Social Indicators for Agri-environment Schemes – Evidence Review

Final Report

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Executive Summary

The overall aim of this evidence review was to identify a set of social indicators that can be used to assess the social outcomes of Agri-Environment Scheme (AES) agreements and their link to environmental outcomes based on a systematic literature review with the key criteria being that they are empirically and conceptually sound. These aims were achieved through the following activities:

1) A review of literatures on how social factors affect the nature or 'quality' of farmer engagement with AES (attitudes, ownership, motivation, etc.) and associated behaviour change (long-term).
2) A review of the literature on the linkages between social and environmental outcomes (with particular references to AES), including an indication of knowledge gaps.
3) The compilation of a recommended list of key, testable, social indicators, based on the evidence review which have the potential to be used for evaluating the quality of farmer engagement with and the social outcomes of and social sustainability of agreements.

Method

Following an extensive search of the literature, 142 journal articles and reports were analysed for the review. Within these documents, key factors affecting the quality of agri-environment engagement and the social outcomes of AES were identified. These factors were then rated for their level of impact (in terms of the number of papers in which the factor was mentioned) and the strength of link they indicated between social and environmental linkages. These ratings were then used to derive high-level indicators and sub-indicators, based on the evidence of impact. Further details on the methodological approach are provided in the main report.

Indicators

Two sets of indicators were identified**.** One set measures the nature and 'quality' of farmer engagement with their agreement within an AES, which we refer to as '**engagement factors**'. For example, engagement factors could include a personal interest in wildlife, the level of farmer agency on their farm, or the influence of social norms on the way a land manager thinks about AES and their agreement. The second set of indicators measures the social outcomes which result from land manager involvement in an AES, referred to as '**social outcomes'.** These indicators can be used in impact and effectiveness evaluations to understand the 'what' (outcomes) and 'where' these occur. Land manager engagement with an AES may have positive or negative social outcomes for the land manager and hence impact the scheme's social sustainability. Social outcomes could include increased social networks, increased confidence as a result of gaining new skills and knowledge, or increased stress due to demands on time.

The indicators identified from the literature review are summarised below:

Engagement Factors

1) Willingness to engage

1. Indicator: Interest in and awareness of the environment - Interest in the environment affects farmers' attitude towards the environment and is most commonly identified as a factor affecting farmers' quality of engagement with agri-environment activities. A number of sub-indicators were identified in the literature as influencing farmers' interest in and awareness of the environment:

- Awareness of and interest in wildlife (species and habitats)
- Awareness of and interest in cultural and landscape assets
- Extent of environmental knowledge
- Extent of unsubsidised environmental activity
- Sense of environmental responsibility
- Interest in game shoots
- Experience of on-farm environmental issue
- Gender – female farmers more environmentally orientated

2. Indicator: Engagement with advice and training – There is evidence that the quality of AES engagement and environmental outcomes are enhanced when agreement holders have received on-farm advice, engaged in an open and constructive dialogue with their adviser and attended training courses.

- Level of engagement with advice
- Level of rapport with adviser
- Level of engagement with training

3. Indicator: Self-identity - Self-identity is the extent to which behaviour is considered to be part of the self and can relate to the social group that the farmer identifies with. It reflects the farmer's personal value system and worldview, which are based on farmers' experiences and moral values and act as internal frames of reference. The image farmers have of themselves contributes to their extent of engagement with AES. A number of different types of farmer self-identity based on underlying values and their impact on environmental behaviour have been identified in the literature and broadly equate to: Profit maximisers; food producers; and custodians.

4. Indicator: Level of AES experience - Length of previous AES experience: Studies have found that the length of experience within an AES scheme can positively affect future AES engagement. Experience is believed to increase the level of skill and knowledge of a particular practice which, in turn, increases the efficacy of the behaviour. Undertaking AES practices for a number of years may lead to greater environmental success or benefits increasing the likelihood of continued involvement.

5. Indicator: Interest in experimentation - Any evidence of experimentation would demonstrate a significant level of engagement with AES, although currently there is no incentive within the restrictive prescriptions of AES to experiment with different approaches.

Engagement Factors

2) Capacity to engage

1. Indicator: Farmer age - Although farmer age is frequently used as an indicator of environmental behaviour, the literature review revealed contradictory evidence. As a result, farmer age is not considered a reliable indicator of the likely quality of engagement in an AES.

2. Indicator: Succession - The evidence on succession and its effects on environmental behaviour is often contradictory. For example, some evidence suggests that land managers without successors are more likely to disengage from full-time agriculture and extensify using AES. However, others have found a lack of a successor was often a reason for farmers not to enter land into a conservation agreement due to winding down, poor labour availability or wanting the flexibility to sell the land.

3. Indicator: Lifecycle stage - Many of the strategic decisions farming families make depend on their family's stage in life or 'life-cycle', with expansion and retrenchment 'switched on and off' at different times in the farming family life cycle. Thus, lifecycle stages can be indicative of different motivations and pathways that have a direct impact on environmental decision-making

- Stage in lifecycle
- Future trajectory

4. Indicator: Financial stability - There is evidence that those farms that are more financially stable are more likely to engage with AES. They have the resources (both time and money) to fully engage in environmental activities and are generally less risk adverse. However, it would appear that the income effect is dependent on the level of investment that is required by the AES.

5. Indicator: Farmer education - In many studies, farmers' formal education has proved to be one of the strongest variables determining conservation behaviour (e.g. Dupraz *et al.*, 2002; Wilson, 1997). -Their general finding is that farmers who have a comparatively low formal education (i.e. left school without exams) are less likely to participate in agri-environmental schemes or to adopt environmentally-friendly farming practices.

6. Indicator: Farming system and farm type - The literature review revealed that farmers of extensive farming systems were more likely to engage in AES than farmers of more intensive livestock and arable farms. Although, some evidence suggests that views on the AES's goodness of fit with the farming system is likely to be a better indicator of the quality of engagement than the actual type of farming sytem.

- Type of farming system
- Quality of agricultural land

7. Indicator: Farm size – Farm size is often included as an indicator in environmental decision-making studies. However, the evidence is contradictory and normally size interacts with other factors. For example, a cereal farm may be both large in area and economically, but it may have limited land to enter into AES, whilst some upland farms may be large in area but very small economically.

8. Indicator: Farm tenure - In the literature, it is generally shown to be the case that tenant

9. Indicator: Resilience - Resilience refers to the ability of farm businesses to recover quickly following difficulties and can affect the quality of AES engagement. Two sub-indicators were identified that may affect resilience and hence quality of AES engagement:

- Farm income (off and on farm): There is evidence to suggest that part-time farmers are more constrained and lack flexibility to respond to environmental concerns and opportunities, whilst other studies have identified a greater number of part-time farmers participating in AES. Due to disparities in the findings between different countries and no conclusive UK study, dependency on the farm for income appears to be an unreliable indicator of the quality of engagement in AES
- Labour availability: Unsurprisingly, having sufficient numbers of employees on the holding to undertake AES management tasks can impact on the quality of AES engagement

10. Indicator: Agency - In social science, agency is the capacity of individuals to act independently and to make their own free choices. In the context of AES, agency refers to the capacity for farmers to make their own decision as to how they manage their land within an AES. Two sub-indicators were identified that may affect agency and hence quality of AES engagement:

- Control over agreement: control over the design of an agreement creates a greater understanding and sense of 'ownership'
- Incorporation of farmer knowledge

Engagement Factors

3) Farmer engagement with others

1. Indicator: Bonding social capital - Bonding social capital is characterised by strong relationships within groups or families (homogeneous individuals) and refers to horizontal ties between peers. Strong bonding social capital can result in information sharing and collaborative working which can improve environmental outcomes. Three sub-indicators were identified that may reflect the presence of bonding social capital:

- Extent of group working
- Extent of information and knowledge sharing (farmers' group)
- Level of social trust

2. Indicator: Bridging social capital – Bridging social capital refers to social connections between individuals who are dissimilar with respect to socioeconomic and other characteristics (heterogeneous individuals). The relationships between people in these networks tend to be weaker, and less sustained than those demonstrating bonding social capital, but contribute advantage through new information and possible introductions to new networks. The extent of bridging social capital appears to have an effect on AES engagement. Two sub-indicators identified to impact on bridging social capital are:

- Extent of non-agricultural networks: farmers who are frequently engaged in non-agricultural networks are thought to be more likely to be involved in AES as they feel a greater social responsibility.
- Public recognition: gaining social recognition for AES activities is a strong motivator for some

3. Indicator: Linking social capital - Linking social capital is used to describe networks of people characterised by power differences; the links between farmers and institutions. Such connections are important for accessing support from formal institutions through personal contacts. Two sub-indicators can be sued to assess the linking social capital of farmers:

- Ability/desire to form positive relationships with government agency staff, landlords etc.
- Level of social trust in government

4. Indicator: Cultural (symbolic) capital - Cultural capital is a form of symbolic capital that refers to the accumulation of knowledge, behaviours, and skills that demonstrate a farmer's competence, and influences his/her social status or standing in society. For example, evidence of respect and positive judgements by other farmers for their AES activities, including the seeking of advice on AES implementation, demonstrates prestige (symbolic capital) and reinforces AES engagement.

- Respect amongst peers

Social Outcome Indicators

The following indicators were identified from the literature as potentially useful for assessing social outcomes arising from participation in AES.

1. Indicator: Awareness of and interest in the environment - Engagement in an AES has been shown to increase farmers' awareness of environmental issues and the environmental impacts of specific management activities. Attitudes to AES can change over time as farmers recognise the ease or difficulty of undertaking environmental activities and experience environmental successes or benefits. Sub-indicators of this indicator are:

- Change in awareness of the environment
- Change in sense of environmental responsibility
- Change in attitudes due to knowledge about ease or difficulty of implementing
- Change in attitudes due to experience of environmental success or failure

2. Indicator: Knowledge and skills – Farmers who have gained new knowledge and skills from AES involvement, and have increased their confidence in their abilities to deliver environmental outcomes are more likely to continue pro-environmental behaviours in the future. This can be indicated by:

- Change in confidence and abilities
- Change in understanding of AES rationale

3. Indicator: Connectedness - Changes in farmers' overall levels of social connectedness were identified as an outcome of AES engagement. This outcome was represented by several sub-indicators:

- Change in levels of social interaction
- Change in levels of social isolation
- Change in learning capacity

4. Indicator: Social Capital - Social capital relates to social relationships that have productive benefits. The presence of social capital can result in increased levels of trust, collaborative working and changes in socially and culturally acceptable behaviour. This can be assessed by looking at:

- Change in levels of social trust
- Change in levels of collaborative working
- Change in social and cultural norms

5. Indicator: Change in Cultural Capital (respect) - Cultural capital refers to the accumulation of knowledge, behaviours, and skills that demonstrate a farmer's competence and influences his/her social status or standing in society. This social outcome can be represented by changes in levels of respect as a result of AES participation. Evidence of gains in cultural capital are apparent if famers are approached for advice about their AES management practices. Also, cultural capital can be gained if a farm whose walls and fences were once in disrepair have been repaired and erected as a result of AES participation. On the contrary, if AES management is not considered part of "good farming" practice and its benefits are not clearly visible, cultural capital might be lost.

6. Indicator: Public image - Evidence suggests that if farmers receive positive feedback and public recognition for their environmental activities, they are more likely to maintain them.

7. Indicator: Agency - One outcome from AES where management practices are heavily prescribed with limited flexibility, is a sense that prescriptions are imposed in a top-down way with little consideration given to local or tacit knowledge. Farmers can feel that they have lost some control over the management of their land and even feel that they have been dispossessed, which can affect environmental outcomes.

8. Indicator: Resilience – involvement in an AES has the potential to contribute to an increase or decrease in farm resilience. This outcome was represented by several sub-indicators:

- Changes in business security
- Changes in business structure

9. Indicator: Labour availability - There is evidence that AES participation can increase demands on labour which can increase levels of stress. In contrast, in areas of widespread underemployment labour demands can provide work for underemployed farm workers and family members.

