


Engaging farmers in environmental management through a better understanding of behaviour

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Abstract The United Kingdom's approach to encouraging environmentally positive behaviour has been three-pronged, through voluntarism, incentives and regulation, and the balance between the approaches has fluctuated over time. Whilst financial incentives and regulatory approaches have been effective in achieving some environmental management behavioural change amongst farmers, ultimately these can be viewed as transient drivers without long-term sustainability. Increasingly, there is interest in 'nudging' managers towards voluntary environmentally friendly actions. This approach requires a good understanding of farmers' willingness and ability to take up environmental activities and the influences on farmer behavioural change. The paper aims to provide insights from 60 qualitative farmer interviews undertaken for a research project into farmers' willingness and ability to undertake environmental management, particularly focusing on social psychological insights. Furthermore, it

explores farmers' level of engagement with advice and support networks that foster a genuine interest, responsibility and a sense of personal and social norm to sustain high quality environmental outcomes. Two conceptual frameworks are presented for usefully exploring the complex set of inter-relationships that can influence farmers' willingness to undertake environmental management practices. The research findings show how an in-depth understanding of farmer's willingness and ability to adopt environmental management practices and their existing level of engagement with advice and support are necessary to develop appropriate engagement approaches to achieve sustained and durable environmental management.

Keywords Farmer behaviour · Social psychology · Environmental management · Engagement

Abbreviations

AES	Agri-environment scheme
CFE	Campaign for the Farmed Environment
Defra	Department for Environment, Food and Rural Affairs
TPB	Theory of Planned Behaviour
UK	United Kingdom
VBN	Value-Belief-Norm Theory

Introduction

There has been a rich history of research exploring farmers' motivations for undertaking environmental management practices on their land. This research has stemmed from a need to encourage environmental management to counteract environmental deterioration as a result of post-war agricultural intensification. From the 1970s onward the

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nature and extent of the environmental impact of agriculture has been increasingly well documented (see, for example, Westmacott and Worthington 1974; Stoate et al. 2001) and, over time, accepted by most stakeholders (Westhoek et al. 2013; Glebe 2007)

The approach to encouraging environmentally positive behaviour in the UK has been three-pronged, through voluntarism, incentives and regulation and the balance between the approaches has fluctuated over time (Cox and Lowe 1983; Winter 1996). Whilst regulatory approaches and financial incentives have been effective in achieving some environmental management behavioural change amongst farmers (Fish et al. 2003; Crabtree et al. 1999), ultimately these can be viewed as transient drivers without long-term sustainability if they do not create a cultural change. We argue that environmental benefits that arise as a result of compensation or regulations require an on-going flow of payments or compliance checks and, if removed, there is a risk that these benefits will disappear. Purchasing environmental benefits by the state/government for short periods, usually 5 or 10 years in England, without any great confidence of achieving long-term gains is not an ideal solution for the public purse, farmers or environmental groups.

In an era of increasing pressure on government resources it is not surprising that government is looking for agri-environmental incentives to be more cost effective (Hodge 2013) and is increasingly attracted toward low cost options linked to voluntary activity by farmers and land managers. The UK Government has already committed 70 % of the agri-environment budget in the 2014–2020 Rural Development Plan for England to servicing existing agri-environment scheme (AES) agreements before they expire. A new scheme has been introduced with a more targeted and competitive approach towards environmental management and will result in an estimated reduction in AES coverage from 70 % to around 35–40 %, as existing 5 year agreements expire and are not renewed. This leaves limited scope for the negotiation of new agri-environment agreements and increases the importance of trying to secure the environmental benefits arising from those agreements that will cease to be funded in the scheme transition. In addition, there is a general reluctance to contemplate an increase in regulation set against a backdrop of European Union Agriculture Commissioner Hogan's emphasis on reducing the regulatory burden on farmers.

Given the constraints on using incentives and regulation to secure appropriate environmental management from the nation's farmers and land managers, there is a growing interest in understanding more about the actions that can be taken to 'nudge' managers towards more environmentally friendly actions, and encourage individual responsibility for the maintenance of normative standards (Barnes et al.

2013). This approach recognises that encouraging voluntary action, rather than enforced behaviour change is more likely to persist over time as it is more likely to become embedded in social norms (Ayer 1997; Ahn and Ostrom 2002).

Work by Gasson (1973) in the 1970s recognised that farmers do not always make decisions based purely on an economically rational basis but instead may optimise social and intrinsic goals. However, despite this work much of the research into farmers motivations in relation to environmental management in the subsequent three decades has focused on financial incentives (Brotherton 1991) and barriers to adoption of environmental practices (Wilson 1997). More recently, however, there has been a growing body of research on using social psychological insights to understand farmers' attitudes and behaviours regarding environmental management (Burton 2004; Burton and Wilson 2006; Spash et al. 2009). This change reflected a cultural turn in the social sciences and a greater focus on culturally informed research into agricultural change (Morris and Evans 2004; Woods 2004), recognising the need to understand the social and cultural influences affecting farmers' behaviour (Burton 2004).

Much of this research has tried to single out specific variables that influence farmers' environmental behaviour using quantitative approaches (Lokhorst et al. 2011; van Dijk et al. 2015; Thompson et al. 2014). This paper differs in that it looks at farmers' qualitative responses and tries to understand the underlying reasons and explanations for farmers' motivations. We argue that this understanding is required in order to help policy-makers to produce appropriate advice and support programmes to encourage more environmental management on agricultural land.

Furthermore, improved understanding might enable appropriate engagement approaches which move farmers from 'tick box' compliance (with AES prescriptions or regulatory requirements) to a genuine commitment towards environmental management where outcomes are more sustained (with the ending of schemes or regulations) or of highest quality (where existing drivers are continued (Pike 2013). Effective engagement between farmers, government and environmental organisations can help create interest, responsibility and a social norm. However, to provide this support and advice requires a good understanding of farmers' willingness and ability to undertake environmental activities and the social and cultural influences on farmer behavioural change.

The main aim of this paper, therefore, is to identify and understand the distinct influences on farmer decision-making in relation to durable environmental management practices. This will be achieved by discussing different determinants of farmer environmental behaviour and presenting new empirical findings that provide insights into

the socio-psychological factors that influence these behaviours. Two conceptual frameworks are presented that explain the social psychological factors that influence farmers' willingness to undertake environmental management practices and the interaction of these with ability factors. This improved understanding will enable policy-makers to produce more effective policy instruments and engagement strategies to support sustainable and durable land management practices.

