy surrounding DWPA and that many farmers and advisors perceive them as being unenforced, with little inspection capacity.

10.6. Future research opportunities

This study offers several avenues for future research. Firstly, future research should further test the applicability of the CREALITY framework developed during this study both within the context of agricultural extension and when exploring the efficacy of other interfaces (e.g., the science-policy interface which CRELE, upon which CREALITY is based, was originally developed for).

The preliminary finding that farmer and advisor perceptions towards DWPA advice is affected not only by the delivery of advice itself but also by other

underlying structures and realities (e.g., the implementation of water quality regulations) leads to the need for further research in this area. Questions were not explicitly designed to explore this emerging narrative; thus a future study should explore this in great detail to determine the extent to which these underlying structures and realities limit the ability of DWPA advice itself to achieve the credibility, relevance, legitimacy and accessibility thresholds.

There remains a need to monitor and evaluate the water quality improvements resulting from DWPA advice. It is, however, unlikely that accurate findings can be ascertained by exploring the impact of individual efforts (e.g., by CSF alone) as there are typically several entities operating within each many English catchments.

Agricultural policy in England will change dramatically within the next few years due to the onset of Brexit; it is, therefore, important that future research attempts to explore the impacts of these changes on the efficacy of DWPA advice according to farmers. This transition period may result in a higher demand for advice, thus exacerbating the existing resource constraints identified during this project.

This study found that farmers perceive video content which provides DWPA advice and information credible and relevant as long as they are of high quality and easily accessible. Since completing this research, Covid-19 has emerged. This has resulted in much DWPA advice moving online, with farmers attending virtual farm walks. Research should, therefore, be carried out to explore whether this has led to a surge in how many videos farmers watch when seeking advice and whether they are likely to continue using this mechanism once the world recovers from the pandemic.

Future studies should use a practical approach to determine how farmers respond to 'hard' evidence surrounding whether their practices likely contribute to DWPA. Detailed research into how farmers react to scientific uncertainty is crucial for this as it is inherent to science. If farmers do not perceive this evidence as credible, it may be unlikely to offer a mechanism for encouraging them to engage with advice. This could be tested by translating and disseminating recent catchment-level monitoring or source attribution data (e.g., sediment fingerprinting) to farmers to explore how they respond to this evidence and

whether it results in an increased likelihood that they (re)engage with DWPA advice in the future.

10.7. Dissemination plans

The author of this study will ensure that the findings of this study are disseminated both to farmer and advisor participants alongside policymakers. This will prevent participants from feeling that the study was extractive and may prevent them from disengaging with future research.

As stated in chapters 4-8, farmer and advisors who participated in this study were given an opportunity to sign up to receive project outputs. These outputs will consist of short, accessible summaries consisting of the key findings of the study alongside their implications. Participants will also be sent a link to this thesis in case they require further detail.

In terms of policymakers, the Environment Agency who part-funded this research will be sent a copy of the thesis. In addition, a final meeting has been agreed upon to allow the researcher to present the findings of the work. The author of this study has already been invited to join a Defra-led Community of Practice on the future of advice and will have the opportunity to relay some of the findings of this study during these meetings. Any peer-reviewed publications resulting from this study will also be disseminated widely through social media and by writing short summaries of their findings.

10.8. Concluding remarks

This thesis has contributed new knowledge to the area of agricultural extension research by examining the *current* efficacy of DWPA advice with a focus on the CSF initiative according to both farmers and advisors. Despite commentators arguing that enhancing the capacity of advisory services could significantly increase farm incomes, thus providing a boost to the agricultural sector (Cawley *et al.*, 2018), fiscal consolidation may continue in coming years, resulting in further reductions in government funding for publicly delivered advice and enforcement (Russel & Benson, 2014). Under these under-resourced

circumstances, advice may struggle to adjust to these current circumstances unless mechanisms are adopted to increase cost-effectiveness whilst modernising and consolidating its delivery. This study, based on extensive empirical research, argues that the government must prioritise ensuring that CSF continues and that the Environment Agency receives enough funding to fulfil its remit of enforcing water quality regulations. Without the support of a functioning Environment Agency, this research posits that CSF itself is unlikely to reach the CREALITY thresholds.

In addition, this research suggests that if DWPA advice delivery is to reach the accessibility threshold of CREALITY, advice should be available both online and through video content alongside via more traditional means such as 1:1 farm visits and farmer events and walks. Secondly, the framework used to frame this finding, CREALITY (see chapter 9), makes a novel contribution to broader agricultural extension research by providing a new way to explore the likely efficacy of DWPA advice (using CREALITY, see chapter 9). Lastly, this research discovers that farmers' and advisors' perceptions of DWPA advice are not just affected by its delivery alone but also by underlying structures and realities, including the efficacy of regulation and policy.

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