10. Mental health and subjective well-being - Only two studies were identified that looked at the interlinkages between mental health and wellbeing and AES participation. Some studies have looked at the quality of life and mental health and well-being effects of agriculture more generally and we have drawn on this literature to make inferences about the impact of AES participation on mental health. Four sub-indicators of stress were identified that could be affected by AES participation:

- Change in stress levels due to workload
- Change in stress levels due to AES administration
- Change in stress levels due to financial issues
- Change in stress levels due to conflicts with associates or family members
- Change in stress levels due to enjoyment of environmental outcomes

Indicators of social sustainability

The study also undertook a review of on-farm indicators that could be used measure the social sustainability of AES. As no studies explicitly considered the social sustainability of AES, the review focused on emerging studies looking at the social sustainability of agriculture. Four high-level indicators were identified, each with a number of sub-indicators:

1. Indicator: Employment and working conditions

- Holiday days
- Free days per week
- Off farm working
- Av. Peak working hours

2. Indicator: Social engagement

- No. organisations participates with
- No. events participated in

3. Indicator: Job satisfaction

- Daily job tasks
- Work life balance
- Being a farmer
- Freedom of decisions
- Overall

4. Indicator: Quality of life

- Satisfaction with quality of life
- Overall quality of life
- Happiness

Key indicators where links between environmental and social outcomes were identified related to farmers' interest and awareness in the environment, their level of engagement with advice and training, the development of their knowledge and skills in relation to environmental management, the extent of social interaction and public acknowledgement as a consequence of AES, and engaging with other farmers or the public affecting norms and cultural capital. The indicators relating to farmers' capacity to engage with AES revealed less evidence of links to environmental outcomes.

A number of feedback loops were identified between engagement factors, social outcomes and environmental outcomes. For example, the more an agreement holder is engaged in receiving advice and training about their agreement, the more conscious they become of the environmental impacts of their management practices, leading to continued activity. Furthermore, the more deeply a farmer is involved in AES activities, the more knowledge is gained about the ease or difficulty of a particular behaviour. As their confidence grows in their skills and abilities they are then more likely to continue the activities. The longer the engagement in AES, the greater the likelihood of recognising and/or experiencing environmental success or benefit. This outcome can then result is an increased desire to

continue with that activity and to be motivated to perform additional pro-environmental activities in the future. If this behaviour is then recognised as 'good farming' within the farming community, and the farmers receives respect and prestige from other farmers for their AES activities, or at least public acknowledgement then the pro-environmental behaviour will become further embedded.

If AES offer an opportunity for farmers to diversify their networks, this can result in a number of positive social outcomes. It can, for example, reduce social isolation, increase information and knowledge sharing and lead to the development of more trusting relationships. However, AES involvement can also potentially produce negative social outcomes, particularly if participation increases levels of stress as a result of administration difficulties or pressures on workloads and financial resources, or if farmers feel they are losing control over the management of their land. These factors can all influence the social sustainability of farming, which can be measured in terms of working conditions, social engagement, job satisfaction, and quality of life.

Evidence Gaps

One clear evidence gap that has emerged from the review is the paucity of literature on the social outcomes of AES. It is also clear that the majority of evidence to date tends to focus on the positive, rather than the negative factors affecting the quality of AES engagement or social outcomes.

Whilst there is more evidence focusing on the monitoring of AES engagement, rather than social outcomes, even this data tends to focus on reasons for AES participation, rather than the quality of AES engagement.

Another evidence gap relates to measuring the social sustainability of AES. This review has, therefore, undertaken a wider review of indicators used for measuring the social sustainability of farms more generally.

Next Step

The next step of the project was to select a short list of indicators to test from the long-list identified in this review, accounting for practical considerations. Recommended selection criteria included:

- Relevance - criteria related to the appropriateness of the indicators in terms of context and quality of the analysis.
- Practicability - criteria related to the practical nature of indicator calculation and implementation.
- End user value: criteria related to the use of the indicators by those undertaking the monitoring and evaluation.

Knowledge transfer and dissemination plans

Awareness of the project was raised through a Natural England intranet article. The long-list of indicators was presented to Natural England staff during a webinar with an opportunity provided to feedback on the indicators through two polling questions. The report will be widely promoted on the CCRI website and in their newsletter. Findings will also be published in a peer-reviewed journal article.

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1 Introduction

Agri-environment schemes (AES) were introduced in England with the 1986 Agricultural Act following concerns about the negative environmental impacts of agriculture, the need to support existing environmentally valuable farming practices, and to enhance habitats and landscapes. The original scheme, Environmentally Sensitive Areas (ESAs), was introduced in 1987 and offered incentives to encourage farmers to adopt agricultural practices which would protect and enhance particular areas of the country. This scheme was followed by the geographically wider Countryside Stewardship scheme (CSS). These 'classic schemes' were then replaced by Environmental Stewardship (ES) scheme in 2005. This scheme adopted a multi-tier approach delivering outcomes through Entry Level Stewardship (ELS), a broad and shallow scheme, Organic Entry Level Stewardship (OELS) and, a targeted and more demanding, Higher Level Stewardship (HLS). This scheme was then replaced by Countryside Stewardship (CS), which was launched in 2015, and brings together a range of environmental protection measures, formerly delivered as three separate schemes: Environmental Stewardship; Catchment Sensitive Farming Capital Grant Scheme and Woodland Grant Scheme.

A requirement of the schemes run under the Rural Development Programme of the Common Agricultural Policy (CAP) is to gather evidence that can contribute to the overall evaluation of the programme. Natural England and Defra operate a monitoring and evaluation programme aimed at providing evidence for the effectiveness of AES. This monitoring and evaluation work has largely focused on identifying the environmental outcomes and the economic impacts of the schemes. Less attention has focused on understanding the intentional or unintentional social outcomes of AES as it relates to the social world of the agreement holders. A better understanding of these social outcomes is salient as there is increasing evidence that they have important impacts on environmental outcomes and, in particular, the agreement holder's willingness to undertake environmental activities in the longer-term.

The comprehensive review of evidence and selection of indicators undertaken in this project will provide an enhanced understanding of how social outcomes of AES can be monitored and evaluated. Furthermore, there will be an improved understanding as to how these social outcomes link to environmental outcomes and in particular long-term and long-lasting environmental behavioural changes and enhanced environmental quality manifesting itself in, for example, farmers' voluntarily undertaking unsubsidised environmental management practices. The review will highlight ideas for how to maximise and sustain (i) positive social outcomes from future AES to increase pro-environmental behaviour and (ii) how to assess the quality of engagement a land manager has with their agreement with the aim of delivering improved social and environmental outcomes.

1.1 Aims and objectives

The aim of the first stage of the project was to identify a set of empirically and conceptually sound social indicators that can be used to assess the social outcomes of AES agreements and their link to environmental outcomes, based on a systematic literature review. The project's overall objectives was to provide:

1) A review of the literature on the linkages between social and environmental outcomes (with particular references to AES), including an indication of evidence gaps.
2) An understanding of how social factors affect the nature or 'quality' of farmer engagement with AES (attitudes, 'ownership', motivation, etc.) and associated behaviour change (long-term).
3) A recommended list of key, testable, social indicators that can be used to evaluate the quality of farmer engagement with AES and the social sustainability of agreements based on the literature review conducted. The focus here was on indicators that:
    - are applicable at the farm-level,
    - are conceptually sound,
    - have potential for evaluating the social sustainability of agreements,
    - can be measured, either quantitatively or qualitatively,
    - are repeatable,
    - are technically feasible and easy to administer during Natural England aftercare visits.

The second stage of the project determined a method to operationalise the monitoring and evaluation of these social indicators. The third stage of the project tested the proposed method on farms with existing CS or ES agreements to provide a 'ground truth' of practicality and validity. These two stages of the project are presented in a follow-on report.

2 Method

2.1 Conceptual Framework

In this project, we define a social (or socio-psychological) indicator as something that points to, measures or otherwise provides a summary overview of a specific social or psychological concept. For example, we can measure if the farmed land is owner-occupied in order to gauge the possible level of agency[1] the farmer has with regard to making decisions about the agri-environment management of their farm. The personal social outcomes, in relation to AES, are intentional or unintentional outcomes of the agreement which relate to the social world of the agreement holder. They could be positive (e.g. increased pride or confidence) or negative (e.g. increased stress or reduced motivation to engage in future AES). Other social outcomes from an AES might relate to the contribution of AES to wider society and quality of life in the rural community (e.g. employment provision, cultural ecosystem services), rather than to the individual. However, as the possibility of monitoring these wider impacts at the farm-level during aftercare visits is unlikely, this impact type is considered outside the scope of the project.

To achieve the aims of the project two types of social indicators are required. The first set are indicators that measure the nature and 'quality' of farmer engagement with their agreement within an AES. This relates to the Government's process evaluation in understanding the 'how' and 'when' of good quality farmer engagement. In the report we call these '**engagement factors**'. For example, engagement factors could include a personal

[1] capacity of farmers to act independently and to make their own free choices.

interest in wildlife, the level of farmer agency on their farm, or the influence of social norms on the way a land manager thinks about AES and their agreement. All of these factors can affect the land manager's quality of engagement with an AES. The quality of land manager engagement with AES can affect the quality of the environmental outcomes. In turn, this can have a negative or positive reinforcing effect on the factors influencing the quality of engagement – a reinforcement/feedback loop (see Fig. 2.1).

The second type of social indicator measures the social outcomes which result from land manager involvement in an AES. We call these '**social outcomes'.** These indicators can be used in impact and effectiveness evaluations to understand the 'what' (outcomes) and 'where' these occur (H M Treasury, 2011). Land manager engagement with an AES may have positive or negative social outcomes for the land manager and hence impact on the scheme's social sustainability. Social outcomes could include increased social networks, increased confidence as a result of gaining new skills and knowledge, or increased stress due to demands on time. In the context of this research, our definition of social sustainability is based on Bostrom's (2012) definition as including quality of life, social justice, social cohesion, cultural diversity, democratic rights, gender issues, human rights, participation, social capital development and human capability.

These social outcomes can have a negative or positive effect on environmental outcomes which in turn can affect engagement factors and quality of engagement. Thus, it is recognised that there may be overlap between these indicators and potential for mutual reinforcement/feedback loops. Figure 2.1 provides a simplified visual representation of these two types of indicators and their links to environmental outcomes.

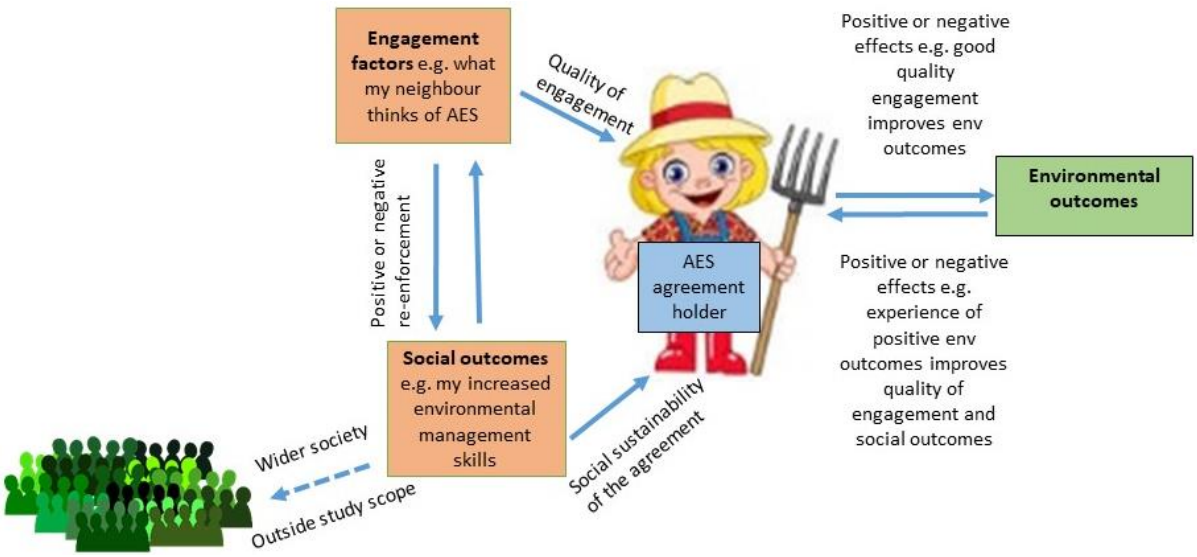

Figure 2.1 Diagram of conceptual framework showing links between AES engagement factors, social outcomes from AES and AES environmental outcomes and feedback loops

This conceptual framework influenced the literature review which looked to identify the two sets of social indicators in the literature, the engagement factors that affect the nature and quality of engagement with AES and the social outcomes that relate to the social

sustainability of AES. Overall, we identified more literature that focused on the engagement factors, than those that related to social outcomes, which is a relatively new field of study.

The next section sets out the approach taken to the literature review.

2.2 Literature Search

A team of four people conducted the literature review and to ensure consistency a protocol was prepared for the research team to follow. The research question that underpinned the search was "What social factors affect the quality of engagement with AES and to what extent have AES contributed to maintaining or developing positive or negative social outcomes (and how has this contributed to environmental outcomes)?"