Understanding farmer environmental behaviour

It has long been recognised that, in order to understand farmers' environmental behaviours and action, consideration is required of both internal factors and the external context in which the farmer operates. It is the interplay of these different factors that is important and this will vary in different contexts. This understanding has led researchers to examine the relationship between the *willingness* to adopt (attitude, beliefs, values and norms of the farmer towards the environment and towards profit) and *ability* to adopt (economic status of farm and compatibility with farming system, external driver etc.) a central theme in a distinct body of research (Gasson 1973; Potter and Gasson 1988; Brotherton 1991; Dwyer et al. 2007). More recently there has been an interest in the importance of engagement with advice and support networks in influencing farmer behaviours. However, most of this work relates to sustainable agricultural practices (Oreszczyn et al. 2010), rather than focusing specifically on environmental management activities.

Understanding farmer environmental behaviour is complex. There is a consensus that farming systems are heterogeneous and therefore that the context and outcome for decision-making in relation to the environment will vary greatly spatially. As Siebert et al. (2006) point out, willingness and ability to co-operate in achieving biodiversity objectives cannot be reduced only to the location of a holding, the attitudes or values of the farmer, or wider social and economic factors in an atomistic fashion. There is an intricate interaction of agronomic, cultural, social and psychological factors; and each of these factors plays interwoven roles in each national, regional and specific farm context. These affect the individual farmer's response to undertaking environmental activities on a voluntary basis. Theoretically this relationship has been explored with reference to *agency* and *structure* and their interaction in the context of AES participation (e.g. Battershill and Gilg 1997; McLaughlin and Dietz 2008), where agency accepts that decision makers have a complex set of goals related to many aspects of their life and focuses on motives, values and attitudes, and structure pays attention

to farm business adjustment/survival strategies adopted in response to external pressures (e.g. markets, farm resources, agricultural policy) farmers face (e.g. Evans 2009).

Ability to adopt

There is a considerable body of evidence that has shown that farm characteristics influence farmers' decision making in relation to environmental management and their ability to adopt new practices. For example Dwyer et al. (2007) found that conditions such as finances, time and labour can facilitate or constrain environmental behavioural change. Similarly, other research has indicated that aspects of farm structure such as farm size (Vanslebrouck et al. 2002; Wilson and Hart 2000; Ahnstrom et al. 2008; Brotherton 1991; Wilson 1996), farm type (Wilson and Hart 2000), tenure (Wilson and Hart 2000; Kabii and Horwitz 2006), dependency on farm income (Kabii and Horwitz 2006), amount of non-intensively used farmland (Wynn et al. 2001), and the bio-geographical conditions of the farmland (Wilson and Hart 2001), can have an effect on the ability to participate in pro-environmental behaviour. Farm household characteristics, such as education (Filson 1993; McDowell and Sparks 1989; Wilson 1996; Wilson 1997), succession status (Potter and Lobley 1992, 1996), age and length of residency (Wilson 1996) can also have a significant effect upon participation in agri-environmental activities.

Willingness to adopt

There has apparently been less research into understanding the willingness of farmers to undertake environmental management practices and the intrinsic factors affecting farmers' environmental behaviours. Research that has explored this area has focused on the use of the Theory of Planned Behaviour (TPB), an approach first defined over 30 years ago. The main assumption of the theory is that the behavioural intentions of an individual are directly related to his/her attitude; that people make deliberate choices in accordance with the beliefs they hold; and that the person's behaviour is a function of the information or beliefs he/she has (which may be based on experience or facts). In recognition of the weakness in using attitude alone as a predictor of response, as a positive attitude does not always lead to action, the TPB has incorporated additional determinants of behaviour including social influences (Ajzen and Fishbein 1980). Thus the TPB attempts to predict and understand behaviour by measuring the underlying determinants of that behaviour: personal attitudes (behavioural beliefs), subjective norms (social influences) and perceived behavioural control (perceptions of the ease or difficulty of carrying out the action). In the past decade, other

behavioural constructs have been added to TPB model. One of these is response-efficacy, the belief that their actions can make a difference (Homburg and Stolberg 2006), as the higher the level of perceived efficacy, the more people are likely to persist with the new behaviour. In addition, others have advocated the importance of self-identity in understanding farmers' motivations (Burton 2004; Lokhorst et al. 2011). Self-identity is the extent to which behaviour is considered to be part of the self (Terry et al. 1999) and can relate to the social group that the farmer identifies with. It reflects the farmer's personal value system and worldview based on their own experiences and moral values and acts as an internal frame of reference, determining their perceptions of external factors and their own preferences. It has been suggested that behaviours associated with self-identity are more likely to persist over time, as the more the behaviour is repeated, the more important it becomes to the individual's self-concept (Charng et al. 1988).

Another theory sometimes applied to understand farmer behaviour is the Value-Belief-Norm theory (VBN), developed by Stern et al. (1999), which is focused on how values and moral norms influence behaviour. This theory is based on the Norm Activation Theory (NAT) (Schwartz 1977), which posits that behaviour can be predicted by personal (or moral) norms. The theory is structured as a causal chain leading to the specified environmentally significant behaviour (Johansson et al. 2013). The chain starts with the core values that are central to the personality. Personal norms are then activated in people who hold an awareness of need (an environmental concern), awareness of consequences (acceptance of public good/bad aspect of private actions on the environment), and awareness of responsibility (belief that their actions could prevent/provoke consequences) (Schwartz 1977; Schwartz and Howard 1981). These personal norms influence behavioural change because people wish to be morally responsible and maintain positive self-concepts. Both TPB and VBN theories have been tested empirically and found to be valuable for explaining environmental behaviour. Thus from this literature we have identified eight key constructs that may influence farmers' willingness to undertake environmental management practices and that have empirical evidence to support their relevance for explaining farmers' pro-environmental behaviour (see Table 1). We suggest that all these factors need to be considered when attempting to engage farmers in environmental practice. In this paper we particularly focus on the TPB constructs (personal beliefs, subjective norms, perceived behavioural control and response efficacy) to explain farmer behaviour, but also introduce a moral dimension by including personal (moral) norms from the VBN theory and the concept of self-identity.

