

## PRE-PRINT

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# **The Roles of Farm Advisors in the Uptake of Measures for the Mitigation of Diffuse Water Pollution**

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## **Abstract**

Governments face increasing pressure to implement effective policy to reduce diffuse water pollution from agriculture (DWPA). Various strategies and combinations of policy mechanisms have been adopted by different countries to change farmer behaviours with varying degrees of success. This paper focuses on the use of advice delivery to farmers as a mechanism to encourage uptake of DWPA mitigation measures on farms in England.

Farm advisory services in England have dramatically changed over recent years, with concerns that the sector has become fragmented due to many organisations and businesses offering advice. This paper studies the role of various farm advisors and organisations providing one-to-one advice by interviewing 81 farm advisors in three agriculturally contrasting regions of England: East Anglia, the North West and South West. Objectives were to assess: which DWPA mitigation measures are being recommended by different advisors? How do recommendations differ between sources of advice and is there any conflict? And which mechanisms do advisors use to influence uptake of advice?

Results from the interviews indicate that the advice delivered and the mechanisms used to influence uptake of advice vary between organisations and some advisors do indeed have particular roles within the farm advisory sector. Policy makers therefore need to consider not only what mitigation measures should be encouraged, but also which organisations and advisors are best placed to deliver on the ground advice to farmers. There is also scope to incorporate understandings of farm advice provision into catchment management plans to aid effectiveness of future agri-environmental policy.

## **Keywords**

Diffuse agricultural water pollution; mitigation measures; farm advice; policy mechanisms



# 1. Introduction

The European Union's Water Framework Directive (WFD) requires member states to achieve 'good ecological and chemical status' in all surface waters over a cycle of programmes of measures. Although legislation has been effective at reducing point source pollution from industrial activity (OECD, 2012), less success has been achieved regarding diffuse pollution, with agriculture being a large contributor of nitrate and phosphate in many member states (OECD, 2008, 2012; NAO, 2010).

A wide variety of mitigation measures exist which farmers can implement to reduce water pollution from agriculture (Newell-Price et al., 2011). Some measures are already accepted as standard farm practice and widely adopted (e.g. not spreading manure or slurry to fields at high risk times) whilst others are implemented less widely (e.g. establishing cover crops) (Vrain et al., 2014). Pressure therefore exists for governments and other organisations concerned with water quality to increase the uptake of additional mitigation measures by engaging with and influencing farmers' behaviours to achieve public policy goals (Garforth et al., 2003).

## 1.1 Mechanisms to influence farmer uptake

A number of different mechanisms operating at varying spatial scales (McGonigle et al., 2012) are available for governments and other organisations to influence the uptake of mitigation measures on farms. Such mechanisms include: enforcing change through regulations; providing incentives such as agri-environment scheme (AES) annual payments, consumer quality assurance schemes or capital grants and encouraging voluntary behavioural change by disseminating knowledge through the provision of advice at farm demonstrations, events, and one-to-one farm visits or through supporting industry led campaigns (OXERA, 2003; RPA, 2014; Aue and Klassen, 2005). Internationally, debate exists regarding the effectiveness and benefits of different combinations of the various mechanisms (Smith et al., 2015). Despite evidence of regulations, taxes and subsidies requiring substantial financial resources and administrative support (Brouwer et al., 2003; McGonigle et al., 2012; OXERA, 2003; Andrews and Zabel, 2003; Heinz et al., 2002), some countries largely rely upon such mechanisms e.g. Germany and Denmark (Johnson et al., 2011), whereas others predominantly use alternative, cost-effective alternatives such as advice provision (OXERA, 2003) e.g. Austria (Opencar, 2014).

Within England, a mixture of mechanisms have been adopted. At the national scale, regulatory baselines have been set, predominantly to comply with EU legislation. Regulatory examples include Nitrate Vulnerable Zones (NVZs) to comply with the EU Nitrates Directive, Silage, Slurry and Agricultural Fuel Oil regulations (SSAFO) and Common Agricultural Policy (CAP) Cross Compliance. As such baselines are not sufficient in themselves to achieve WFD 'good status' (Kay et al., 2012) additional mechanisms need to be applied at a targeted local scale (UKWRIP, 2011). Approaches included, financial support through AES payments and the provision of advice through the Catchment Sensitive Farming (CSF) initiative.

At present, there is substantial emphasis on voluntary uptake of measures by farmers to achieve policy objectives and, for example, a number of initiatives from within the agricultural sector have sought to increase levels of uptake and influence the types of measures adopted e.g. The Campaign for the Farmed Environment (Clothier and Pike, 2013) and Get Pellet Wise ([www.getpelletwise.co.uk](http://www.getpelletwise.co.uk)). More broadly, it has been recognised that there is a need for more evaluation of such activities to inform understanding of best practice (Fazey et al., 2012).