The literature search was undertaken using both the Web of Science and Google Scholar. It is considered good practice to use more than one search engine, as different search platforms are known to yield different results. Due to the limited time available to conduct the search and analysis, the decision was taken to limit the search to papers published between 2000 to 2018. The search was open to all geographical regions to capture experiences from other parts of the world. A further search of grey literature (including project reports) was also conducted using Google as a search engine and checking the websites of Defra, Natural England and Forestry Research.

An analytical framework was used to structure the literature search and analysis (see Figure 2.2). The framework is based on previous studies (Ingram *et al.*, 2009; Mills *et al.*, 2013) which looked at factors that influence farmer environmental decision-making. It has long been recognised that in order to understand the environmental behaviours and action of farmers, consideration needs to be given to both internal factors and the external context in which farmers operate. This has led researchers to examine the relationship between the willingness to adopt (attitude, beliefs, values and norms of the farmer towards the environment) and capacity to adopt (economic status of the farm and compatibility with the farming system, external drivers etc.), a central theme in a distinct body of research (see Dwyer *et al.*, 2007). In addition, farmer engagement is increasingly considered an important influence on environmental decision-making, which we define as an active engagement in environmental learning through advice and support networks (Mills *et al.*, 2017).

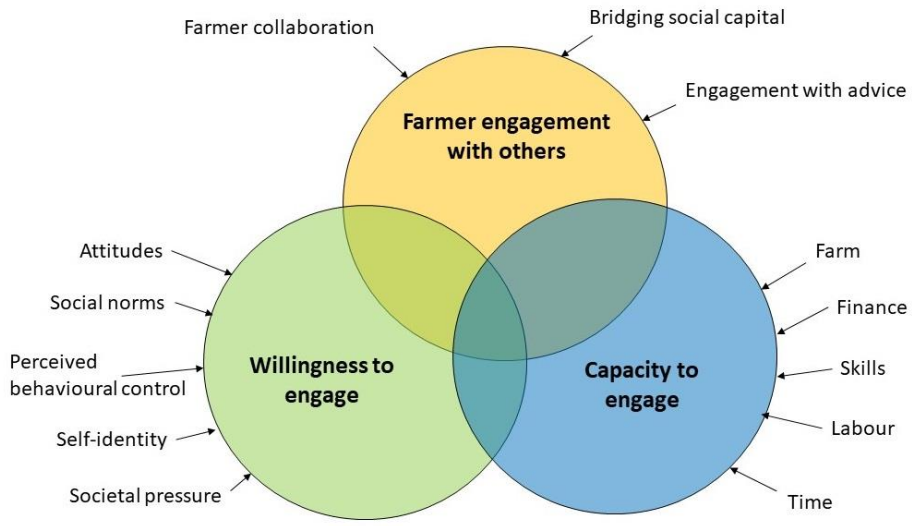

Figure 2.2 Analytical framework guiding the literature search

In the literature search, the following three search strings were used:

Willingness:
Farmer (or land manager, forester) AND "agri environment" (or conservation, biodiversity, agriculture and environment, woodland) AND attitude (or behaviour, awareness, self-identity, mental health, wellbeing, mood disorder, depression, stress, loneliness)
Capacity:
Farmer (or land manager, forester) AND "agri environment" (or conservation, biodiversity, agriculture and environment, woodland) AND knowledge (or training, skills, labour, employment, time, finance, capacity, resilience)
Farmer engagement with others:
Farmer (or land manager, forester) AND "agri environment" (or conservation, biodiversity, agriculture and environment, woodland) AND social capital (or cooperation, groups, collaboration, advice, public, access, antisocial behaviour, sheep worrying)

All three search strings included the word 'farmer' to ensure that farmers were likely to be the study subjects of the articles. Two further search terms were used, land manager and forester, to ensure other potential study subjects were not excluded. For the same reasons we also included the term "agri environment", but also added alternative terms, such as 'conservation', 'biodiversity', 'agriculture and environment', 'woodland', in recognition that not all regions of the world use the term agri-environment and to capture evidence related to woodland schemes. These words were then followed by terms identified in previous studies that relate to factors affecting environmental decision-making.

The initial search was conducted between 29 October 2018 to 5 November 2018. The search terms yielded 262 articles, which were uploaded to the reference management software, EndNote. In addition, relevant draft or unpublished reports suggested by the Steering Group were also added, which resulted in a total of 352 documents.

In addition, a further search of the literature was undertaken to identify indicators of the social sustainability of AES and agriculture more broadly.

2.3 Literature screening

The team then screened each of the articles by examining the abstract and excluded those that were not relevant to the purpose of the study. The main reasons for exclusion were:

- The paper was natural science focused or only reported on environmental outcomes (66)
- The cultural context was not relevant to the UK situation. This particularly applied to papers focused on African countries (30)
- The paper was theoretical in content or only focused on AES design issues (19)
- The paper related to agricultural practices only, with no mention of agri-environment activity (17).
- The paper appeared multiple times in the research results (32). Duplicate papers were excluded.

The reference lists of five key papers that appeared in all three searches (willingness; capacity; engagement) were examined for additional relevant references and 19 of these were added to EndNote. This process resulted in 175 documents remaining for full-text analysis. In a final step, after a more thorough reading of the full-text, a further 53 articles were excluded due to reasons outlined above, leaving 122 documents included in the review. A summary of the figures is included in Figure 2.3.

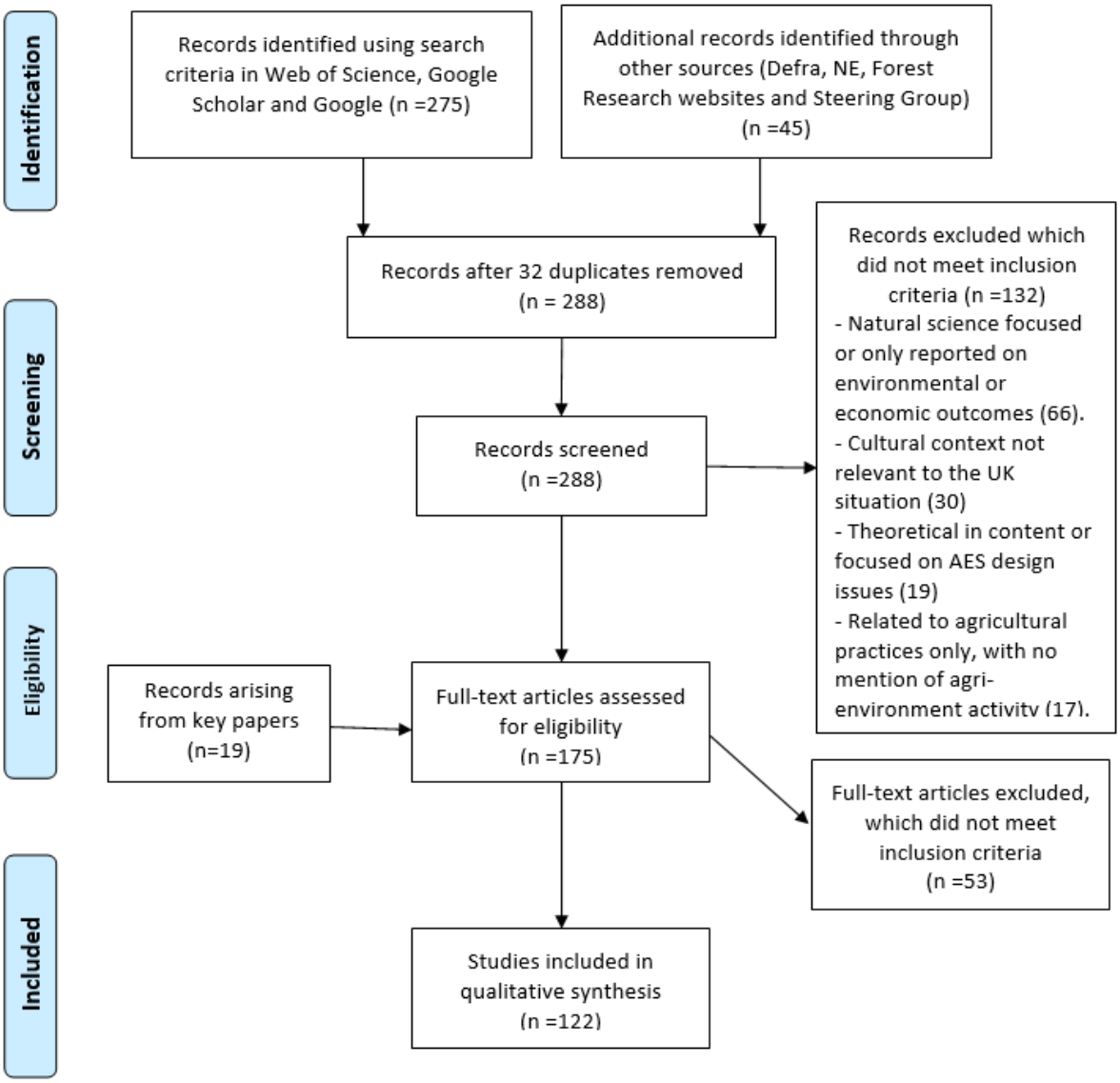

Figure 2.3 PRISMA flow diagram for systematic review

2.4 Literature Analysis

The literature analysis was undertaken using the qualitative data analysis software, QSR NVivo 11. The same 4 team members who undertook the literature search and screening also conducted the analysis. A protocol was provided to aid consistency and each paper was analysed according to the following criteria:

- Purpose/objective of study
- Main methods use - including sample size
- Main engagement factors affecting quality of engagement with AES
- Social outcomes
- Environmental outcomes

Each document was read thoroughly and the salient segments coded to a succinct label (a 'node'). Some nodes were created prior to the analysis, whilst new nodes were also added. These nodes were then used to produce indicator variables which formed the basis of the indicators. Using expert judgement, some variables were combined to produce composites in order present a more robust indicator.

One person checked a 10% sample of the papers analysed to assess the consistency of the noding and ratings. Very few differences in analysis were identified, providing confidence in the approach taken.

For each engagement factor or social outcome identified, a rating for level of impact was assigned based on the 5-point scale in Table 2.1. All ratings were assigned based on the expert judgement of social scientists familiar with the subject area.

Table 2.1 Rating for level of impact of factor on quality of AES engagement or social outcomes

++	substantial positive impact of factor on AES engagement/social outcomes
+	some positive impact but not substantial
0	no impact
-	small negative impact
--	substantial negative impact

Also, for each engagement factor or social outcome identified, a rating for strength of link between social and environmental level of impact was assigned based on the 5-point scale in Table 2.2.

Table 2.2 Rating for strength of link between social and environmental outcomes

++	substantial positive link between social and environmental outcomes
+	some positive link
0	no link
-	small negative link between social and environmental outcomes
--	substantial negative link

A rating was also based on the strength of the evidence provided based on the design of the study based on the 3-point scale in Table 2.3.

Table 2.3 Rating for strength of evidence

high	well-designed study providing clear evidence
medium	study design not ideal but still producing useful evidence of success or failure, with reasons
low	poorly designed study not producing conclusive evidence; small sample

3 Review of Social Indicators for AES

3.1 Information on the literature reviewed

In total, 122 papers and reports met the criteria of the study and were reviewed according to the protocol presented above (see Appendix 1 for a full list of reviewed papers and reports). The studies were mainly focused on economically-advanced countries. The top five countries were: UK (56%); Netherlands (8%); Ireland (6%); Australia (5%) and USA (3%).

In Table 3.1 the first column presents engagement factors and social outcomes identified in the review and are included in order of level of evidence for positive impact on quality of engagement with AES or social outcomes of AES (with most positive impact first).

The third column in Table 3.1 represents an assessment of the number of papers that mention a particular factor as having a substantial positive impact, some positive impact, some negative impact or a substantial negative impact on the quality of AES engagement and social outcomes. In general, the literature focused on the positive impacts of engagement factors or social outcomes in relation to AES, with far fewer studies identifying the negative impacts, as illustrated in Table 3.1. It is worth noting that a high occurrence of papers mentioning a factor may simply reflect particular research interests, rather than a reflection of the importance of the factor in affecting quality of engagement and social outcomes.

The final column shows the strength of the causal link identified between social outcomes and environmental outcomes for individual papers. Generally, there was a paucity of evidence explicitly identifying the link between social factors and environmental outcomes. For example, for the factor 'Attitude to environment', out of the 29 papers mentioning this factor, only ten papers referred to a causal link between social factors and environmental outcomes, and these papers all identified a positive link.

The factors identified most often as having a substantial positive impact on the quality of engagement with AES or social outcomes resulting from AES, related to: attitudes to environment; skills; advice and farmer-adviser relationship; self-identity; and different forms of social capital.