Farmer engagement with environmental advice

In the context of this paper, we view farmer engagement with environmental advice as occurring when farmers are sufficiently interested and motivated to improve the environmental management of their land, such that they enter into dialogue, discussion and collective problem framing with those who hold environmental expertise and knowledge. There are different aspects to looking at the issues of engagement, such as the nature and extent of engagement and the different influences upon that, such as sources of advice, levels of trust, and continuity of relationships. However, in this paper we want to focus on how engagement with advice and support networks can help create interest, responsibility and a sense of personal and social norms (Dwyer et al. 2007; Pike 2013) that leads to sustained and high quality environmental outcomes.

The literature suggests that farmers engage with environmental advice in different ways. As with agricultural advice, the provision of environmental advice in Europe is highly fragmented. Farmers engage with a wide range of actors, including extension agents, rural development agents, local authorities or agri-businesses (Feola et al. 2015). In particular there has been an increase in the number of advisors delivering environmental advice as a result of agri-environment schemes and regulatory requirements (Klerkx and Proctor 2013). Also some government agencies offer advice related to specific schemes or legal requirements, for example advice in relation to cross compliance requirements. The nature of farmers' relationships with all these advisers and particularly levels of trust therein (Sutherland et al. 2013), critically determine the level of engagement. For example, relationships with some government agencies have been constrained and they are not always considered a trusted source of advice (Oreszczyn et al. 2010; Hall and Pretty 2008). In recent UK policy, the concept of 'nudge' to influence behaviour has gained particular prominence (Barnes et al. 2013), which has been defined as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives." (Thaler and Sunstein 2008, pg 6) This follows current thinking in the UK that by combining good information with knowledge of how people make decisions, it might be possible to "nudge" them towards sustainable choices (Ölander and Thøgersen 2014). For example (Kuhfuss et al. 2015) found that by providing farmers with information about the intentions of how other farmers intended to behave, the prevailing social norm, greatly influenced a farmer's stated decision whether to maintain or not AES practices once their contract ended.

Table 1 Key constructs influencing farmers' willingness to engage in environmental behaviour

Construct	Definition	Empirical evidence
Personal beliefs/ personal attitudes	Strength of belief that a consequence will result from behaviour The degree to which a person has a favourable or unfavourable evaluation of a behaviour or object	(Beedell and Rehman 1996, 2000)
Subjective norms/social influences	Perceived social pressure felt from significant others to perform a certain behaviour	(Lokhorst et al. 2011; van Dijk et al. 2015; Beedell and Rehman 1996, 2000; Burton 2004; Ajzen and Fishbein 1980)
Perceived behavioural control	Perception of the ease or difficulty of performing a behaviour. Degree of control felt over the performance of the behaviour	(Burton 2004; van Dijk et al. 2015; Beedell and Rehman 1996, 2000; Ajzen and Fishbein 1980)
Response efficacy	The degree to which performing a specific behaviour is believed to deliver the desired outcome	(Homburg and Stolberg 2006; Karrer 2012)
Self-identity	The extent to which a certain behaviour is considered to be a part of the self	(Terry et al. 1999; Charng et al. 1988; Lokhorst et al. 2014; Sulemana and James 2014; Burton and Wilson 2006)
Personal norms	Self-expectations based on internalised values. Sense of personal responsibility, awareness of need, awareness of consequences	(Lokhorst et al. 2014; Schwartz 1977; Johansson et al. 2013)
Personal moral obligations	The degree of regret anticipated if the behaviour is not performed	(Gorsuch and Ortberg 1983; Ajzen 1991)
Social/group norms	The perceptions of whether other people in the reference group (e.g., farmers) perform the behaviour. Perceived pressure from others in the reference group (e.g., farmers) to adopt the behaviour	(de Snoo et al. 2013; Bamberg and Möser 2007)

Farmers may also engage with environmental learning and behaviour through networking with other farmers (Sligo and Massey 2007; Oreszczyn et al. 2010) and informal sharing of knowledge and know-how. Within the UK, farmers have increasingly engaged with environmental advice through novel local governance structures, such as catchment management initiatives and landscape partnerships. Some such approaches rely heavily on seeking to change social norms. Group sharing of information, as well as raising the visibility of individual farmer practices among their peers, sets new normative standards for acceptable behaviour (Barnes et al. 2013). This approach, for example, has led to improved farmer understanding of diffuse water pollution issues (Sabatier et al. 2005; Mills et al. 2008).

Usually studies of farmer environmental behaviour consider just the effects on farmers' short-term willingness and ability to undertake environmental management activities. However, in view of the need for more sustained, long-term and resilient behaviour change, research evidence suggests that 'engagement' with advice and support networks can help create interest, responsibility and a sense of personal and social norm (Dwyer et al. 2007; Pike 2013). Engagement means more than passive advice such as is available through a website or leaflet, but practical face-to-face interaction to complement and increase the effectiveness of interventions. By understanding farmers' motivations and values and the context within which they work, engagement strategies and the framing of advice can

be developed to resonate with them in a way that leads to sustained action.

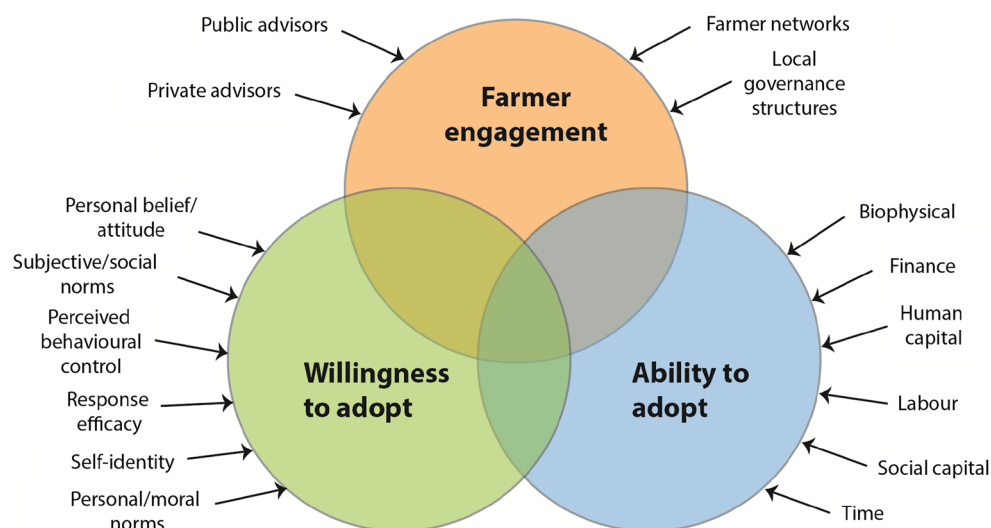
We suggest that there is a complex and iterative inter-relationship between all three elements discussed above, which influences farmer environmental decision-making and is perhaps best represented as shown in Fig. 1.