## 1.2. The changing role and provision of farm advisory services in England

The role of farm advice includes the enhancement of farmer skills and access to knowledge and information (Labarthe et al., 2013), acting as a trigger for change (Dwyer et al., 2007). Through advice, improvements to existing practices and adoption of new ones can be achieved to increase the performance of farm activities (Proctor et al., 2011; Phillipson et al., 2014). Farm advisors act as crucial knowledge brokers for science to be implemented on the ground, with farmers looking for their advisors to absorb complex, ambivalent messages from diverse sources, and to translate and repackage them into terms they can understand and act upon (e.g. Proctor et al., 2012). Nevertheless, over time the role and focus of advisors has changed.

Following WWII, the UK Government provided farm advice focussing on improving production, however, since the mid 1980's, the Government has taken the view that production and farm management advice are essentially private rather than public goods and should therefore be provided by the market on a commercial and competitive basis (Garforth et al., 2003). The result has been further diversity in the advice sector in order to fill the gap left by the repositioning of previously public advisory organisations such as ADAS (Prager and Thomson, 2014). Advisors have had to adapt their role over time with evolving policy<sup>1</sup> and the changing demands of those receiving advice. Advisors now not only have to help farmers improve competitiveness and resource efficiency, but they must also ensure farmers follow regulations (Cowap and Reed, 2013), deliver environmental objectives and contribute to the wider sustainable intensification agenda (AIC, 2013).

The diverse farm advice sector which has evolved in England is considered to have both advantages and drawbacks. Garforth et al. (2003) believes the sector benefits from efficiency, competition, flexibility, choice and reductions in public funding, however others are concerned that fragmentation has occurred leading to inconsistent, conflicting or duplication of messages (AIC, 2013). Such fragmentation is believed to create difficulty for farmers to decide which advice to follow (Angell, 2007; Winter et al., 2001) and may result in message fatigue and advice being ignored (Kahan et al., 2012; AIC, 2013). Government reports spanning over a decade consider the sector to be inadequate for

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<sup>1</sup> For example, since the 1986 Agricultural Act, advisors have been required to take account of the environmental impact of their advice.

meeting farmer requirements and have called for a streamlining of advice (Cabinet Office, 2002; Farming Regulation Task Force, 2011; Foresight, 2011; HM Government, 2011). On the contrary, Klerkx and Proctor (2013) claim assumptions of a collapse of interaction within the advisor sector are not supported by evidence. Such debate in the literature highlights the need to investigate whether problems such as conflict, duplication or inconsistency exist in the existing pluralistic farm advice sector.

Further reasons to study the farm advisor landscape arise from the growing emphasis for governments to use non-regulatory mechanisms (UKWRIP, 2011) and local scale approaches (Green et al., 2013). Financial cutbacks have created further pressure to reduce government spending, with England hoping to reduce its spend of £20 million per year on administering and delivering government advisory schemes and initiatives to farmers by 25% (Defra, 2013). To achieve such a goal, the review of ‘Advice and Partnership Approaches’ published in March 2013 highlighted that government advice needed to be clearly targeted and linked to that provided by other advisors, rather than duplicating or creating confusion (Defra, 2013). Nevertheless, without a better understanding of the advisory landscape, it is not possible to know who does what and where in order to increase efficiency and effectiveness.

Several studies have attempted to summarise different aspects of the farm advisory landscape within the UK. Defra (2013) provides an illustrative representation of the different sources of environmental advice in England, but only includes the public sector and professional bodies providing advice on behalf of the Government. Another review was undertaken through the Value of Advice project, but focused solely on how the commercial sector delivers professional advice to farmers (AIC, 2013). The most relevant report to date lists all actors in Agricultural Knowledge Information Systems (AKIS) in the UK (Prager and Thomson, 2014). Despite such recent assessments, none focus specifically on the provision of DWPA advice to help meet WFD targets.

### 1.3 Current DWPA advice provision

As DWPA has risen up the policy agenda, many areas of the industry have become involved in DWPA advice dissemination. Government agencies, land agents, large agri-consultancies and independent specialists (for example in the fields of agronomy, veterinary care, feed supplies, and agri-chemicals) all offer advice regarding elements of DWPA mitigation. Furthermore, even organisations and businesses not directly related to agriculture, such as not for profit environmental organisations and water companies, have realised the potential for influencing farming practice through delivering advice to farmers (Devon Wildlife Trust, 2012; Inman, 2005; Wessex Water, 2011; Eden Rivers Trust, 2014; RSPB, 2014).

One-to-one delivery is generally considered to be the most effective at encouraging uptake of advice (Dwyer et al., 2007; Blackstock et al., 2010; AIC, 2013; CSF Evidence Team, 2014) and so is the focus of this research. Table 1 summarises the main providers of one-to-one advice to farmers from the government sector; not for profit environmental sector and the agricultural business sector.