Table 3.1 No. of papers mentioning factors with positive or negative impacts on quality of engagement and social outcomes and strength of causal link

Factor affecting quality of engagement and social outcomes	No. of sources	No. of papers mentioning level of impact of factor on both quality of engagement and social outcomes				No. of papers identifying strength of causal link between social factors & environmental outcomes			
		Substantial positive impact	Some positive impact	Some negative impact	Substantial negative impact	Substantial positive link	Some positive link	Some negative link	Substantial negative link
Attitude to environment	45	17	27	1		2	22		
Advice	26	16	10			8	8		
Self-identity/business orientation	26	9	8	3	1	2	5		
Knowledge/skills	21	6	11	3	1	2	10		
Bridging social capital	18	6	10	1		3	3		
Bonding social capital	16	8	7	1		2	6	1	
Farmer age	22		13	1	2		3		1
Experience of AES	13	7	4			1	4		
Farm income	12	1	8	2			4		
Level of education	15	2	9				9		
Social trust	14	1	8	2		1	4	1	
Time/labour availability	14	1	4	6			3	2	
Agency	11	1	4	3	2		3		
Paperwork	11			4	6			1	1
Social norms	10		6	3			4		
Succession status	16	1	6	2			1	2	
Risk aversion	10		3	5			1	2	
Training	8	5	3			2	5		
Farm size	14		6				5		1
Farm type	8	1	2	2			2		
Attitude to public	5	1	2	2			2		
Peer pressure	5		3	2			3	1	
Mental health	6	1	3	1			2	1	
Entrepreneurial attitudes	4		4						
Farm tenure	7	1	2	1			2	1	1
Public access	4	2	1		1			2	
Public recognition	5		4				2		
Farm size		1	2				2	1	
Environmental responsibility	2	2							
Gender	5	1	1				1		
Information sharing	2	1	1						
Stress levels	3	2							
Linking social capital	1					1			

Papers were excluded from ratings if impact was ambiguous (e.g. mentioned both negative and positive impacts) which means totals may not equal number of paper sources

The indicators and sub-indicators that emerged from the literature review as having the most impact in terms of quality of AES engagement and social outcomes are described in the

following sections. These form the long list of social indicators identified for further consideration.

3.2 Key social factors influencing quality of engagement: engagement factors

The next section presents the key engagement factors identified in the literature that affect the nature and quality of farmer engagement in AES. The section is structured using the analytical framework presented in Figure 2.2 around the themes of willingness to engage; capacity to engage and level of farmer engagement. The indicators and sub-indicators are summarised in a table followed by a short description of the supporting evidence from the literature. Such indicators could be used in the monitoring of agreements to indicate the trajectory of the agreement and so predict outcomes (social and environmental). Such indicators may provide an earlier indication of the quality of engagement rather than relying on environmental indicators alone.

3.2.1 Willingness to engage

Table 3.2 presents the key indicators identified in the literature that affect the nature and quality of farmer engagement in AES linked to willingness to engage. A key high-level indicator is identified together with either a single or sub-indicators that form the high-level indicator.

Table 3.2 Indicators and sub-indicators related to willingness to engage

High-level Indicators	Sub-indicators
Interest in (and awareness of) the environment	• Awareness of and interest in wildlife (species and habitats) • Awareness of and interest in cultural and landscape assets • Extent of environmental knowledge • Extent of unsubsidised environmental activity • Sense of environmental responsibility • Interest in game shoots • Experience of on-farm environmental issue • Gender – female farmers more environmentally orientated
Engagement with advice and training	• Level of engagement with environmental advice • Level of rapport with advisor • Level of engagement in training
Attitudes and beliefs about farming (self-identity)	• Profit maximisation-focused • Food production-focused • Custodianship-focused
Level of AES experience	• Length of previous AES experience

Interest in experimentation	• Evidence of experimentation

1) Indicator: Interest in and awareness of environment:

Interest in the environment affects farmers' attitude towards the environment and is most commonly identified as a factor affecting farmers' quality of engagement with agri-environment activities. A number of engagement factors were identified in the literature as influencing farmers' interest in and awareness of the environment:

Sub-indicators that make up the high-level indicator:

i. **Interest in wildlife**: Herzon and Mikk (2007) in their study of 51 farmers in Finland and Estonia, found an interest in wildlife positively correlated with a willingness to undertake wildlife-friendly measures. Similarly, Mills *et al.* (2013) in a study of 60 farmers' attitudes to the environment identified that those farmers who fully engaged in AE activity had a personal interest in wildlife and particularly birds, often since childhood. Ahnström (2009) showed that the more interested in nature a farmer was, the higher the biodiversity was of the farmer's arable land. Also, a study of a scheme for meadow bird protection the Netherlands (Swagemakers *et al.*, 2009) showed that farmers with an "eye for the birds" improved environmental outcomes by protecting more nests and chicks before carrying out farming activities. Specific habitats are also valued by farmers, as Ingram *et al.* (2009) found in their study of farmers in Wales who had areas of environmental interest, such as woodlands and meadows, which they did not want to improve or intensify.

   Negative experiences of wildlife as a result of AES participation can also influence quality of engagement. For example, if AES activities lead to increased predation of smaller birds by birds of prey, or increased fox, badger and rabbits populations, then farmers are less likely to engage with AES (Franks *et al.*, 2016).

ii. **Interest and awareness in cultural and landscape assets:** Farmers' quality of engagement with agri-environment activities is also influenced by their interest in and awareness of the environment in terms of cultural assets such as historic buildings, field and farm boundaries and archaeology. Gaskell *et al.* (2014) evaluated the effectiveness of Environmental Stewardship for the conservation of historic buildings. A survey of 50 agreement holders who had restored historic buildings found their decision to restore was dominated by intrinsic reasons often linked to an emotional attachment to the buildings. When asked to rank the importance of landscape, historic environment and wildlife factors in their decision to restore their buildings, nine out of 10 agreement holders said that the restoration was important or very important for the historic environment and the landscape. Agreement holders were then asked about any benefits to themselves or their farms that they thought had resulted from the restoration. Many of the responses mentioned a sense of pride or achievement in being able to restore an historic building. This was often linked to comments about public benefits. Agreement holders mentioned that through undertaking the building restoration they had improved their understanding of how to maintain historic buildings

   Fish *et al*. (2003) in their study of 100 farmers and land managers examined the correspondence between AES objectives and different land-manager motivations. In addition to attachments to nature and wildlife they found that the beauty, character,

diversity and historical value of landscapes were also important factors influencing farmer motivation to engage in AES. Some land managers spoke with a considerable sense of pride about the visual superiority of the land they managed, particularly if they owned it. Three important themes were identified. First, there was an interest in conserving features regarded as important in terms of a landscape's social and cultural history. Second, the appreciation of cultural and landscape assets was connected to personalised accounts of place. Third, farmers and land managers linked the beauty and character of landscapes and features to particular traditions of the land management that had produced them.

iii. **Extent of environmental knowledge (increases or limits the sense of responsibility):** Evidence has shown that if farmers lack environmental knowledge this limits their sense of responsibility**,** whilst the reverse is also evident. For example, numerous studies have shown that a lack of knowledge concerning bird population trends and some misinterpretation of habitat requirements may limit farmers' sense of responsibility and their willingness to adopt AES (Herzon and Mikk, 2007; Jacobson *et al.*, 2003; Smallshire *et al.*, 2004). However, once farmers have obtained this knowledge they are more inclined to adopt environmental practices. For example, Mills *et al.* (2013) recounts a farmer's attitudinal change after attending a training course following the realisation that his spraying practices adjacent to a river could cause widespread water pollution.

iv. **Unsubsidised environmental activity:** An interest in the environment is often reflected in unsubsidised environmental activity on the farm. Morris *et al.* (2000) found that those who had already undertaken enhancements under their own initiative, and those with some distinguishing environmental feature on the farm such as a river, were more inclined to engage in AES.

v. **Sense of environmental responsibility:** A number of studies have highlighted the importance of a farmer's sense of responsibility in engaging with AES. Ingram *et al.* (2009) in their survey of 466 farmers in Wales found that those in an AES had a higher level of support for a statement on farmers' responsibility towards the environment than those who had never joined an AES. There is also evidence in the literature that a strong sense of belonging or place can contribute to a sense of environmental responsibility. Saxby *et al*. (2018) in their study of farmers involved in the North Yorkshire Cornflower Project identified how their sense of place belonging in terms of their past experiences and relationships with the farm and local area, resulted in a sense of responsibility for land stewardship. If this sense of environmental responsibility is lacking, then farmers are less likely to adopt AE activities, as identified by Barnes *et al*. (2013) in relation to water pollution issues and Guillem and Barnes (2013) in relation to a lack of knowledge concerning bird population trends and habitat requirements.

vi. **Interest in game shoots**: Farmers with a predilection to game conservancy may be encouraged to engage in AES. Morris *et al*. (2000) found such farmers were more favourably disposed to deliver arable field margin AES options than other farmers, although in some cases this interest was motivated by financial reasons. Furthermore, Mills *et al.* (2013; 2017) found that in the arable areas of Eastern England some farmers viewed and valued game strips as an environmental activity, as they were felt to also benefit smaller wild birds. There was evidence of experimentation with seed mixes and a holistic approach to locating these strips across the farm.

vii. **Experience of on-farm environmental issues**: Experience of an on-farm environmental issue or problem has been shown to create a greater awareness of the environment. Burton (2014) cites Battershill and Gilg (1997) who identified that experience with environmental degradation during the productivity era in the 1970s inspired increased interest in conservation. There is also evidence that those who have experienced soil erosion are more interested in AE activities (Boardman *et al.*, 2017). However, Burton also suggests that environmental degradation in agriculture has been normalised by farmers such that they regard it as part of agriculture rather than as a problem.

viii. **Gender of key decision-maker** may also play a part in farming interests in the environment. Burton (2014) in a review of the impact of gender on environmental behaviour found that generally women in agriculture are more environmentally oriented than men. He points to evidence that farms are more likely to encourage wildlife when women are involved in decision-making (Hall and Mogyorody, 2007) and women are more likely to participate in agri-environmental programs or undertake private conservation activities (Ahnstrom *et al.*, 2009). Furthermore, Kross *et al.* (2018) in a survey of 122 farmers in the U.S. found that female farmers viewed birds as beneficial, whereas male farmers viewed birds as slightly harmful overall. However, Burton points to other studies that have also observed no significant relationship between gender and environmental behaviour (Best, 2009; Borsotto *et al.*, 2008).

2) Indicator: Engagement with advice and training

Sub-indicators that make up the high-level indicator:

i. **Level of engagement with advice:** There is evidence that those who have received on-farm advice are more likely to value and engage in environmental activity. Gabel *et al.* (2018) in a study of 133 farmers in Switzerland, of whom 23 have received on-farm advice for 6 years, found this group were more inclined to believe in the compatibility of biodiversity conservation and production and the importance of biodiversity than those who had not received advice. Furthermore, in a survey of 250 farmers involved in the Catchment Sensitive Farming initiative, in England, 62% of those who had received advice from their Catchment Sensitive Farming officer (CSFO) had made environmentally beneficial changes in the previous two years, compared to 34% of those who had not met their CSFO. Those who had received advice were also twice as likely to be considering future changes (30%) compared to those who had not met their CSFO (15%) (Ipsos MORI, 2016a). Similarly, a survey of 102 HLS agreement holders found that for 62% of the agreement holders the advice and support received had made them more aware of both the HLS option features and the required management to optimise ES outcomes (Jones *et al.*, 2015).

ii. **Level of rapport with adviser**: It is not just receiving on-farm advice that indicates the level of engagement with advice and training, but also the level of rapport that the farmer has with the adviser. If the farmer is willing to communicate with the adviser and engage in an open and constructive dialogue, good environmental outcomes can be achieved. For example, a perceived good working relationship between fen owners and managers and their Natural England adviser was correlated with successful delivery of lowland fen maintenance/restoration (Wheeler and Wilson, 2016). Such positive

environmental outcomes are particularly likely where farmers have been able to develop a relationship with a particular adviser over a period of time (Morris, 2006).

iii. **Level of engagement with training:** There is evidence that active involvement in a formal environmental training course can affect the quality of environmental engagement and environmental outcomes. Lobley *et al.* (2013), in a study of 48 farmers involved in an AES in England, found that training farmers increased their confidence in their abilities. They also developed a more positive attitude to agri-environmental management. Furthermore, the same study demonstrated positive environmental outcomes, as there were more flower or seed resources and higher numbers of bees or birds on AES areas managed by trained farmers relative to untrained farmers. Twenty-one thousand farmers participated in training programmes as part of an AES in Ireland and according to Gorman *et al*. (2001) this fostered a 'culture of conservation', linking closely to self-identity and social and cultural capital indicators, and made a significant contribution to increased farmer awareness of agri-environmental issues.