Methods

The paper draws on two research projects that were undertaken for the UK Government. One project was concerned with understanding and influencing environmental behaviour change among farmers (Dwyer et al. 2007). This involved a comprehensive literature review and 78 in-depth, face-to-face interviews with a range of farmers and farm families involved in five contrasting advisory initiatives in England covering soil, water and waste management practices. The study team also interviewed and convened a discussion group with scheme promoters and key stakeholders. The project led to the development of the two key conceptual frameworks presented in this paper (Figs. 1 and 3).

The empirical data presented in this paper is derived from a later research project for the UK Department for Environment, Food and Rural Affairs (Defra) (Mills et al. 2013a) which explored farmers' attitudes to on-farm environmental management. This project involved 60 in-

Fig. 1 Factors influencing farmer environmental decision-making



depth, face-to-face interviews conducted with arable or mixed farmers in England.

The interviewees were selected from a previous Government postal survey in relation to the Campaign for the Farmed Environment (CFE), an industry-led partnership approach to encourage farmers to voluntarily adopt environmental management practices (Clothier 2011). The Campaign promotes and offers guidance on agri-environmental activities, but offers no financial incentives. This original survey was sent to a representative sample of approximately 5500 arable holdings over 10 ha across different English regions and farm sizes. The aim of our selection process was to obtain a good coverage from this survey of the different combinations of formal (undertaken within an AES) and informal (outside of any scheme) environmental management activity as reported by the farmers and a range of farm sizes and different locations (see Table 2).

A few farm managers were interviewed, but the majority of those interviewed were the principal farmer, often a second or third generation farmer on a family farm.

The interviews were based around a semi-structured questionnaire, and usually lasted around 1.5 h. The interview schedule was designed to identify the key willingness

and ability factors identified in Fig. 1 that affect environmental behaviours. The questions covered:

- Farmers' situations—their needs, opportunities and constraints;
- Environmental behaviours, and how these may have changed over time;
- How attitudes have influenced decisions made, and vice versa; and
- Perceptions and opinions of different drivers and how these affect environmental decision-making.

The interviews were recorded and transcribed in full. The transcription was then analysed following an iterative and reflexive process using Nvivo, a qualitative data analysis software package as suggested by Bryman (2008) and Bazeley and Jackson (2013). Using a priori deductive codes, the data was first coded into broad categories. The second stage of the analysis took an inductive approach to further coding, capturing different patterns and themes within the broad categories. Finally, over a period of 3 days an expert panel was convened comprised of the study interviewers and ecologists to discuss each of the 60 interviewees, case by case, and to rate them on a 4 point scale for their willingness and ability to undertake

Table 2 Interview sample characteristics

Environmental management activity as reported by farmers	Nos. interviewed	Farm size	Nos. interviewed
AES & Informal	30	Small (≥ 10 and < 100 ha)	18
Informal only	25	Medium (≥ 100 and < 200 ha)	20
AES only	4	Large (> 200 ha)	22
No AES & informal	1		
Total	60		60

environmental management based on how they responded to the survey questions and the results of ecological surveys.

The next section of the paper uses the conceptual framework in Fig. 1 to explore and to understand how farmers' willingness and ability to adopt environmental management, and their level of engagement with advice, affects environmental outcomes.

Results

Levels of willingness, ability and engagement

Analysis of the responses revealed that the farmers interviewed could be placed in different positions within the conceptual framework presented in Fig. 1, depending on their level of willingness and ability to take up environmental management and their level of engagement with advice (Fig. 2).

Willing and engaged only

The data revealed farmers who had a willingness to undertake environmental management activities on their farm either within or outside of an AES, had engaged with advice through for example discussions with advisors, but this had not translated into behaviour because they lacked the ability to do so, either as a result of the biophysical constraints of the farm, or skills, labour and financial constraints. One interviewee, for example, had a personal interest in birds and was a member of two environmental organisations and expressed a desire to do more for the environment, but this had not translated into action. The interview revealed that whilst the farmer managed a small area of grassland informally on his farm to benefit wildlife,

he felt that the rest of the arable land on his farm lacked any obvious features, such as woodland, or ponds, that could easily be developed for environmental purposes, so mistakenly believed it unsuitable for conservation purposes and consequently had undertaken no positive action. In this situation he lacked the ability (knowledge and skills) to maximise the environmental potential of his farm. Training was needed specifically to equip the farmer with the practical skills and confidence to enable him to undertake positive environmental behaviour.

Able and engaged only

The study also revealed farms that were undertaking environmental management and had engaged with advice, but lacked sustained motivation to maximise environmental benefits. This included, for example, farmers who had joined agri-environment schemes for the financial rewards, but with no change in their underlying attitudes to environmental management work. They stated that once funding stopped they would revert back to previous production practices. Some farms were large, efficient farm businesses that saw environmental management only as a subsidiary income stream. They had sufficient management capacity to engage with agri-environment schemes, as well as tailor their activities to meet the minimum prescriptions required. Environmental management was viewed as a 'crop' that was managed according to the scheme prescriptions, with a tick box mentality, which meant that they did not undertake any more environmental activity than required by the scheme, unless there were clear agronomic reasons for doing so. To achieve sustained environmental management in the long-term with farms that fall into this group would require an increased internalisation of the values underpinning environmental management activities, among the farmers concerned.