Table 1. Farm advisors providing one to one advice in England. (2 columns)

	Source of DWPA advice	Main types of advice provision
Government departments and agencies	Environment Agency (EA)	Regulatory advice on farm practices.
	Natural England (NE)	Agri-environment scheme options.
	Catchment Sensitive Farming Initiative (CSF)	Targeted DWPA advice and capital grants.
	Forestry Commission	Tree planting and forestry legislation
Not for profit environmental organisations	The Farming & Wildlife Advisory Group (FWAG) <sup>2</sup>	Whole farm conservation
	Game and Wildlife Conservancy Trust	Game and wildlife conservation and shoot management
	Royal Society for the Protection of Birds (RSPB)	Farmland bird conservation and habitat management
	The Wildlife Trust	Species and habitat management advice/grants.
	The Woodland Trust	Tree planting and woodland maintenance advice/grants
	The Rivers Trust	Catchment scale projects delivering DWPA advice/grants
Agricultural business sector	Large agricultural consultancies	Whole farm business advice
	Agronomists	Crop improvements e.g. through soil and pest management
	Veterinarians	Animal health and welfare
	Feed/seed/ chemical/machinery salesmen	Farm practices for best use of product
	Water companies	Strategies vary and include CSF partnership, capital grants, voluntary agreements or reverse auctions.
	Auction houses	Whole farm business advice for livestock farmers
	Land agencies	Whole farm business advice

A key development in this area has been the role of the CSF initiative established in 2006. CSF officers (CSFOs) cover eighty priority catchments in England, providing free advice to farmers on mitigation measures in areas at high risk of failing the WFD and offering capital grant incentives to help encourage behaviour change (Natural England, 2014). The national CSF programme has also collected evidence on scheme effectiveness, with CSFOs reporting each recommendation made (approximately 112,000 over six years) into a central database and a sample of farmers being contacted in a follow-up survey to assess whether the advice was acted upon.

#### 1.4 Research objectives

Given the policy emphasis on advice as a means of increasing voluntary uptake of mitigation measures, the diversity of current advice provision and the limited existing data, this study sought to undertake a detailed assessment of the recommendations delivered by different advisors and the mechanisms they employ to increase the uptake of their advice. Underlying this focus is the normative perspective that effective advice provision is that which results in changes of farm practice and adoption of additional mitigation measures. By interviewing a diverse, fully representative sample of farm advisors across three contrasting regions in England, the objectives were to discover:

- Which DWPA mitigation measures are being recommended?

<sup>2</sup> FWAG was a not for profit organisation set up to provide independent environmental advice to farmers but went into administration in 2011 due to funding problems (<http://www.fwagadvice.co.uk/>). Former employees in different regions (e.g. the South West) have since collaborated to provide advice to farmers, either as a new not for profit organisation or an advisory businesses, some of which have applied for charitable status.

- How do recommendations differ between sources of advice? Do they conflict?
- Which mechanisms (guidance on regulatory requirements, financial incentives, signposting or voluntary approach) are being used to influence uptake of mitigation measures?

The remainder of this paper outlines the methodology used for interviewing advisors and presents key findings with discussions. An overall conclusion considers the implications of the findings for policy makers regarding the provision of DWPA advice and for improving the advisory sector as a whole.

## **2. Interview methodology**

### **2.1 Sample selection**

To select advisors for interviews, the UK AKIS report (Prager and Thomson, 2014) was first consulted, leading to a web based search to identify whether the listed bodies deliver one-to-one advice. Furthermore, existing knowledge and consultation with CSFOs in various catchments helped identify suitable individuals and organisations to interview. To provide a complete picture of the sector, the research aimed to include advisors from as many different organisations as possible, as well as capturing the diversity of advice within them, therefore interviews with more staff from particular organisations were sought when multiple perspectives existed.

To enable generalisations to be made from the interview findings, a comparative framework was designed. Advisors were categorised dependent upon their geographical location and employer: the public sector (government); not for profit environmental organisations (environment); or private agriculture sector (business). Selecting advisors from all three types of employer in each locality was fundamental as the farming landscape varies greatly and with it advice. Interviews were carried out with advisors in three regions of England (Fig. 1). These three regions were selected to cover the four main national farming types and reflect the different physical and socio-economic factors which influence agricultural activities. The farming systems were arable in East Anglia; lowland livestock in the North West; and dairy and mixed farms in the South West. Within each region, only advisors who predominantly deliver advice to the relevant main farm type were contacted.

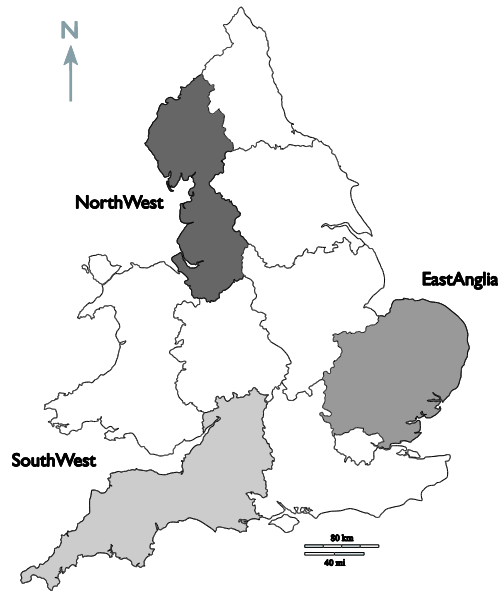


Fig. 1. The regions of England where farm advisors were interviewed. (single column)

## 2.2 Interview design

To gather data which would be comparable between different advisors, semi-structured interviews were conducted with set objectives and open questions. Open questions were used to allow greater context to be obtained, a technique suited for research seeking to identify peoples' experiences and discover thoughts, feelings, intentions and attitudes (Gillham, 2008), thus gaining a deeper understanding of their role for providing DWPA advice to farmers and their techniques.