3) High-level Indicator: Self –identity (Attitudes and beliefs about farming)

Sub-indicator that makes up high-level indicator:

i. **Self-identity** is the extent to which behaviour is considered to be part of the self 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). The image farmers have of themselves contributes to their decision whether to participate in AES or not. Often it relates to farmers' view of what makes a 'good farmer', an idealised 'identity' which the farmer strives to imitate (Burton, 2004). The perceived loss of self-identity as it relates to productionist farming ideals, can act as a motivational deterrent from fully engaging in AES (Burgess *et al.*, 2000; Burton, 2004). A number of different types of farmer self-identity based on underlying values and their impact on environmental behaviour have been noted in the literature (Mills *et al.*, 2017; Page and Bellotti, 2015; Schmitzberger *et al.*, 2005) and broadly equate to:

Profit maximisers: Some studies have detected farmers who identify themselves as profit maximisers. Their self-image is focused on running a profitable enterprise. Environmental concerns here are at best secondary, or possibly tertiary, uses for quality farmland and are generally considered a distraction from the project of farming (Mills *et al.*, 2013).

Food producers: Other studies have found farmers who identify themselves as primarily food producers. For them, it is a (moral) obligation to produce food to feed the world. They are reluctant to remove land out of production for environmental benefits resulting in low biodiversity maintenance performance (Mills *et al.*, 2013; Schmitzberger *et al.*, 2005).

Custodians: Those who identify themselves as custodians of the land believe they have an obligation to pass the land on to future generation in a better condition than they found it. They are more likely to engage in environmental activities (Mills *et al.*,

2013; Page and Bellotti, 2015). Self-identity can also have an effect on whether farmers undertake unsubsidised environmental activities (Lokhorst *et al.*, 2011; van Dijk *et al.*, 2015). Custodians consider themselves "the kind of person who does this", leading to the incorporation of the behaviour in the self.

4) Indicator: Level of AES experience

Sub-indicators that make up the high-level indicator:

i. **Length of previous AES experience (increases knowledge and skills; response efficacy, understanding the rationale of AES):** Studies have found that the length of experience within an AES scheme can positively affect future AES engagement (Defrancesco *et al.*, 2008; Siebert *et al.*, 2006; Smithers and Furman, 2003; Wilson and Hart, 2000). Siebert *et al.* (2006) in their review of factors affecting European farmers' participation in AES, found that the significance of experience, measured by the proxy indicators of former participation in a similar scheme, is a strong indicator of farmers' willingness to participate in future AES. Experience is believed to increase the level of skill and knowledge of a particular practice which, in turn, increases the efficacy of the behaviour (Jongeneel *et al.*, 2008). Lobley *et al.* (2013) suggested that farmers with more experience of AES recognise the importance of knowledge and become more receptive to training and advice. Furthermore, through long-term experience, knowledge is gained about behavioural control (the ease or difficulty of a particular behaviour) which in turn determines the likelihood of undertaking a specific behaviour (Ajzen, 1991). In the context of AES increased experience can relate to 'response efficacy' in that farmers following AES practices for a number of years may start to notice the environmental benefits (Riley, 2016). As Mettepenningen *et al.* (2013) found, the more a farmer is convinced of the effectiveness of the schemes, the higher the probability that he/she will participate in them. Similarly, Staley *et al*. (2018) found in their evaluation of HLS, that agreement holders who recognised the environmental success or benefit of their agreement were more likely to want to carry on a similar scheme in the future than those who deemed HLS as neither successful nor unsuccessful, unsuccessful or very unsuccessful (79.8% vs. 58.8%). Furthermore, through longer-term experience farmers may develop a greater understanding of the environmental rationale for a practice and undertake it more broadly across the farm, often as unsubsidised activity (Riley, 2016).

5) Indicator: Interest in experimentation

Sub-indicator that makes up the high-level indicator:

i. **Evidence of experimentation:** Evidence of experimentation could possibly demonstrate a significant level of engagement with AES, although currently there is no incentive within the restrictive prescriptions of AES to experiment with different approaches (Lobley *et al.*, 2013). Examples of such experimentation might include trying different seed mixes for wild bird or nectar and pollen strips, or different hedge cutting techniques.

3.2.2 Capacity to engage

Table 3.3 presents the key engagement factors identified in the literature that affect the nature and quality of farmer engagement in AES linked to capacity to engage.

Table 3.3 Indicators and sub-indicators related to the capacity to engage

High-level indicator	Sub-indicators
Farmer age	• Farmer age (Not a reliable indicator)
Succession	• Presence or absence of successor (Not a reliable indicator)
Lifecycle	• Stage in lifecycle • Planned future trajectory
Financial stability	• Financial stability
Farmer education	• Level of formal education
Farming system and farm type	• Intensity of farming system • Quality of agricultural land
Farm tenure	• Tenure status
Farm size	• Farm size (Not a reliable indicator)
Resilience	• Business security • Labour availability
Agency	• Control over agreement • Incorporation of farmer knowledge

1) Indicator: Farmer age

Sub-indicator that makes up the high-level indicator:

i. **Farmer age**: Although farmer age is frequently used as an indicator of environmental behaviour, the literature review revealed contradictory evidence as to whether it exerts a positive or a negative influence. Burton (2014), who reviewed the literature on the relationship between farmer age and environmental behaviour, found that the majority of studies suggest that younger farmers are more likely to undertake programmes or environmental enhancements than older farmers (Boon *et al.*, 2010; Brodt *et al.*, 2006; Hynes and Garvey, 2009; Mathijs, 2003; Murphy *et al.*, 2011; Siebert *et al.*, 2006; Van Rensburg *et al.*, 2009; Vanslembrouck *et al.*, 2002). However, in almost 38% of the studies reviewed no relationship was found between age and environmental behaviour (Finger and Lehmann, 2012; Siebert *et al.*, 2010; Yiridoe *et al.*, 2010), while others have found younger farmers to be less willing participants (Barreiro-Hurle *et al.*, 2010; Defrancesco *et al.*, 2008), possibly as a result of their greater enthusiasm for intensive agricultural practices (Burton, 2006) (e.g. Short, 1997; Burton and Wilson, 2006). Due to the contradictory evidence, we conclude that farmer age is not a reliable indicator of the likely quality of engagement in an AES, a conclusion also reached by Knowler and Bradshaw (2007) and Pannell (2006).

2) Indicator: Succession

Sub-indicator that makes up the high-level indicator:

i. **Succession**: The evidence on succession and its effects on environmental behaviour is often contradictory. Potter and Lobley (1992; 1996) and Beedell and Rehman (2000) suggested farmers without successors are more likely to disengage from full time agriculture and extensify which benefits the environment. However, Riley's (2006) study of hay meadows in the Peak District found that the lack of a successor was often a reason for farmers not to enter land into a conservation agreement due a winding down, poor labour availability or wanting to have the flexibility to sell the land. Others have not found any evidence to show that succession and business trajectory were determinants of environmental change on farms, or the uptake of woodland incentives (Wynn *et al.*, 2001). These findings support others that show that successor factors may not be an accurate predictor of farmer environmental decision-making (Wilson, 1997). We, therefore, recommend not using succession as an indicator of the nature and quality of AES engagement.

3) Indicator: Lifecycle stage

Sub-indicators that make up the high-level indicator:

i. **Stage in lifecyle**: Rather than farmer age and succession, we suggest that lifecycle stage is a better indicator of the quality of engagement in AES, although it can be very complex to determine on multi-generational farms. According to Farmer-Bowers and Lane (2009) many of the strategic decisions farming families make depend on their family's stage in life or the 'life-cycle'. Similarly, Potter and Lobley (1992, 1996) suggested that expansion and retrenchment are 'switched on and off' at different times in the farming family life cycle. Thus, lifecycle stages can be indicative of different motivations and pathways that have a direct impact on environmental decision-making (Ingram *et al.*, 2013). These stages might, for example include periods of major restructuring, farm expansion and landscape change as the farm is prepared for a successor (Beedell and Redman 2000), which might not be compatible with AES engagement. Alternatively, the farmer could be at the stage of approaching retirement and winding down (Barreiro-Hurlé *et al.*, 2010) hence more amenable to AES that involve extensification of the farming system.

ii. **Future planned trajectory**: An understanding of future plans would provide an indication of the trajectory of the farm holding and the potential for long-term pro-environmental behaviour.

4) Indicator: Financial stability

Sub-indicator that makes up the high-level indicator:

i. **Financial stability**: There is evidence that those farms that are more financially stable are more likely to engage with AES. They have the resources (both time and money) to fully engage in environmental activities and are generally less risk

adverse. Yiridoe *et al.* (2010) suggest that farmers with high income tend to be more open to moderate risks of (potential) failure from implementing new innovations and practices than farmers with lower income. However, it would appear that the income effect is dependent on the level of investment that is required by the AES.

5) Indicator: Farmer education

Sub-indicator that makes up the high-level indicator:

i. **Level of formal education**: In many studies, farmers' formal education has proven to be one of the strongest variables determining conservation behaviour (e.g. Dupraz *et al.*, 2002; Wilson, 1997). It is generally argued that farmers with comparatively low formal education (i.e. left school without exams) are less likely to participate in agri-environmental schemes or to adopt environmentally-friendly farming practices. In fact, Wilson and Hart (2000) found a relationship between the level of education of farmers and participation in AES across the ten countries in Europe they studied. At EU level, those who completed schooling were far more likely to engage in AES than those with no full-time education.

6) Indicator: Farming system and farm type

Sub-indicators that make up the high-level indicator:

i. **Type of farming system**: The review revealed that extensive farming systems were more likely to engage in AES (Vanslembrouck *et al.*, 2002; Defrancesco *et al.*, 2008; Wilson and Hart, 2000) than more intensive livestock and arable farms (Brooks, 2010). It may be that the more extensive farming systems are more willing to engage with AES simply because they fit better with their farming practices than more intensive farmers on better quality land (Brooks, 2010). Although the initial evaluation of the CS found that lowland grazing farms and dairy farms were more likely to engage with CS than the more extensive Less Favourable Area (LFA) farms due to scheme design issues. Therefore, views on the AES's goodness of fit with the farming system is likely to be a better indicator of the quality of engagement than the actual type of farming sytem.

ii. **Quality of agricultural land**: Often an extensive farming system is a reflection of the quality of the land, as those as on poorer soils are limited in their production options and thus payments received under AES make financial sense (Brooks, 2010).

7) Indicator: Farm size

Sub-indicator that makes up the high-level indicator:

i. **Farm size** is often included as an indicator in environmental decision-making studies. The general expectation is that owners of larger, more prosperous farms will possess a greater ability (if not a greater inclination) to participate in conservation initiatives. However, although a cereal farm may be both large in area and economically, it may have limited land to enter into AES. Furthermore, some upland farms may be large

in area but very small economically. Therefore, although some studies suggest that farm size is a strong factor explaining participation in AES, support for this in the literature is mixed (e.g. some studies find that larger sized farms are less likely to engage in AES (Hynes and Garvey, 2009; Vanslembrouck *et al.*, 2002) and normally the size of the farm interacts with other factors to affect AES participation. In fact, several studies indicate no clear link between farm size and AES participation (e.g. Franzén *et al.*, 2016; Mathijs, 2003), therefore we conclude that farm size is not a reliable indicator of the quality of farmer engagement in AES.

8) Indicator: Farm tenure

Sub-indicator that makes up the high-level indicator:

i. **Tenure status**: In the literature, it is generally shown that tenant farmers will demonstrate a lesser degree of involvement in AES than landowners (Defrancesco *et al.*, 2008; Walford, 2002). It is shown that farm tenure will have a bearing on participation of any scheme that restricts farming practices for a long period of time, and that may command substantial changes in farm management. In most of the ten EU countries Wilson and Hart (2000) investigated, tenure played some role with regard to scheme uptake. At EU level, those with more than 50% of their holding as freehold property were more likely to enter into an AES than those owning less than 50% freehold. They found that most tenant farmers did not enter schemes for two major reasons: first, they were uncertain about long-term tenancy agreements with the landlords and, second, landlords often would not share agri-environmental benefits with their tenants (which meant that there was little incentive for tenant farmers to make the effort to join a scheme). Results from a study by Fish *et al.* (2003) support this finding. They found that some tenant land managers surveyed were reluctant to engage in schemes (ESA/CSS) because they had to follow the prescriptions which did not lead to a corresponding reduction in rent or they did not get any of the benefits. They also did not want to protect or enhance landscape features they did not own, partly because of the high cost of tenanted land. In contrast, Wilson (1996) in a study investigating factors influencing farmers' motivations for participation in the Cambrian Mountains (CM) ESA scheme in Wales found that tenure did not seem to greatly influence farmers' decisions, mainly because most tenants in CM ESA receive the ESA payments and not their landlords.