Willing and able only

This type of farm was actively undertaking environmental management, but had not engaged with any advice which meant that the land was not delivering its full environmental potential. In our study this category is typified by a mixed farm where the farmer had a personal interest in wildlife with a wealth of knowledge about nature. However, as he lacked confidence that the AES prescriptions would deliver the required environmental outcomes (response efficacy) and the AES lacked flexibility to adapt to his local knowledge he had not engaged with any scheme and consequently not received any advice. As a result, some of the environmental management practices on the farm, as assessed by ecologists involved in the study (Mills et al. 2013a), were not as effective as they could

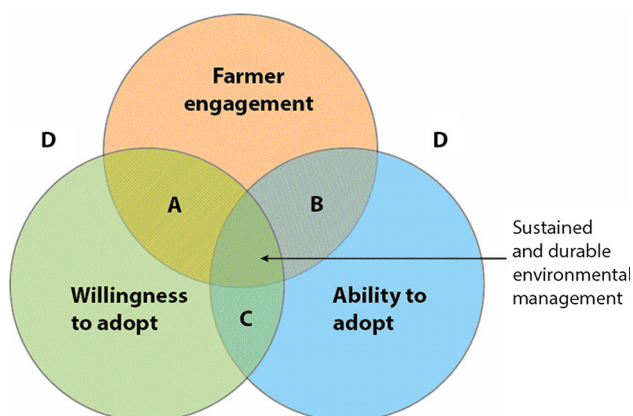


Fig. 2 Farmer categories depending on levels of willingness, ability and engagement

have been. Providing advice to those farmers that are ‘willing’ and ‘able’ can ensure the highest quality environmental outcomes for the land. This often requires specific scientific knowledge that farmers may lack. There may even be opportunities to support interested farmers to undertake on-farm experimentation to identify the best environmental practices for their farm. Some farmers may not seek this advice believing they are already producing the best environmental outcomes. However, the study also found that there is often a disparity between farmers’ perceptions of environmental benefits delivered by their activities and the observed environmental benefits, as identified by ecologists (Mills et al. 2013b).

Disengaged

There was also a smaller group of farmers who had not engaged with any environmental management, either because they were not willing, they do not have capacity, or they dislike outside interference or are concerned about loss of control or management flexibility. Often these farms were isolated and not part of any social grouping. They could be the least networked farms in our sample, lacking external information and thus more immune to social influences. Consequently, it was judged very difficult to influence their norms and self-identity.

Finally, there was a group of farmers who fell into the intersect between A, B and C. These farmers were committed to long-term environmental management on their farms and had the ability (time and resources) to undertake the work and to engage with environmental advice. For one such farmer the catalyst for his interest in the environment stemmed from contact with a University academic who monitored the plants in his ditches and persuaded him in the 1980s to change his annual ditch clearing to every 3 years. He has since had a long-term association with University academics and taken part in a number of monitoring trials, gaining considerable enjoyment from learning about the science involved.

Levels of influence on willingness

The literature suggests that of the three elements presented in Fig. 2, the hardest to influence is a farmers’ underlying beliefs and therefore their overall willingness to change (Pannell et al. 2006; Johansson et al. 2013; Gardner and Stern 1996). A complex set of inter-relationships influences willingness to change which can be usefully considered at three different levels: farm level; community level and societal level; as illustrated in Fig. 3. At the farm level evidence suggests that family members, particularly on large farms, have an important influence on the decision-making process (Burton and Wilson 2006; Blackstock et al.

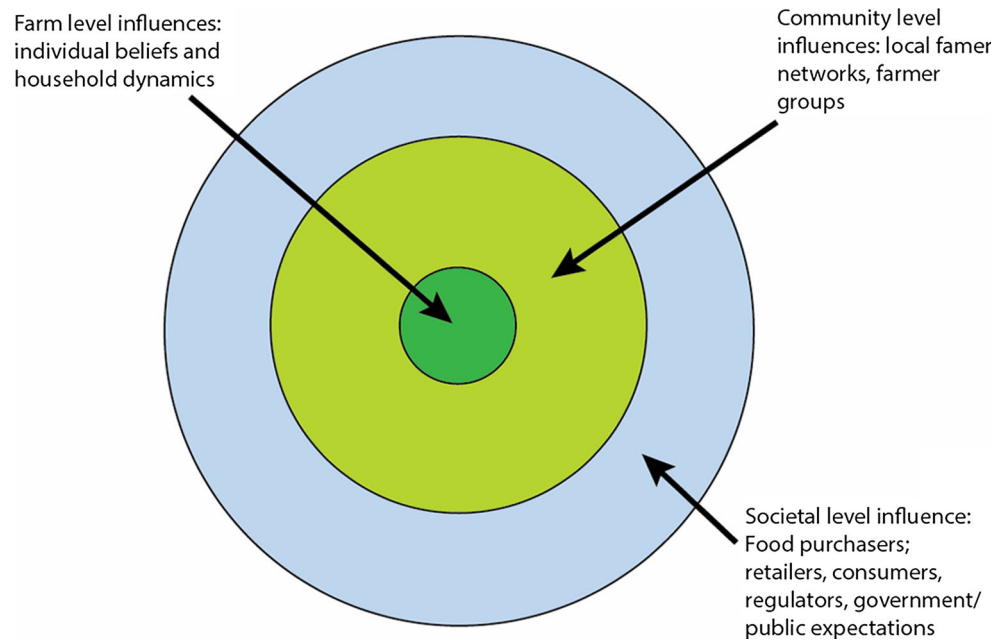
2010). Whilst at the community level, research has found that people are usually more influenced by in-group than out-group messages (Olson and Zanna 1993). Perception of societal wishes have also been found to influence pro-environmental behaviour by farmers (Beedell and Rehman 2000). We found evidence in our data that showed how these different levels of influence could in particular affect farmers’ beliefs, norms and self-identity.

At the farm level the influence of the individual farmer or family dynamics is important for environmental decision-making. As identified from the literature, at the core of an individual farmer’s attitude to environmental practice is their personal beliefs and moral norms. Our data demonstrated how farmers’ personal beliefs and norms appeared to affect their self-identity and overall farming philosophy, including their attitude to environmental management. Two important personal beliefs could be identified from the farmer interviews, based around the concepts of custodianship and productivity, which reflected how they perceived themselves as farmers (self-identity). This in turn affected the type of advisors that they engaged with. Those farmers expressing strong views on custodianship tended to be more positive about environmental management activities than farmers who emphasised the productive nature of their farming activities. However, these were not mutually exclusive groups and some of the farmers said that taking care of the land was not incompatible with productive farming. Also of importance was the influence of family members and particularly a strong influence from the previous generation, a reflection of the family nature of many farm businesses.

For those who displayed custodianship beliefs, the importance of taking care of the land and farming responsibly was stressed as was handing the land to the next generation of their family in ‘good heart’. For some, custodianship was seen as a moral obligation. Food production was only one of a number of considerations that had to be taken into account when deciding on how the land should be managed. Taking care of the environment in terms of resource protection, wildlife and biodiversity and landscape protection was seen as an important and sometimes essential part of being a good custodian of the land and part of their self-identity. Farmers with a strong view on the importance of custodianship also generally had a positive attitude to environmental management activities. Good agronomic and environmental management were seen as compatible and in some cases indistinguishable. An illustration of such a view of custodianship is provided by the quote below.