Exploratory in-depth interviews with various experts in the field of farm advice and farmer attitudes/ behaviours were conducted to support development of the study design. Independent agricultural consultants, River Trust staff, the CSF evidence team, academics and government experts were consulted to clarify research objectives and question structure. Pilot interviews were then conducted with four CSFOs based in catchments outside of the study areas.

Interviews were structured around the question topics listed in Table 2. In the first section, the interview focused on gaining an understanding of the advisor's employment and background. The second section investigated the methods used by the advisor to deliver advice and target farmers. In the third, the focus was on the advice delivered, asking which DWPA mitigation measures were recommended, whether any conflicting suggestions had been encountered and whether uptake was monitored. The final section sought personal opinions on what individuals believed influenced farmer uptake of their advice and what their niche was in the advice sector.



Table 2. Question topics for the semi-structured interviews with farm advisors. (single column)

1	Employment and background
2	Farm types advice is delivered to Method of advice delivery and targeting of advice
3	DWPA mitigation measure recommendations Other advice provided Examples of conflicting advice with other advisors Monitoring uptake of advice
4	Mechanisms to influence advice uptake Niche of the advisor in the sector

## 2.3 Data collection

Advisors were selected and initial contact was made through email to introduce the research project. 83% of those contacted agreed to participate and interviews were then arranged to be conducted over the phone or face-to-face. Across the three regions, 81 advisors were interviewed, of whom 29 were CSFOs (Table 3).

Table 3. The number of farm advisors interviewed from each group in the three regions. (2 column)

		Catchments		
		East Anglia (Arable)	North West (Livestock)	South West (Dairy/mixed)
Government departments and agencies	Environment Agency (EA)			
	Natural England (NE)			
	CSFO	14	12	14
	Forestry Commission			
Not for profit environmental organisations	FWAG (South West)			
	RSPB			
	The Wildlife Trust	5	9	11
	The Woodland Trust			
	The Rivers Trust			
Agricultural business sector	Large agricultural consultancies			
	Agronomist			
	Veterinarians			
	Seed salesmen			
	Auction houses	6	4	6
	Land agencies			
	Feed nutritionist			
	FWAG (North West and East Anglia)			
Total		25	25	31

The semi-structured format of the interviews and the manner in which discussions took place, justified the use of both face-to-face and telephone data collection (Roberts, 2007). A single interviewer conducted all interviews to ensure consistency in the procedure. Interviews occurred between August and October 2013, when advisors generally experienced a lower demand of work load from farm visits. Interviews lasted 40 – 60 minutes.

Dictaphone recordings and hand written notes were taken during both face-to-face and telephone interviews when possible. Transcripts were then typed the same day, ensuring any extra thoughts from the discussion could be added to the transcripts.

## 2.4 Data analysis

To analyse the results obtained, transcripts were coded and imported into the statistical analysis software SPSS<sup>®</sup> version 22 (IBM Corp, 2013). Responses regarding recommended measures were allocated to one of thirty-five categories. Numerous responses were similar in vocabulary and thus simple to categorise e.g. soil analysis, however, on occasion, novel recommendations were mentioned which did not fall into the common categories and thus placed in their own. Summary tabulations were created to identify what advice was recommended most frequently and by whom. To enable comparisons between the various organisations, a Multidimensional Scaling tool PROXSCAL (PROXimity SCALing) was used, as this can be very useful in highlighting relationships within data (Young, 1987; Garson, 2012) and is more flexible for visualising and data analysing than other methods such as ALSCAL (Jung and Takane, n.d.). PROXSCAL is often used in fields such as ecology and psychology (Borg and Groenen, 2005; Gatrell 1983), and has been previously used to visualise correlations in survey responses (e.g. Grunert et al., 2012). In this study PROXSCAL was used to compare individual advisors in terms of the measures they recommended and then derive an overall proximity matrix indicating the degrees of difference between them. The same data were also used to assess the similarities between measures in terms of which advisors recommended them.

PROXSCAL processes the proximity matrix to generate a variety of outputs, including x,y coordinates for each input entity (e.g. individual advisor) which position them in a two dimensional conceptual space so that, for example, advisors who made similar types of recommendations were located close together and those with little or no overlap were spaced much further apart. To compare the similarities in recommendations between groups of advisors (e.g. all CSFOs), one standard deviation ellipses were created in ArcGIS using the advisor co-ordinate positions derived from the PROXSCAL output. The sizes of ellipses indicated the variability in the recommendations made by a group of advisors, with compact shapes where they were all similar and much larger where they were diverse. Since the ellipses were based on only one standard deviation around the mean co-ordinate position for each group they essentially defined the core area of interest (e.g. in terms of common recommendations), but with some individual advisors likely to be situated outside their boundaries. Comparing the shapes, size, overlap

and location of the various ellipses helped to visualise differences between groups of advisors and to inform interpretations of results.