9) Indicator: Resilience

Sub-indicators that make up the high-level indicator:

i. **Farm income (off and on farm)**: Dependency on the farm for income has been recognized as a key factor in AES engagement decisions (Wilson and Hart, 2000). Siebert *et al.* (2006) highlight a debate about whether full-time or part-time farms are more likely to participate in biodiversity-enhancing measures throughout European countries. Some have argued that part-time farmers are more constrained and lack flexibility to respond to environmental concerns and opportunities (Munton *et al.*, 1989). However, Ingram *et al.* (2009) in their study of an AES in Wales found that the income of agreement holders was more likely to be supplemented by non-farm sources (especially in the case of newcomers), than non-agreement holders.

Similarly, in Spain more part-time farmers participate in AES, tending to engage more often in programmes that require less involvement (Barreiro *et al.,* 2010). In contrast, Seibert *et al*. (2006) referred to evidence from Germany where more full-time farmers are increasingly engaged in implementing nature conservation and biodiversity enhancing measures. Here there is a tendency for large, full-time modern farms to participate, rather than part-time and small-scale farms. Mettepenningen *et al*. (2013) also suggest that full time farmers are more likely to adopt AESs, and the probability of participation increases with the proportion of income derived from farming activities. Due to disparities in the findings between different countries and no conclusive evidence from the UK, we suggest that the dependency on the farm for income is an unreliable indicator of the quality of engagement in AES income.

ii. **Labour availability**: Having sufficient numbers of employees on the holding to undertake AES management tasks can be important in affecting the quality of AES engagement (Morris, 2004). If labour is available to undertake AES 'in house', this can keep down the costs of the management tasks and facilitate AES engagement. Conversely, labour constraints can reduce the quality of AES engagement and can be an issue if, as some evidence suggests, workforce capabilities are not considered in advice provision. For example, in a survey of 979 farmers involved in advice and incentive schemes, only 28% of respondents agreed that the advice received took into account the potential impact on the workforce (Quadrant Consultants and BMG Research, 2012).

10) Indicator: Agency

In social science, agency is the capacity of individuals to act independently and to make their own free choices. In the context of AES, agency refers to the capacity for farmers to make their own decision as to how they manage their land within an AES.

Sub-indicators that make up the high-level indicator:

i. **Control over agreement:** One outcome from AES where management practices are heavily prescribed with limited flexibility, is a sense that prescriptions are imposed in a top-down way with little consideration given to local or tacit knowledge. Farmers can feel that they have lost some control over the management of their land and this can result in feelings of dispossession, which can affect the quality of engagement with an AES and therefore environmental outcomes (Burgess *et al.*, 2000). Woodland owners have stated that woodland grants were too restrictive and constraining, causing loss of control over their land (Dandy, 2012; Urquhart *et al.*, 2010). In contrast, within AES that operate a bottom-up process, such as results-orientated AES, which give farmers the control over and responsibility for delivering the management practices required to achieve environmental outcomes, a much greater sense of agency is evident, which is likely to lead to improved environment outcomes. For example, Wezel *et al.* (2018) in a survey of 79 mountain farmers in 5 countries in Europe found that almost two thirds of farmers thought that a result-oriented approach to AES would promote more direct and efficient management of biodiversity on their farm. Staley et al. (2018) in their evaluation of HLS found that agreements were more likely to be perceived by farmers as environmentally successful when they felt they had complete or considerable control over the design of their agreement. They concluded that this suggested a greater understanding and

'ownership' of the agreement may be associated with greater effort and care in its implementation.

ii. **Incorporation of farmer knowledge:** Related to the point above with regards AES that are heavily prescribed, farmers can feel that their knowledge on how best to manage their land for environmental outcomes is ignored (Burgess *et al.*, 2000) limiting their ability to innovate and display their skills (Burton *et al.*, 2008). In contrast, Fleury *et al.* (2015) in a survey of a results-orientated flowering meadows AE measure (2018) found that farmers welcomed such payments as it acknowledges their skills and knowledge.

3.2.3 Farmer engagement with others

Table 3.4 presents the key engagement factors identified in the literature that affect the nature and quality of farmer engagement in AES, linked to their connectedness and general level of social engagement.

Table 3.4 Potential high-level indicators and sub-indicators indicating quality of farmer engagement with others

High-level Indicators	Sub-indicators
Bonding social capital	• Extent of group working • Extent of information and knowledge sharing • Level of social trust
Bridging social capital	• Extent of engagement in non-agricultural networks • Engagement with general public • Public acknowledgement
Linking social capital	• Ability/desire to form positive relationships with government agency staff • Level of social trust with government
Cultural (symbolic) capital	• Respect amongst peers • Advising other farmers

1) Indicator: Bonding social capital

Bonding social capital is characterised by strong bonds within groups or families (homogeneous individuals) and refers to horizontal ties between peers. It is generally assumed that the bonds between peers will be more frequent, closer in affinity and identity. Therefore, they are seen as strong ties, low in information but high in re-assurance and support.

The literature shows that in some instances the extent of bonding social capital and social connectedness as a result of AES participation can increase the quality of engagement and environmental outcomes through increased networking and collaborative working. However,

there is the possibility that socially bonded groups can enforce conformity with productivist goals, thereby slowing any progress to environmentally-orientated farming (Walford, 2002).

Sub-indicators that make up the high-level indicator:

- **Extent of group working**: A number of studies have shown that where bonding social capital exists within a group of farmers this can result in positive environmental outcomes. Mills *et al*. (2008;2011), in a study of a farmer's group in Wales, found that enhanced environmental outcomes were achieved due to collective commitment-making and a sense of collective efficacy. Similarly, Wynne-Jones (2017), looking at the same group, found that group membership gave them the support and encouragement needed to undertake work that they would not have done otherwise.

- **Extent of information and knowledge sharing (farmers' group)**: There is also evidence that increased networking and the building of close relationships among farmers, are more likely to lead to information sharing and knowledge exchange, as well as collaborative work (Swales, 2009). Barnes *et al.*, (2013) and Mills *et al*. (2011) found that information sharing within a group and making individual farmer practices visible to their peers, can change perceptions of what are deemed as acceptable farming practices (i.e. pro-environmental behaviours).

- **Level of social trust**: Bonding social capital is characterised by strong social trust. This social trust enables the information and knowledge sharing outlined above. However, if this trust is absent there is a danger that group working can have negative effects on environmental achievements. Emery and Franks (2012) identified a potential barrier to collective AES is a fear of exposure to the potential judgement of others and a potential lack of effective AES engagement if this does not fit with the cultural norms of the group, a situation that is unlikely to occur in the presence of strong social trust.

2) Bridging social capital

Bridging social capital refers to social connections between individuals who are dissimilar with respect to socioeconomic and other characteristics (heterogeneous individuals). The relationships between people in such networks tend to be weaker, and less sustained than those demonstrating bonding social capital. However, it contributes advantage through new information and introductions to new networks. The extent of bridging social capital appears to have an effect on AES engagement.

Sub-indicators that make up the high-level indicator:

i. **Extent of non-agricultural networks:** Research has shown the benefits that new networks, linkages and flows of information can have for changing social and business activity (Oreszczyn *et al.*, 2010). Whereas familiar networks can provide reassurance and re-affirm identity, new people bring with them novel flows of information and perspectives (Granovetter, 1977). Those who are frequently engaged in non-agricultural networks are also thought to be more likely to be involved in AES as these farmers feel a larger social responsibility (Polman and Slangen, 2008).

ii. **Experiencing and appreciating public acknowledgement:** According to Kuhfuss *et al.* (2015) farmers who experience acknowledgment for their contribution to the protection of the environment are more likely to maintain the adopted practices even in the absence of payment. They may value external positive judgments and might fear social disapproval if they go back to their less environmentally-friendly practices. Parry *et al*. (2005) highlighted how farmers have felt personally distressed by how they have been represented by the media, and the declining public esteem in which they felt they were held. This has had a negative effect upon their morale and sense of self. Siebert *et al.* (2010) discovered that improving the public image of farmers is one reason for them to participate in AES. Similarly, Dwyer *et al.* (2007) found that farmers are motivated to join AES and farm assurance schemes by the prospect of gaining social recognition. In their study, farmers interviewed in all five case studies were very conscious of their public image and were keen to be seen in a positive light. They were motivated to change practices more when they thought that the public appreciated their activities. Robinson (2006) also found that by joining AES, farmers reaffirmed their role as good stewards of the land and so reinforced or enhanced their standing in the local community. AES engagement can be seen as a way of building up more cooperative and appreciative, bridging social ties with the non-farming community (de Krom, 2017).

3) Indicator: Linking social capital

Linking social capital is a term used to describe networks of people characterised by power differences, such as links between farmers and institutions. Such connections are important for accessing support from formal institutions through personal contacts.

Sub-indicators that make up the high-level indicator:

i. **Ability/desire to form positive relationships with government agency staff:** Hall and Pretty (2008) in a study of Norfolk farmers revealed differences in farmers' ability and desire to form positive working relationships with government agency staff, which affected the level of support they achieved and hence environmental outcomes. Farmers with sustainable farms had success-based identities and stronger feelings of self-efficacy about their interaction with government agency staff and welcomed the prospect of farm visits from advisers and regulators. Conversely, farmers who fundamentally disagreed with the direction of agricultural policy and were aware of polluting and illegal practice on their farms were wary of contact with government agency staff.

ii. **Level of social trust with government**: Polman and Slangen (2008) found that farmers who do not trust the government are less likely to conclude AES contracts. The feeling that government departments lacked the understanding and operational knowledge of farm level practices often compounded this outcome (Oreszczyn *et al.*, 2010). In a situation where an AES was co-designed with farmers and government agencies, an agreement on adapted management of ditches and shores to improve water quality and biodiversity was reached when previously there had been low levels of trust (Westerink *et al.*, 2017).

4) Indicator: Cultural (symbolic) capital

Cultural capital is a form of symbolic capital that refers to the accumulation of knowledge, behaviours, and skills that demonstrates a farmer's competence, which in turn impacts on

his/her social status or standing in society.

Sub-indicators that make up the high-level indicator:

i. **Respect amongst peers**: Evidence of respect and positive judgements by other farmers for their AES activities demonstrate prestige (symbolic capital) and reinforce AES engagement. However, loss of prestige or respect amongst peers as a result of AES participation can reduce the quality of AES engagement (Kuhfuss *et al.*, 2015). Burton *et al*. (2008) found that farmers were demotivated to participate in an AES because of a perceived inability to earn the desired levels of cultural capital through the land management options prescribed in comparison to productivist techniques they would otherwise pursue. The visible nature of farming practices, especially of AES activities, means that there can be a loss of cultural capital and respect for the farmers who pursue AES land management options.

ii. **Advising other farmers**: Burton and Paragahawewa (2011) suggest that evidence of farmers advising other farmers on the implementation their scheme demonstrates cultural capital. This interaction reinforces the idea that these practices are socially accepted by their peers which means that they are more likely to become the focus of farm objectives. Saxby *et al.* (2018) found that farmers involved in the North Yorkshire Cornfield Flowers Project had developed specialist plant skills and their advice was respected both within the project by other farmers and by agencies. However, they also recognised that other farmers outside of the project might not appreciate their conservation work.

3.3 Key social outcomes from AES

The previous section has presented evidence from the literature on social factors that affect the quality of engagement with AES: engagement factors. Indicators were identified which indicate the quality of the agreement holder's engagement during the implementation of the scheme on their land. This section focuses on identifying indicators that can be used to assess the change in social factors arising from participation in the schemes; social outcomes. Such social outcome indicators could be used in scheme evaluation, as complementary to environmental indicators.

As mentioned earlier, considerably less literature was identified that focused on the social outcomes of AES compared to engagement factors. In the literature that did consider social outcomes, the research tended to focus on the positive, rather than negative, social outcomes of AES. Suggested indicators and sub-indicators to assess social outcomes are presented in Table 3.5.