I’ve always been conscious of the wildlife around me. My father was a big believer in that we’re only farming for a very short period of time in the global thing, so we’re only borrowing the land and when you borrow anything from anybody, whether its land

Fig. 3 Levels of influences affecting farmers' willingness to change



or your next door neighbour's car, lawnmower or kettle or whatever, when you borrow anything you always put it back as good or better as when you got it. That's deep inside me with everything, with everything I do... That applies to the land just as it does with your next door neighbour's kettle. (AES only, large arable tenant farm)

The quote reflects the influence of a significant other, his father, in shaping his values. It was also common for farmers to talk about the need to find a balance between production and environmental management, which were not always viewed as conflicting needs. This was particularly the case on some of the farms that had replaced conventional ploughing with direct drilling systems.

In contrast to those who emphasised the importance of custodianship of the land, some farmers had an inherent, deep-seated personal belief that agricultural production should be maximised on productive land. This was sometimes couched in terms of needing to make a profit, but also in terms of the need to feed a world with impending food shortages, that it was a moral obligation. One farmer cited a large area of productive agricultural land close to his farm.

The world is short of food, full stop, end of story. To take land out of production and let somebody starve, morally is that right? Who is the prime species? Is it human or is it wildlife? It's a balancing act... There is a vast area of land, thousands of acres being taken out of production. Now this is prime vegetable growing land which is being taken out of production for the butterflies and the birds. Now morally is that right? There are areas in the country that can't produce a

good crop.... Let the poorer land go for the birds and the butterflies (AES only, large, arable, tenanted farm)

Similarly, another farmer argued that:

The world needs food and this here two metre margin amounts to a lot of land in a big field and that could be producing food that the country needs, well the world needs. It's around thousands and thousands of acres and it mounts up... We seem to be more interested in wildlife than we are people... That's my feeling. (Informal only, small, arable, mixed tenure)

The data also revealed evidence of differing inter-generational views about environmental management within a family, demonstrating that at the farm level, strongly held beliefs and values can change over time. One farmer who had recently taken over the management of the farm business from his father, had difficulties in persuading his father, who undertook all the ploughing, to leave grass margins against hedges. This young farmer was trying to undertake more environmental activities but was facing resistance from his father. As he explained in relation to leaving 2 m margins:

The only thing I did struggle with was my Dad because he doesn't like to leave these 2 m margins. He is totally against it; I had to threaten him because he does all the ploughing. It is just a generation thing. When my Dad was brought up if they couldn't get into the corner the ploughman used to get out and turn it over with a spade. With the hedges they used to dig under hedges to stop the weeds spreading. It

goes completely against how they were brought up. (No AES, medium, mainly horticultural, tenanted farm)

Some case study farmers reflected on how their views on the environment had changed. This quote reflects how the lifestyle of an individual can affect their willingness to adopt environmental practices.

I remember years ago when I was a young man, soon after I left school, there was a farm nearby where I farmed... It had a lot of parkland... I remember saying to my Dad one day, "Jesus if I farmed this I would rip all them trees out and plough up to the hedge." There was probably 10 metres around every field that they couldn't plough. I, as a young man, looked at it as a waste of land because it wasn't doing anything. It wasn't producing wheat; they couldn't cut it to produce hay It was just a waste. And Dad turned round to me and said 'thank the Lord you don't farm it boy.' And I look back at that and think how right he was. It's age, it mellows you... As a young man I did not see wildlife, I saw production of wheat, production of crop. As a young man I wanted to produce, I wanted to be the best farmer in the world. I wanted to produce the maximum from every acre that I farmed, that I rented. (AES and Informal, medium, arable, mainly tenanted farm)

Our data highlights that the personal beliefs farmers held about wildlife was often a key factor influencing those with a positive attitude to the environment. Where farmers have an interest in the environment, which can often be deep-seated, it can be a trigger to undertaking beneficial management actions on their farms and seeking advice to maximise these benefits. The interview survey found that farmers expressed their personal interest in the environment in different ways. For some the interest was lifelong and could be traced back to childhood and growing up on a farm, as reflected by this quote from a farmer who is not engaged in any AES

I've been interested in the environment since my childhood. Both me and my wife enjoy walking in the countryside. You look for things. I don't go around with a pair of binoculars, twitching. It is nice to see the wildlife about. It's nice to see the swallows; we never had those in years gone by. We have Canada geese coming on to the pond which we never had before, not that they are an endangered species. There are lots of bits and bobs. We also have black-headed gulls, when I'm ploughing I've had up to 7 herons following me down the fields picking up worms, which never happened before. This year for the first time ever I had a big tawny owl following me. There

are barn owls on the farm. (Informal only, medium, arable farm)

The following quotes highlight the enjoyment that these farmers derive from observing wildlife on their farms and the influence of positive management reflecting personal norms and contributing to self-esteem.

It creates a bit of habitat and some seeds for the birds, creatures, or whatever over winter. And I feel good about myself when I do that sort of thing. (AES only, small, dairy owner occupied farm)

When you are driving around on a tractor all the time you see a lot. I was driving the tractor last week and I had 13 buzzards following me. Last year I had 20 something and 2 red kites. They must be getting short of food to be after the worms. That has only happened in the last 10 years as the numbers have increased. We don't mind, it is nice to see the birds of prey. The red kites are beautiful; it is nice to see them up close. When you're sat on a tractor you can be 10 or 20 yards away and they don't mind, you get out and they have gone, the same with the buzzards. You can get really close to them. (Informal only, medium, mixed, owner occupied farm)

As the quotes above illustrate, the representation of the environment from these farmers' perspectives and many others in our interviews largely related to the higher species and particularly birds.

At the community level farmers' attitudes to the environment can be influenced by those who are in their reference group, and by their perception of how other farmers see them through social norms. For some of the farmers interviewed, having a productive farm and that other farmers recognised it as such, were seen as a status achievement. For these farmers, productivity was seen as the main criterion by which they and their farming should be judged. This was important for their own self-image as contributing to society more broadly, as well as running a profitable enterprise, and their status within the farm community. Environmental concerns were seen at best as secondary, or possibly tertiary uses for quality farmland and generally a distraction from the project of farming.