### **3. Results and discussion**

#### **3.1 Targeting and monitoring advice**

Many differences were found in the way advisors were operating to target farmers for advice. For instance, Natural England proactively targeted farms suitable for Higher Level Stewardship agreements but were reactive when farmers requested consent for particular farm practices within AES agreements. Many advisors in the business category claimed they were reactive when undertaking a public sector contract but proactive for private clients, especially true for sales representatives who target large farms for the opportunity to sell more. Two of the Rivers Trusts explained they first target larger dairy farms near rivers by driving around their catchments and looking for issues, whereas a Wildlife Trust in the North West used aerial photographs to identify potential farmers to target. Overall, 65% of advisors were both reactive and proactive for providing advice, but only 9% stated they were solely proactive. Many advisors highlighted that as a good reputation was gained, less proactive work was required.

Advisors were asked whether or not they collected details of recommendations made or of advice uptake. Several independent specialists stated they informally monitor their private clients as they have a good relationship, revisiting and setting targets. However, specialists carrying out events, or one-to-one advice through a government scheme contract, stated that they often never see the farmers again, receive no feedback and had no opportunity to build a relationship. On the other hand, some advisors from agricultural businesses conducted no monitoring, one explaining *'the farmer has paid for my advice, it is up to them if they choose to take it'*. This illustrates that although an effective advisor would be most commonly regarded as one whose recommendations are implemented, there are situations where their goal may extend no further than delivery.

For newly established environmental organisations, limited funding resulted in data collection only to meet the requirements of funders, often not including details of actual recommendations made or which mechanisms were used to encourage the uptake of advice provided.

#### **3.2 DWPA recommendations**

Each interviewee was asked *'What are the top five DWPA mitigation measures you currently recommend to farmers?'* Amongst the most common responses were: soil analysis, separating clean and dirty water, roofing, buffer strips and reducing fertiliser applications (see Table 4).

Table 4. The top ten most frequently recommended mitigation measures from advisors interviewed. (single column)

Recommendation	Number of advisors recommending (n=81)
Soil analysis	28
Clean and dirty water separation	26
Roofing	21
Buffer strips	18
Reduced fertiliser application	17
Increase manure/slurry storage	16
Track management	16
Fencing	15
Soil compaction/pits	15
Pesticide handling	15

It is important to note that in some cases the organisational affiliation constrained the recommendations made, whereas other advisors had more discretion and tended to make suggestions based on their own knowledge and regarding measures they were more comfortable with. Recommendations regarding measures such as cover crops and biobeds<sup>3</sup> were rarely made, as advisors stated they did not feel confident providing advice with limited information. Overall, there was no simple tendency for either organisational affiliation or personal background to be the dominant influence on the recommendations made.

Analysis using PROXSCAL generated x,y co-ordinates for each of 35 recommendations in a two dimension conceptual space whose axes represented the degree of overlap in which advisors recommended them. In the results shown in Fig. 2 the mitigation measures located close together were more likely to have been recommended by the same advisor while those widely separated were unlikely to have had such overlap.

<sup>3</sup> A pit filled with a mixture of straw, soil and peat-free compost used in agriculture to capture pesticide residues and break it down.