Table 3.5 Potential indicators and variables indicating social outcomes of AES

Indicator	Sub-indicators
Attitude to (interest in) environment	Change in: • Environmental awareness • Sense of environmental responsibility

	• Attitudes due to knowledge about ease or difficulty of implementing • Attitudes due to experience of environmental success or benefits
Knowledge & Skills	Change in: • Confidence and abilities • Understanding of AES rationale (Indicators of Success)
Connectedness	Change in: • Levels of social interaction • Levels of social isolation • Learning capacity
Social capital	Change in: • Levels of social trust • Extent of collaborative working and information sharing • Social and cultural norms
Cultural capital	Change in: • Level of respect/social standing with peers
Public image	Change in: • Extent of public acknowledgement and appreciation
Agency	Change in • Control over land
Resilience	Change in: • Business security • Business structure
Labour demands	Change in: • Workload
Mental health and subjective well-being	Change in: • Stress levels due to workload • Stress levels due to AES administration • Stress level due to financial issues • Stress levels due to conflicts with associates or family members • Stress levels due to enjoyment of environmental outcomes.

1) Indicator: Awareness of and interest in the environment:

Sub-indicators that make up the high-level indicator:

i. **Change in awareness of the environment:** Engagement in an AES has been shown to increase awareness of environmental issues and make farmers more conscious of the environmental impact of their management actions (Mills, 2012). For example, those who had heard of, or interacted with the Catchment Sensitive Farming (CSF) Project were more likely to say that agriculture contributes at least a little to water pollution in their area (High Priority Areas: 91%; Moderate Priority Areas: 90%) than those who had not heard of, or interacted with the CSF Project (High Priority Areas: 75%; Moderate Priority Areas: 73%) (Ipsos MORI, 2016b). In some of the LandCare groups in Australia, Lockie (2006) found that participation in the programme had helped to change the way that

farmers looked at their properties and the way they interpreted warning signs of land and water degradation. Similarly, Wilson and Hart (2001) found that farmers in an AES, where the importance of conserving particular species or habitats were discussed and how this might best be achieved in management terms, were more environmentally aware than those farmers in an AES where these issues were not discussed.

ii. **Change in sense of environmental responsibility:** Whilst a change in a sense of environmental responsibility is clearly important to encourage long-term behaviour change, there was little evidence in the literature of AES as to how to instigate this change. There was some evidence from the CSF project that those who had met their CSF officer were more likely to say their farming activities contributed at least a little to water pollution in their area (73%) compared to those who had not met their CSF officer (55%) (Ipsos MORI, 2016b). The finding suggests that engagement with the CSF officer raises awareness of farming's contribution to the environmental issues in the catchment.

iii. **Change in attitude due to perceived ease or difficulties of environmental practices:** Through participation in an AES, knowledge is gained about the ease or difficulty of a particular practice which in turn determines the likelihood of undertaking the specific activity (Ajzen, 1991). There is evidence that if farmers have received training in AES management this creates a positive attitudinal change (Lobley *et al.*, 2013). Burton (2014) explained that this outcome was a result of learning about the ease or difficulty of implementing a practice and removing 'mental barriers'.

iv. **Change in attitude due to response efficacy:** Evidence shows that farmers experience response efficacy when they themselves recognise and/or experience environmental success or benefit and are then more likely to want to continue with that behaviour and to be motivated to perform additional pro-environmental behaviours in the future (Hall 2018; Mills *et al*., 2018; Staley *et al*., 2018; Emery and Franks 2012; Riley 2008; Mettepenningen *et al.,* 2013). Indeed, Staley *et al*. (2018) found in their evaluation of HLS, that agreement holders who recognised the environmental success or benefit of their agreement were more likely to want to carry on a similar scheme in the future than those who deemed HLS as neither successful nor unsuccessful, unsuccessful or very unsuccessful (79.8% vs. 58.8%). Also through longer-term experience farmers may develop a greater understanding of the environmental rationale for a practice and undertake it more broadly across the farm, often as unsubsidised activities (Riley, 2016).

2) Indicator: Knowledge and skills

Sub-indicators that make up the high-level indicator:

i. **Change in environmental knowledge and skills**: One clear outcome from active engagement in AES is an increase in knowledge and skills. Mills (2012) reported that a high percentage of HLS (85%) and OHLS (87%) agreement holders had gained environmental skills and knowledge from joining the schemes. Burton (2014) showed that as more experience is gained in implementing AES, there is an increase in skills and knowledge which increases the efficacy of the behaviour. This relates to the perceived behavioural control and response efficacy outcomes mentioned above. This finding is supported by Wilson and Hart (2001) who in a comparison of two AES, found that in the AES where

farmers had learnt new management skills, they were more likely to enter a new agreement on expiry of the current one and to continue with management practices once the scheme stopped.

ii. **Change in confidence and abilities:** There is evidence that involvement in environmental training can affect the quality of environmental engagement and environmental outcomes. Lobely *et al.* (2013) in their study of 48 farmers involved in an AES in England found that training farmers increased their confidence in their abilities and developed a more positive attitude to agri-environmental management. This relates to the point about the perceptions of the ease or difficulty of a practice, mentioned above. The same project also demonstrated positive environmental outcomes, as there were more flower or seed resources and higher numbers of bees or birds on AES areas managed by trained farmers relative to untrained farmers. A number of farmers who had chosen the educational access options in HLS, which provided funding for the hosting of visits to the farm, mentioned that they enjoyed meeting the public and school children. One farmer talked about how he had grown in confidence as a result of having to talk to the public (Mills, 2012).

iii. **Change in understanding of AES rationale**. As mentioned previously, longer-term experience and knowledge gained with an AES can result in farmers developing a greater understanding of the environmental rationale for a practice and undertaking it more broadly across the farm (Riley, 2016).

3) Indicator: Connectedness

Changes in the farmers' overall level of connectedness was identified as an outcome of AES engagement. This outcome was represented by several variables.

Sub-indicators that make up the high-level indicator:

i. **Change in levels of social interaction**: Looking at two collective AES in Wales, Mills *et al*. (2011) identified improved levels of personal communication and a wider sense of community as an outcome of scheme membership. Members of both groups particularly valued the increased social interaction and the 'feeling of belonging' brought about by group membership. Mills (2012) also identified increased social interaction as an outcome of Environmental Stewardship (ES) involvement, with 31% of Entry Level Stewardship (ELS) participants and 55% of Higher Level Stewardship (HLS) participants reporting more contact with other farmers and or/members of the public. The mechanism for contact with the public was mainly through educational links, including visits to schools or parties coming to the farm. Members of the public with an interest in conservation, particularly ornithologists, also played an important role in these contacts. A telephone survey of 221 holders with the HLS permissive access option found that four-fifths (82.8%) of respondents experienced positive encounters with users of access, and only 2.3% had negative experiences. The vast majority (93.2%) indicated they would consider entering into another agreement with access options similar to the agreement they currently held (Powell *et al.*, 2013). Similarly, in a survey of those who provided educational access under AES, 64% agreed that they liked teaching people about farming, and 53% simply enjoyed contact with these groups and liked seeing visitors' interest in what they were being told. Over 90% agreed, the majority strongly, that they enjoyed dealing with teachers and the visiting group (in this case schoolchildren) (ADAS, 2007).

Mills *et al*. (2012) identified walkers as an important category of contact, but also the only ones who attracted criticism if they walked over conservation areas and affected environmental outcomes. In an evaluation of the permissive access option of HLS, Powell *et al*. (2013) found that around 44% of respondents indicated some form of negative impact, which included illegal hare coursing and deer stalking; encouraging the "we've got rights" attitude when people are asked to alter behaviour; uncontrolled dogs (i.e. off-leads) and more dog mess; destruction of ground-nesting bird nests; people walking off the permissive access route – straying, cutting corners, ignoring boundaries; vandalism and theft; gates left open; rubbish being left; wear and tear on the ground; damage to crops; wildlife disturbance. The authors acknowledge that some of the negative aspects will have occurred without the permissive access as much of the anti-social behaviour occurred on farms very close to urban or built-up areas. Sheep worrying appears to result in particular negative public interaction, although no evidence was found to explicitly link this concern to AES. For example, a survey by the National Sheep Association (2016)[2] of 233 farmers in UK found that sheep worrying by dogs was a major cause of stress to them as individuals (85% of respondents), with 78% also citing anxiety over the possibility of future attacks. This anxiety was also the top response when respondents were asked what the single main impact on them was of sheep worrying.

ii. **Change in levels of social isolation:** Farmers are increasingly socially and culturally isolated within rural communities due to a rationalisation of farmers' traditional social networks (Lobley *et al.*, 2018). A number of reasons for this have been identified, including the shedding of farm workers, partners working off-farm, erosion of community ties and collective working arrangements and fewer meeting places, such as auction markets that have closed (Appleby, 2004; Burton *et al.*, 2005; Lobley *et al.*, 2005; Parry *et al*., 2005). Increased social isolation can lead to depression and further reduction in social contacts. In contrast, those farmers that are able to diversify their activities, including engaging in AES, can increase their social networks and reduce social isolation (Lobley *et al.*, 2005).

iii. **Change in learning capacity**: There is evidence that membership of collaborative networks increases learning capacity. Sobels *et al.*, (2001) found in their study of two LandCare Networks in Australia that the networks had increased the individuals' and groups' capacity to deal with bureaucracy, increased confidence in discussing more complex concepts and information and increased the ability to adapt to change.

4) Indicator: Social Capital

Social capital relates to social relationships that have productive benefits. The presence of social capital can result in increased levels of trust, collaborative working and changes in socially and culturally acceptable behaviour.

Sub-indicators that make up the high-level indicator:

i. **Change in levels of social trust**: Involvement in AES may lead to changes in attitudes to Government agency staff, particularly if the relationship has been a positive experience, leading to effective agri-environmental knowledge exchange (Morris, 2006).

[2] https://www.nationalsheep.org.uk/workspace/pdfs/2016-results_1.pdf

The development of social capital in the groups was an important factor contributing to effective social learning and successful co-operative working in both of the collective AES that Mills *et al.* (2011) studied. The social capital manifested itself in a number of ways, including an increase in trust. Conversely, a bad experience of an AES can result in reduced social trust

ii. **Change in levels of collaborative working:** The presence of bonding social capital (strong social relationships within groups or families) can lead to collaborative working. Collective AES, in particular, can increase bonding social capital which can have several positive social outcomes, including an increase in collaborative working and an increased sense of collective efficacy; an understanding that environmental improvements are more likely to be achieved if working collectively (Mills *et al.*, 2011).

iii. **Change in social and cultural norms:** Much of the literature points to a change in social and cultural norms as an effective way of delivering environmental outcomes. If AES engagement results in changes in what are considered as acceptable environmental behaviours, this can result in positive environmental outcomes (Burton and Schwarz, 2013). Barnes *et al.* (2013) and Mills *et al*. (2011) suggest that this can be achieved, for example, through the group sharing information, or making individual farmer practices visible to their peers

5) Indicator: Cultural capital

Cultural capital relates to the accumulation of knowledge, behaviours, and skills that demonstrates a farmer's competence, which in turn impacts on his/her prestige, social status or standing in society.

Sub-indicator that makes up the high-level indicator:

i. **Change in levels of respect**: Evidence shows that participation in an AES can lead to a gain or loss in cultural capital. Evidence of gains in cultural capital are apparent if famers are approached for advice about their AES management practices. Also, cultural capital can be gained if a farm whose walls and fences were once in disrepair have been repaired and erected as a result of AES participation. On the contrary, if AES management is not considered part of "good farming" practice and its benefits are not clearly visible, cultural capital can be lost (Riley, 2016).

6) Indicator: Public image

Sub-indicator that makes up the high-level indicator:

i. **Change in public image:** Some farmers enter AES in part to improve their public image (Franks and Mc Gloin, 2007). If they receive positive feedback and public recognition for the environmental activities they undertake, they are more likely to maintain these adopted practices even in the absence of payments (Kufhuss, *et al*, 2015).

7) Indicator: Agency

Sub-indicator that makes up the high-level indicator:

i. **Change in control over land:** One outcome from AES where management practices are heavily prescribed with limited flexibility is a sense that prescriptions are imposed in a top-down fashion with little consideration given to local or tacit knowledge. Farmers can feel that they have lost some control over the management of their land, resulting in feelings of dispossession (Burgess *et al.*, 2000).

8) Resilience

Sub-indicators that make up the high-level indicator:

i. **Change in business security:** Evidence suggests that AES payments can help improve business security. For example, in an assessment of the incidental benefits of ES, Mills (2012) found that the scheme payments helped to stabilise income and offered the security of a regular income twice a year. The payments also made it easier to budget for lean months and the 10-year time horizon of HLS helped with financial planning. Often the farmer's commitment to the farmed environment was wrapped up in the importance of the schemes funding contribution to their income, and certainly without the payments they would have been farming differently. Similarly, Ingram *et al.* (2013) found that Tir Gofal payments in Wales offered financial security and were viewed as a way of keeping the farm business going when farm incomes were low. Not all AES provide financial security, for example in relation to woodland grants, Dandy (2012) suggested that the economic gains from these grants were often considered so small as to be neutralised by the costs of the bureaucracy involved.

ii. **Change in business structure**: There is evidence that funding from AES can facilitate business restructuring and long-term adjustment, particularly in a shift from productivism to cost-efficiency (Gorman *et al.*, 2001; Ingram *et al.*, 2013). AES offer a financial buffer that enable farms to evaluate the risks in a move towards the production of environmental goods (Gorman *et al.*, 2001; Kuhfuss *et al.*, 2015).