However, community image is a mutable concept and can change over time. One farmer suggested that what is considered acceptable farming practice within the farming community has changed over the years. This farmer when asked if he had undertaken any activities for the benefit of the environment initially responded in the negative and that everything he did was just normal farming practice. Then on reflection he recounted that the situation on his farm was very different in the 1970s when they had ploughed to the edge of every field, sprayed out all the hedge bottoms and

ditches to keep the weeds down and cropped the hedges to very near the ground. He said that such practices were the norm then but that he farms differently now, in that he has margins around every field, does not use as many chemicals and lets his hedges grow out more than he used to. When asked why he did this, his response was ‘to reduce pollution and to benefit the wildlife’.

Societal level influence through the way that farmers perceive consumer and public concerns can also affect farmers’ views and responses towards environmental protection. Our findings showed evidence amongst the farmers interviewed of a more positive attitude to the environment compared to three decades previously. A cultural change has occurred partly as a result of societal influences affecting subjective norms. In particular, negative publicity has had an impact as the following quote illustrates.

Over the years farmers have had a lot of bad publicity and rightly so..., in those days we were burning straw and if you lost a hedge, I mean we put firebreaks in, but no one said much about it (Informal only, large, arable, mainly tenanted farm)

This need to be seen to “be doing the right thing” was demonstrated by a number of farmers in the survey whose farms abutted nature reserves which motivated them to do more for the environment. They felt under an obligation (or observation) to undertake environmental management practices, in part as it contributed positively to their societal image.

It is easier to have the margin because on the other side of the ditch the land belongs to an ecological trust and they have trees and fancy grass and bird boxes and all that and I thought it might look like I was doing my bit as well. (No AES, medium sized, tenanted, horticultural farm).

Evidence of this sense of social responsibility was even found amongst those not participating in an AES. Some had come out of an AES, but were continuing some of their activities and were particularly keen to highlight that they were contributing to the environment, despite not being involved in an AES.

The social influence of the farming community and broader society on farmers’ attitudes to environmental management has not been uncontested. The productivist values that dominated much of the post-war period are still an important influence on farmers. Recent discussions surrounding food security and the threat of impending world food shortages were drawn on by some farmers in the interviews to justify some of their land management practices and lack of engagement in environmental management activities, as they felt they had a social responsibility to produce as much as possible from their land.

Discussion: implications for farmer engagement

The research findings showed considerable heterogeneity in the levels of farmer commitment to environmental management. Consequently, advisory approaches need to be able to understand and to cope with this heterogeneity and must adapt and target messages accordingly (Blackstock et al. 2010). They must also be sensitive to the ways in which different combinations of farmers’ level of willingness, ability and engagement, in different circumstances or even between different farms in similar circumstances, will present different challenges and opportunities. To be able to develop this understanding and locate advice in its farm specific context requires some degree of personal engagement.

The interviews have shown the importance of understanding values and personal and social norms, as well as pragmatic and economic factors, affecting farmer environmental behaviour. Of particular importance are beliefs about custodianship and productivity. By having this awareness of the underlying values and norms that shape farmer decisions, we suggest it would be possible to frame advice messages and to develop advisory programmes that work more collaboratively in partnership with individual farmers and farm families to encourage more effective and sustainable environmental behaviour. We recognise, however, that it is generally easier to change environmental beliefs and attitudes through advisory approaches than particular ethics or values, which take longer to change (Johansson et al. 2013; Gardner and Stern 1996). Some attempts have been made to segment farmers into behavioural groups which recognise different underlying values and motivations (Wilson et al. 2013). However, we believe that the most effective way of gaining a nuanced understanding of the factors affecting farmers’ environmental behaviour is through one-to-one advisory programmes.

Our findings identified different farmer groupings based on their level of willingness and ability to change, as well as their extent of engagement with advice, for environmental management. For the farmers falling into group A in Fig. 2 that are willing to undertake environmental management activities but are unable to respond to advice due to biophysical, economic, technological or labour constraints (a value: action gap), educational and/or financial support may help to galvanise such farmers into action. The approach in this situation could be through some hands on learning process, enabling development of specific skills and confidence (Petty et al. 2003), coupled with finance targeted at removing or reducing specific constraints, as far as feasible.

For farms in group C, where the farmers are willing to be engaged with environmental activity but have not taken

up external advice through fear of loss of control or outside interference, then information could be disseminated through environmental or other organisations to which the farmers belong. Alternatively, they could be encouraged into action through more of a partnership working process, enabling them to experiment with different options, contributing their own knowledge, whilst also providing a sense of ownership and control.

For those who are implementing environmental activity but with no accompanying attitudinal change (Group B), initially financial incentives can be positive if they introduce farmers to new ways of doing things and to new people, change initial beliefs and introduce new “habits” (Kuhfuss et al. 2015; Hiedanpää and Bromley 2014). However, evidence suggests that eventually, to ensure sustained environmental management, an internalisation of the values underpinning environmental management activities is required, which is a challenge to achieve through financial support alone. Use of nudges may help in these situations. For example, providing information about the pro-environmental behaviour of other farmers in their peer group could be a powerful nudge. Also, engaging farmers within schemes in a learning process, where they share their experiences with experts and other farmers, encouraging discussion and debate about outcomes and perhaps offering encouragement to engage in this way through prizes and newsletters and reporting and celebrating progress could be beneficial. However, there is evidence that unless these nudges lead to environmental management activities that become habituated their influence can diminish overtime (Allcott and Rogers 2012).

The group of farmers who are most difficult to engage and have a negative attitude to environmental management may have strong self-identities related to food production. It may be difficult to influence this cohort of farmers through advice alone. Our research found that often these farms are not well networked or part of any social grouping and therefore lack information and may be more immune to wider community level influences. This situation makes it difficult to change norms and self-identity through advice and support programmes. Others may be disengaged from advice due to negative experiences. This was evident in our study where farmers’ experiences of the inappropriateness of particular AES prescriptions led them to disengage from schemes. One way to achieve behavioural change on such farms is to work with the next generation of farmers and to seek tactics which explicitly couple improved business management with a higher level of environmental management: presenting a younger cohort of farmers with a challenge to step up to enhance performance across the board. There is evidence to suggest that deeply-held values within a farming family can change across generations (Elder and Conger 2014).

At the *farm level*, it is a challenge to change an individual farmer’s deeply-held values and beliefs, particularly through advice to an individual alone. However, this change can occur through extended periods of personal interaction with a known advisor or peer group and the building up of trust over time (Sutherland et al. 2013). In general, the higher the credibility of the advice source, such as people from farming backgrounds or trusted networks, the higher the persuasion factor will be (Blackstock et al. 2010). Advice can also be effective in engaging farmers by identifying an issue, problem or particular species of interest to the individual, such as flooding or soil erosion issues or visible or emblematic species in decline such as birds, flowers, pollinators. There was strong evidence from our interviews of a widespread interest in birds among farmers which had led to conservation efforts, including by farmers who were not part of an AES.