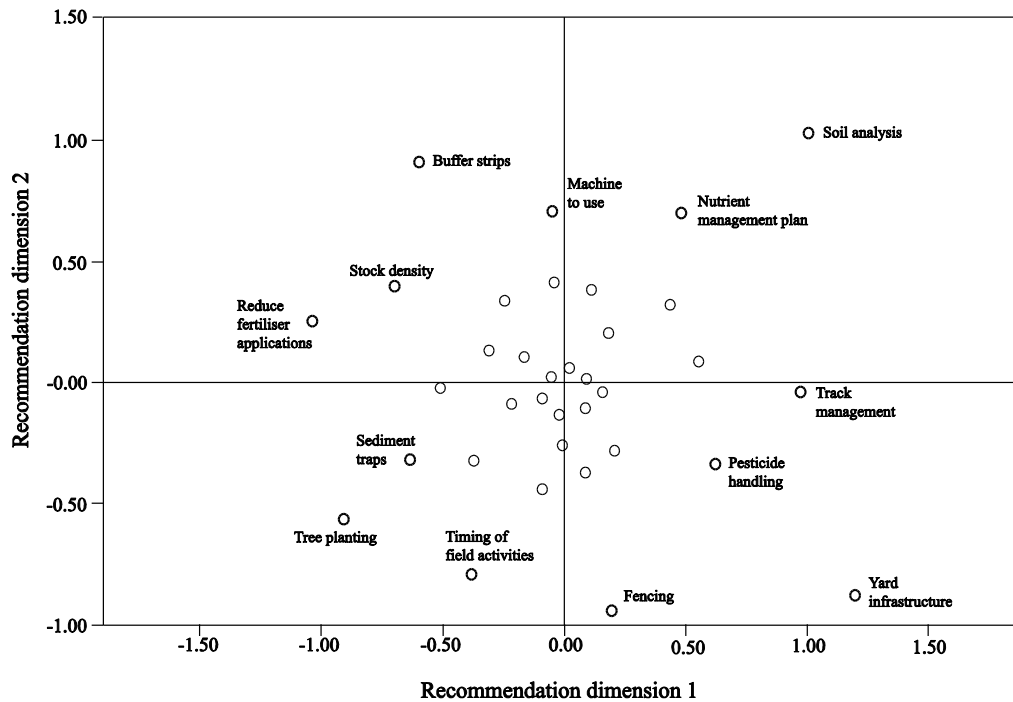


Fig. 2. DWPA mitigation measures plotted on two axes derived from PROXSCAL analyses which indicate the degree of commonality in advisors recommending them. Peripheral measures are labelled. (2 columns)

Many of the recommendations in Fig. 2 cluster near the central origin of the two dimensions. These include arable reversion (taking land out of crop production) and re-siting gateways. Measures located in this part of the plot had no particularly distinctive pattern in terms of who recommended them. The peripheral measures (labelled on Fig. 2) were more distinctive in terms of who proposed them. Groupings occur between measures in the different quadrants, for example, soil analysis and nutrient management plans (top right) were less likely to be recommended by an advisor who also recommended tree planting (bottom left). These results do not imply advisors never made such combinations of recommendations, only that the likelihood was less.

### 3.2.1 Comparison of recommendations made by sets of advisors

PROXSCAL was also used to plot each advisor on two axes representing similarities in the recommendations they most commonly made. To compare the similarities in recommendations between different types of advisors, one standard deviation ellipses were created around the mean co-ordinate positions for each group.

In Fig. 3, each of the 81 advisors is plotted as a dot on the two axes representing similarities in recommendations. Advisors located near each other were therefore more likely to have recommended similar measures. One standard deviation ellipses were created for: CSFOs; Natural England (NE); Environment Agency (EA); independent specialists; and not for profit environmental organisations,

including Rivers Trust; Wildlife Trust; RSPB; Woodland Trust, and FWAG in the South West (environmental organisations).

Not surprisingly, overlap exists between organisations in terms of recommendations, with certain measures being proposed by many different advisors (e.g. timing of field activities and buffer strips). However contrasts also exist, suggesting distinct niches for particular groups of advisors.

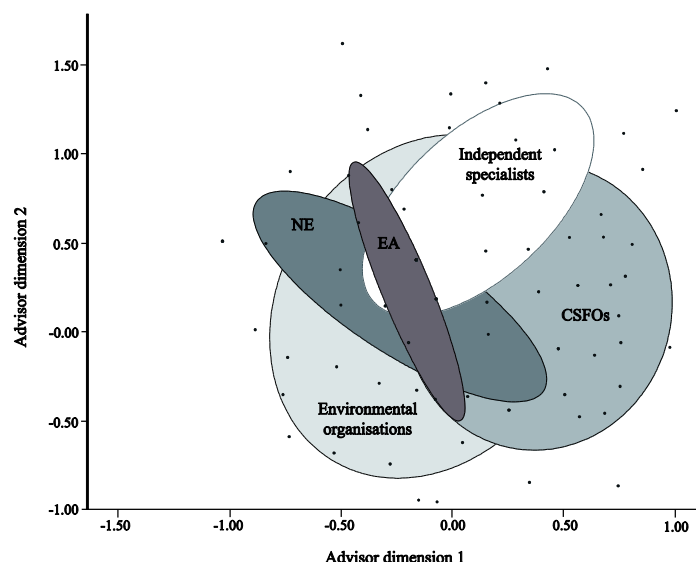


Fig. 3. The 81 advisors plotted on two axes representing similarities in the main measures they recommended, with one standard deviation ellipses for CSFOs, NE, EA, independent specialists and environmental organisations. (single column)

The Environment Agency is represented by a narrow ellipse reflecting the particular focus in their advice on regulatory requirements. Substantial overlap occurs between Natural England and environmental organisations, as many of the latter also focused on recommending AES options (similar to Natural England) as an incentive to engage with farmers. Grouping environmental organisations resulted in a large ellipse corresponding to a broad set of recommendations. Nevertheless, different organisations in this group tended to focus on their own area of expertise such as particular habitats or species. Independent business specialists had the least overlap with government staff, primarily as they provided particular advice on topics such as animal nutrition, crop rotation and nutrient requirements which are not part of the public sector advice remit.

### 3.2.2 Comparison of regions

As this research was conducted across different regions and therefore farming systems, Fig. 4 demonstrates differences in recommendations in the three regions considered. The Environment Agency ellipse in all three regions is the same and represents the results from staff across all three regions (from Fig. 3) to provide context. This was deemed appropriate as the role of Environment Agency staff is to enforce regulatory measures and does not differ regionally. The CSFO and environmental organisation's ellipses, which have been calculated separately using data from advisors in each region, highlight that recommendations from such advisors focussed on different sets of DWPA

measures. Regional results could not be plotted for independent business specialists and Natural England staff due to insufficient data for the calculation of standard deviation ellipses.

The differences shown in Fig. 4 imply that CSFOs adapted their approach within their catchments/region depending upon farmer needs. In East Anglia, many of the CSFOs interviewed recommended a smaller number of measures that they specialised in depending upon farmer requirements in their catchment e.g. pesticide management. The larger sized ellipse implies that advisors within CSF were making different recommendations to one another, covering a broader remit. CSFOs in the North and South West recommended similar measures to each other, such as yard infrastructure, track management and fencing, resulting in more compact ellipses.

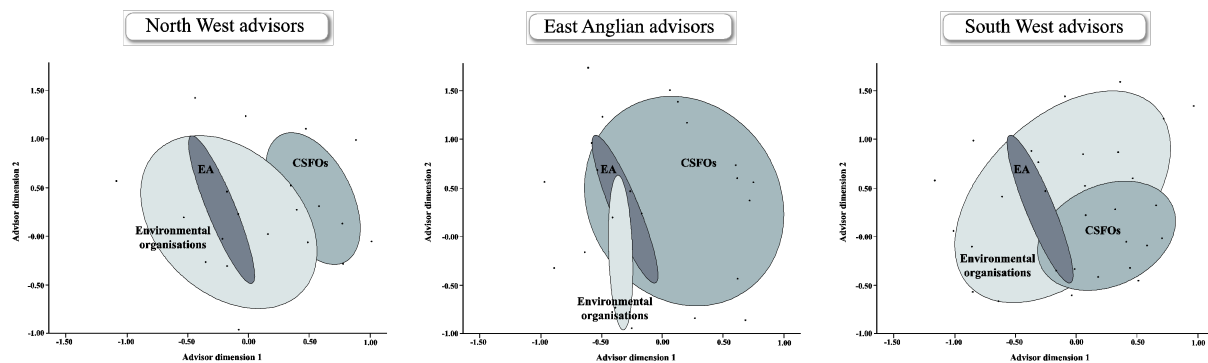


Fig. 4. Advisors from each region plotted on a two dimensional similarity scale using PROXSCAL based upon the diffuse water pollution mitigation measures they recommend, with one standard deviation ellipses for CSFOs, Environment Agency and environmental organisations. (2 column)

Environmental organisations were also found to fulfil different roles in the three regions. In East Anglia, they tended not to make recommendations for farm yard infrastructure, contrary to the findings for the North and South West, providing a much narrower set of recommendations. Whereas in the South West, recommendations made by environmental organisations were more similar to the CSFOs, but covered a broader remit.

### 3.3 Issues of consistency in advice provision

Interviewees were asked ‘*can you think of examples when you have provided advice which has conflicted with other advice the farmer has received?*’ 64% of advisors reported that during a one-to-one visit, a farmer stated they had received different advice from another source. Conflicts predominantly existed between advisors with differing focuses (environment, government or business), for example regarding the amount of fertiliser to spread or silage cutting times. However, conflicts also occurred between advisors with the same broad focus, e.g. species and habitat priorities varying amongst environmental organisations. One example was tree planting to create shading for fish versus open spaces for wading birds. Conflicts also occurred within and between government organisations. The most common disagreements involved AES options and whether they were effectively targeted, such as AES grassland management options resulting in over or under grazing.

Frequently changing regulations were identified by many non-governmental advisors as causing confusion and creating difficulties with keeping up-to-date and delivering consistent advice. Advice regarding dates for closed periods in NVZs differed greatly and was a particular concern amongst advisors.

Not only did conflicts of recommendations occur but there were also reports of a lack of communication and knowledge exchange between advisors, thus creating some unnecessary duplication of recommendations and barriers in locating and signposting expertise to meet particular needs. Good communication and interactions did exist in certain cases. An excellent example of coordination between advisors was apparent in the North West's Eden catchment, where the close knit nature of the whole farming community brought various advisors from different organisations together. Signposting farmers to the relevant advisor was second nature, and collaborative projects occurred between Natural England, Environment Agency, CSF, Rivers Trust, Woodland Trust and independent contractors.

### 3.4 Mechanisms used by advisors

The interviews revealed that advisors utilised a range of mechanisms to increase farmer adoption of their advice (grants, AES, guidance on regulatory requirements, voluntary approach or signposting to other advisors). Differences were found between advisors regarding the approaches they used. Many organisations focused upon one form of mechanism (e.g. RSPB encouraging AES options), whilst a select few used a variety of mechanisms (e.g. Rivers Trusts used funding incentives, voluntary approach, regulatory advice and signposting). The majority of advisors favoured specific mechanisms for particular measures (e.g. grants and AES for tree planting) but employed a combination of mechanisms in other instances (e.g. timing of field activities). Two measures illustrating the greatest differences in results (tree planting and timing of field activities) are shown in Fig. 5, listing only those advisors which recommended either or both of the measures.