Advice delivered at the *community level* through farmer/peer groups might prove more effective at influencing and engaging farmers in environmental behaviours than advice to individual farmers (McGuire et al. 2013; Mills et al. 2011). There is evidence that environmental messages passed through a group can create a positive social norm (if most farmers in the group take up the message). Through group sharing of information and best practice with their peers, perceptions of what is deemed appropriate behaviour become more accepted and this increases feelings of personal responsibility (van Dijk et al. 2015; Mills et al. 2011; Barnes et al. 2013). In the case of environmental change, it can also increase response efficacy, as individuals feel they are more likely to achieve a positive outcome if all are working towards resolving the issue. For advisory approaches to work at this level requires an understanding of who is in the farmer’s network (their reference group), whom they trust and could possibly take a local delivery, partnership working approach.

The positive environmental behavioural response of those abutting nature reserves is an interesting observation and may reflect what Goddard et al. (2013) refer to when looking at environmental behaviour in urban settings, as neighbour mimicry—a feeling of not wanting to let the standards down in an area. This was an observation also noted by Mills et al. (2008) when looking at the social processes involved in motivating a group of farmers undertaking environmental management practices, such as hedge management in a water catchment. This social process could be harnessed to encourage more environmental behaviour within a particular locality.

At the *societal level* changing farmers’ values and beliefs is easier if they recognise that it is something that society wants and values. It is government’s role to ensure clear, consistent, practical messages on desired behaviour are delivered to farmers, as to other citizens. Within living

memory (and bearing in mind the relatively high average age of farmers today), farmers in the UK have received some contrasting messages about what society requires of them, often couched in terms of a trade-off, between being managers of the UK countryside and custodians of the natural environment first and foremost (Department of Environment and Ministry of Agriculture Fisheries and Food 1995; Department of the Environment Transport and the Regions and Ministry of Agriculture Fisheries and Food 2000), and being global food producers with a duty to produce marketable outputs cheaply and efficiently, as the priority (Her Majesty's Stationery Office 1979, 1975). Policy-makers need to encourage and reinforce a sense of civic responsibility for environmental management among the farming community, particularly given the emerging discourse about the need to maximise food production to counter threats to food security caused by increased global demand. Policy-makers have a role to play in communicating the more sophisticated message that environmental management and productive agriculture are not mutually exclusive but must work hand-in-hand. In that context in particular, the modern policy rhetoric of 'sustainable intensification' may be useful for encouraging a 'twin-track' approach to future farm management, but only in so far as the environmental element is promoted as strongly as the intensification message, and in combination with it. History suggests that farmers can be motivated by a feeling that their core purpose (as they see it) of food production is explicitly valued and encouraged by government, but it would seem essential that this process is today fostered within a wider climate of farming 'better', in respect of protecting and sustaining environmental resources, rather than presented as a swing of the political or economic pendulum back to the narrowly output-oriented focus of the early 1980s.

Finally, in the process of behaviour change, farmers often state that they would value a much greater level of feedback and public or formal recognition that they are doing a good job or at least making a positive contribution that is valued (see, for example, Ingram et al. 2009). This feedback in itself can help in the process of identity verification and in establishing new norms for the practice of environmental management (McGuire et al. 2013). For example, (Kuhfuss et al. 2015) found that farmers who experienced acknowledgment for their contribution to the protection of the environment or a better life quality were more likely to maintain the adopted practices even in the absence of payments. However, in recent years, as a result of the pursuit of 'greater efficiency' in the delivery of agri-environmental schemes, the vast majority of farmer participants have received almost no feedback on the results of their changed practices, from government agencies or environmental NGOs supporting the schemes. Rather, the

national and international message of campaigning organisations that 'things are still getting worse, and policies are insufficient' is prominent in media coverage. Without a more personal level of positive feedback, this could lead to cynicism and a sense of futility among farmers in respect of their (admittedly, often modest) environmental efforts. It would therefore seem worthwhile for some advisory resource to be devoted to this purpose.

Conclusions

The paper has presented two conceptual frameworks which we feel are helpful in understanding the complex set of inter-relationships influencing farmers' willingness to undertake environmental management practices and which can assist in developing appropriate engagement approaches. The first framework is useful in identifying factors affecting farmers' levels of environmental activity depending on their willingness and ability to adopt environmental management practices and their existing level of engagement with advice. The second conceptual framework helps in showing how farmers' willingness to adopt environmental activities is affected by influences at different levels which range from individual beliefs and values to community and societal norms. Our research findings highlight the considerable heterogeneity of farmers' beliefs and values in relation to custodianship and productivity. Consequently, advisory approaches need to be able to understand and to cope with this heterogeneity and need to adapt and target messages accordingly. We would suggest that further research, particularly approaches involving action research and working closely with farmers in the co-production of knowledge and understanding, could help to clarify and test the most appropriate engagement messages and approaches required in different situations.

Reflecting further on the insights achieved through these studies, we note that whilst appropriate advice and engagement strategies are important, the ultimate aim is to achieve sustainable and durable environmental activity. This calls for a balanced mix of policy measures also involving partnership working, incentives and regulations. There is the need for a coherent policy and advice framework in which regulations and incentives are important elements for signalling societal norms and expectations, but advice and engagement are equally important ingredients in helping to encourage sustained behavioural change on the ground. There is, in fact, a growing number of local partnerships and/or farmer-group initiatives which are offering new ways to engage the sector in deliberative environmental management (Hodge and Adams 2014). However, most of these are relatively short-term projects,

which presents a challenge to building trusting relationships and encouraging sustained outcomes.

Ultimately, farmers need to be encouraged and empowered to take long-term ownership of the environmental agenda and work in a more equal partnership with government agencies and NGOs, to deliver resilience and adaptability in the face of unpredictable challenges (e.g. from climate change and global market volatility), for the future.

Given the long-term nature of the endeavour in which society has engaged in pursuing greater environmental sustainability on agricultural land, establishing a longer-term approach to agri-environmental support which focuses on influencing the underlying beliefs and values of farmers, and which is less directly dependent upon current public finances which are currently subject to year on year decline, could be a worthwhile investment.

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