		CSFO	Natural England	Environment Agency	Forestry Commission	Land Agent	Independent specialist	Large company	FWAG	Rivers Trust	Wildlife Trust	Woodland Trust	RSPB
Tree planting	South West												
	North West												
	East Anglia												
Timing of field activities	South West												
	North West												
	East Anglia												

Fig. 5. Mechanisms used by different organisations in the three regions to increase the uptake of tree planting and timing of field activities. (single column)



Government agencies such as Environment Agency, Natural England and Forestry Commission were consistent in their use of mechanisms, however CSFOs used a variety of mechanisms for individual measures, differing between catchments. Not for profit environmental organisations varied more in the mechanisms used, predominantly caused by contrasting access to funds. If an organisation did not have a funded project or were unable to offer farmers a grant, they often provided advice on AES options (fulfilling a similar role to Natural England staff) but targeting specific options for the benefit of a particular species or habitat. Organisations with grants often fulfilled gaps in government schemes by providing grants for mitigation measures not covered by AES. Additionally, some environmental organisations used more unusual mechanisms to encourage advice uptake such as volunteer power (Cornwall Wildlife Trust), machinery sharing and the lending of livestock for grassland management (Devon Wildlife Trust). Advisors from the agricultural business sector predominantly used the voluntary approach and signposting with advice provision. Recommendations using the voluntary approach would often be to save the farmer resources e.g. reducing fertiliser application rates and if a recommendation required resources, signposting would be used, e.g. to CSF capital grants for infrastructure.

#### **4. Conclusion and implications for agri-environmental policy**

The aim of this study was to enhance understanding of advice provision ultimately improving such dissemination activities to help reduce water pollution. Interviews with a diverse range of advisors in different farming systems provided information on who suggests which DWPA mitigation measures and how they seek to influence uptake of their advice.

Through the use of PROXSCAL and standard deviation ellipses the research demonstrates how an analytical method more commonly used in other research fields can be an effective technique to visualise patterns in interview data and, in this case, show how various sets of advisors fulfil different or similar roles in terms of recommending DWPA mitigation measures.

From the interview results it is apparent that the advice delivered by different advisors is not homogeneous and particular niches exist within the farm advice sector. However, gaps were discovered and concerns were raised by some advisors about a lack of knowledge regarding activities by representatives from other organisations. These results provide evidence which supports Proctor et al. (2011)'s claims that advisors need to be better informed of the networks and local contexts in which they are operating and their role within them. To address such issues, two key recommendations are made below.

The diversity highlighted in this study suggests there would be merit in conducting further assessments of advisory services in other regions. This would help policy makers, advisors and farmers to better navigate the existing advisory landscapes and identify potential sources and pathways for dissemination of information on particular issues. Catchment Management Plans (CMPs) required by the WFD, would

significantly benefit from such work and organisations involved in creating CMPs should consider conducting similar advisory system assessments for their catchment. In England, many CMPs currently fail to consider the importance of advice provision to farmers (e.g. The Norfolk Rivers Trust, 2014) and only a few summarise the current advisory landscape (e.g. Broadland Catchment Partnership, 2014) or include advice provision in their strategy (e.g. Tamar Catchment Plan, 2012). The Eden Rivers Trust CMP (2014:12) acknowledges the need for developing a joined-up advice programme and better co-ordination of existing initiatives, thus supporting the recommendation for further assessments.

There is also scope for government policy implementation to make better use of non-government advisors. Although regional briefing sessions and training are provided for such advisors, this has not always avoided conflict or confusion regarding what guidance should be disseminated. Through greater cooperation and better communication, advice dissemination schemes could achieve more effective implementation of agri-environmental policies to support catchment management (as evidenced in many of the case studies discussed by Smith et al., 2015). It is recommended that more funds are targeted towards organisations providing advice which have well-established relationships with farmers, acting as an intermediary for the government. The ability to offer trusted, tailored advice reduces a farmer's perception of risk, and with the use of mechanisms such as grant incentives or other innovative methods (e.g. the Wildlife Trust's machinery ring) allows flexibility and improves effectiveness of engagement.

#### 4.1 Overall conclusion

This research indicates that farm advisors' expertise is differentiated, with recommendations varying within and between sets of advisors across different parts of the country. Agri-environmental policy has started to reflect this variation with the 2014 CAP reform. England has removed universal Entry Level Stewardship, replacing it with a more targeted scheme which prioritises different measures in particular catchments. Although this is certainly a step in the right direction, it creates additional demand on advisors to make relevant recommendations to farmers and requires greater on the ground expertise in order for such schemes to be effective.

Policy needs to recognise that the advisory systems cannot be treated as homogenous, and that to gain the greatest value from advice provision, strategies and investments need to be made to complement new and existing policies. The conclusions presented here are also applicable to the wider context of knowledge brokerage (exchange), whereby having an understanding of what advisors are recommending within a system, allows adjustments and redesigns of advisory messages to be made, streamlining and improving effectiveness of uptake.

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