9) Indicator: Workload

Sub-indicator that makes up the high-level indicator:

i. **Change in labour availability:** Evidence suggests that AES can increase workload. Mills (2011) found that around 27% of ES agreement holders reported an increased workload as a result of the scheme. The Higher Level schemes, which are more demanding than the Entry Level schemes, experienced the highest increases in workload: 68%. Reasons stated for this increased workload included an intensification of boundary work, such as hedges and walling, and more scrub management. Conversely, reasons given for decreases in workload included less hedge cutting, reduced grassland inputs and stock numbers. Only 14% of agreement holders employed additional workers or made additional payments to existing employees to help specifically with ES work, which suggests that most of the work was undertaken by existing labour. One potential social outcome of this increased workload could be an increase in stress levels (see below). In contrast, in areas of widespread underemployment, such as the more marginal upland areas of England, labour demands of AES were seen as providing work for underemployed farm workers and family members, keeping them in full-time employment and therefore bringing a positive social outcome (Mills *et al.*, 2012).

10) Indicator: Stress levels, mental health and subjective well-being

It is widely recognised that farming is a stressful occupation which can impact on mental and physical health (Gregoire, 2002). According to a European Working Conditions Survey carried out in 31 European countries (Parent-Thirion, 2007), 32% of agricultural and fishery workers reported that work-related stress affects their health, compared to 22% in other occupational sectors. Farmers face numerous stressors, including long working hours, time constraints, unpredictable weather, uncertain markets, untimely equipment breakdowns, social and geographical isolation, increasing regulation, among others (Kearney *et al.*, 2014; Parent-Thirion, 2007; Parry *et al.*, 2005; Walker, 2012).

Given what is known about the impact of farming on mental health it is surprising that only two studies were identified that looked at the interlinkages between mental health and wellbeing and AES participation (Hounsome *et al.*, 2006; Saxby *et al.*, 2018). Hounsome *et al.* (2006) undertook a survey of the physical and mental health of farmers in Wales conducted through the Farm Business Survey using the SF-36 health questionnaire, which is a 'clinically validated, multi-purpose, short-form health survey with 36 questions' (Brazier *et al.*, 1992). They found that those who participated in AES had significantly better mental health than non-adopters. Saxby *et al*. (2018) also found that wellbeing, which they defined as social activity, identity, status and place belonging, is enhanced through AES participation.

Some studies have looked at the quality of life and mental health and well-being effects of agriculture more generally and we have drawn on this literature to make inferences about the impact of AES participation on mental health.

Truchot and Andela (2018) have produced a Farmers Stressor Inventory, to assess stressors met by farmers. Consideration of the identified stressors are of interest to our study if they are exacerbated by participation in AES. Table 3.6 lists 8 factors identified by Truchot and Andela (2018) that are linked to different aspects of farmers' job stressors.

Table 3.6 Factors contained in Farmers Stressors Inventory developed by Truchot and Andela (2018)

Stress factor	Item
Workload and lack of time	• Having too much workload • Having too much physical workload • Lack of time to complete tasks properly/to do the job well • Lack of time to rest • Lack of time to participate in social activities • Lack of time to participate in leisure activities • Do not have enough time to meet people, to go out with
Incertitude toward the future and the financial market	• To feel that the results provided in one's work do not live up to the gains and/or results obtained • To feel some uncertainty about the future • Being faced with production costs higher than selling costs, having to sell at a loss • Dealing with a reduction in financial margins • Being confronted with a reduction in subsidies • Being confronted with market instability (price

	collapse, price fluctuations, etc.)
Agricultural legislation pressure	• Having to adapt continuously to new regulations • Feeling harassed by agricultural policies • Having to adapt to excessive regulations • Being subject to regular checks by administrations • Being confronted with very complicated and complex hygiene standards • Having to always control everything for fear of making a mistake • Fear of the sanctions due to bad filling of files
Social and geographical isolation	• Suffering from lack of shops nearby • Suffering from the lack of services nearby (banks, post office, etc.) • Suffering from lack of health services (doctor, dentist) in the vicinity
Financial worry	• Having to contract loans • Having difficulty repaying loans, debts • Fear a situation of cessation of activity or bankruptcy • Coping with bank pressure
Conflicts with associates or family members	• Encounter conflicts with one's associate(s) • Have one or more associates who do not share one's professional values
Family succession of the farm	• Be afraid that my child(ren) will face the same difficulties as me • Fear of not being able to transmit the farm to one's child(ren) • Fear of having to find a successor outside the family
Unpredictable interference with farm work	• Weather unpredictability • Being exposed to machinery breakdown • Having to use increasingly sophisticated equipment • Frequent changes in work (machinery breakdown, weather conditions, unexpected, event, etc.)

Of these eight factors, evidence from the literature suggests that four in particular could be exacerbated by AES participation.

Sub-indicators that make up the high-level indicator:

i. **Change in stress levels due to workload:** As identified above, AES involvement can lead to increases in farm workload. This increased workload has the potential to increase stress levels. There is evidence that some farmers are already under considerable stress from their existing workloads, working long hours, with little time to relax and recuperate (Parry *et al.*, 2005). Therefore, any increased workload from AES may add to existing stress levels.

ii. **Change in stress levels due to AES administration:** Parry *et al.* (2005) in their study of the farming community's mental health highlighted that farmers' were increasingly stressed by the mounting levels of paperwork. The paperwork was considered to have grown beyond the point it was manageable, especially if IT skills were absent. Stress was also created by systems which were changed before farmers had time to adjust to them, and by new systems being introduced with insufficient lead-in times. Several evaluations of AES have identified a dislike of the paperwork involved (Mills *et al.*, 2012) and of the AES administrative systems employed (Short *et al.*, 2018; Staley *et al.*, 2018). Similarly, the administration process for the Better Woodlands for Wales grant scheme was found to be particularly frustrating, being both time-consuming and onerous (Ambrose-Oji *et al.*, 2012). Therefore, it can be inferred that the level of paperwork and difficulties with the administrative systems of AES can contribute to farmers' stress levels. Also fear of compliance inspections and of inadvertently breaching the AES rules have also added to farmers' level of stress.

iii. **Change in stress levels due to financial issues:** Farmers who have financial concerns may face additional pressures from the additional demands of AES. However, there is also evidence that AES payments can help relieve some of the financial pressure on farm businesses. As reported earlier, scheme payments can help to stabilise farm income and offer the security of a regular annual income (Ingram *et al.*, 2013; Mills, 2012).

iv. **Change in stress levels due to conflicts with associates or family members:** A number of studies have identified incidences when decisions to participate in AES have conflicted with the views of other family members, particularly those of a different generation, increasing levels of stress. For example, Mills *et al.* (2013) found that one farmer in their study had difficulties persuading his father, who undertook all the ploughing, to leave margins against hedges.

> "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".

v. **Change in stress levels due to enjoyment of environmental outcomes:** Positive impacts on mental health and wellbeing may result from AES participation due to improvements in the on-farm environment, which might include an increase in particularly species, such as birds, flowering plants or particular features, such as ponds or woodlands. Saxby *et al.* (2018), for example, described three farmers involved in an AES project who were motivated to stay at home to enjoy the wildlife attributed to their AES work, when previously they would have visited wildlife sites elsewhere.

3.4 Key factors influencing the social sustainability of AES

A further review was undertaken to identify social outcome indicators that can gauge the social sustainability of AES. These relate to on-farm conditions or experiences that affect the social world of the agreement holder and include some of the social outcomes identified above. In the context of this research, our definition of social sustainability is based on Bostrom's (2012) definition as including quality of life, social justice, social cohesion, cultural diversity, democratic rights, gender issues, human rights, participation, social capital development and human capability.

As no studies explicitly considered the social sustainability of AES, our review focused on emerging studies looking at the social sustainability of agriculture, that is "the extent to which social values, social identities, social relationships and social institutions can continue into the future" (Black, 2004).

Even looking more widely at the indicators to measure the sustainability of farming, few studies have measured social sustainability, partly due to its subjective character, and the limited availability of required data. Studies that have looked at the social sustainability of farming have included issues such as measures of the quality of life on farms, including health and safety indicators, measures of the likelihood of farm succession, sectoral resilience and demographic change (ageing, migration, mobility), measures of educational participation and employment creation and risk or isolation and access to services.

There are two types of social sustainability indicators, those relating to the farm community (such as health and well-being of farmers and their families) and those relating to society as a whole (such as the quality of life in rural areas). In the context of this study, only the first type of social sustainability indicators, relating to farmers and their families, are of interest.

In their review of the indicator literature, Lebacq *et al*. (2013) grouped the social indicators found into three main categories:

(i) education;

(ii) working conditions;

(iii) quality of life;

We have used these three categories for our identification from the literature of different social sustainability indicators. A review of Frameworks and Methods for Measuring and Monitoring Sustainable Agriculture (Hayati, 2017) was a key document used to compile the list of indicators in Table 3.7.

Table 3.7 List of Social Indicators from review of literature

Category	Social indicator	Reference
Education	• Level of (agricultural) education attainment	(Binder *et al.*, 2010; Dillon *et al.*, 2016; Hřebíček *et al.*, 2013; King, 2016)
	• Knowledge about resource conservation	(Waney *et al.*)
Working conditions	• Working time, working hours	(Hřebíček *et al.*, 2013; Van Cauwenbergh *et al.*, 2007);
	• Salary	(Hřebíček *et al.*, 2013)

	• Workload	(Van Cauwenbergh *et al.*, 2007)
	• Safety and health protection at work	(Hřebíček *et al.*, 2013)
	• Work–life balance, holidays	(Dillon *et al.*, 2016; Hřebíček *et al.*, 2013)
Quality of life/Wellbeing	• Physical health	(Latruffe *et al.*, 2016)
	• Isolation risk	(Dillon *et al.*, 2016)
	• Household vulnerability	(Dillon *et al.*, 2016)
	• Income inequality	(King, 20160
	• Access to services and infrastructures. Existence of formal and informal structures and institutions that allow people to take care of each other according to their own values	(Hřebíček *et al.*, 2013; King, 2016; Mettepenningen *et al.*, 2013; Meul *et al.*, 2008; Waney *et al.*)
	• Social involvement/diversification, Local community engagement/ Social capital	(Binder *et al.*, 2010; Hřebíček *et al.*, 2013; Latruffe *et al.*, 2016; Waney *et al.*)
	• Professional pride - How a farmer's identity and expectations fit with the daily reality of farming - eight factors in a list of 24 that farmers consider as essential for maintaining their pride	(Mettepenningen *et al.*, 2013)
	• Gender equality	(Van Cauwenbergh *et al.*, 2007)
	• Agency - Farmer's feeling of independence; room for manoeuvre to take own decisions according to own insights, capacities and desires	(Meul *et al.*, 2008; Van Cauwenbergh *et al.*, 2007)
	• Image of farmers/ agriculture in local communities	(Latruffe *et al.*, 2016)
	• Social acceptance	(Binder *et al.*, 2010)

The FLINT study (Herrera *et al.*, 2016) is a particularly comprehensive study of on-farm social sustainability indicators. It used 'objective' social indicators (events or conditions on the farm) and 'subjective' social indicators (perceptions of the farmer's experiences or affecting factors) to measure farm-level sustainability. The objective indicators incorporated four main topics: knowledge and information, employment and working conditions, social engagement and succession and farm continuity, whilst the subjective indicators covered three areas: satisfaction with several dimensions of the job and quality of life, perceptions of the change from the past and perceptions about the continuity of farming.

Table 3.8 Farm-level indicators and variables identified in the FLINT study

Indicator	Variables (units)
Knowledge and information	• Number of total contacts of advisory service per year (number of contacts) • Number of providers of advisory services (number) • Number of types of advice (number) • Type of technologies used

	• (Categories: 1=internet; 2=modern technologies (GPS, robotics); 3=modern management tools). • Number of main information sources about CAP and Cross Compliance (number) • Number of persons participating in training events (number) • Years of experience as manager (years)
Employment and working conditions	• Holiday days (days) • Free days per week (days) • Off-farm annual working hours of owner (annual working hours) • Off-farm annual working hours of spouse (annual working hours) • Average weekly working hours of manager (weekly working hours) • Average day working hours during peak season (daily working hours) • Professional replacement in case of illness (Categories: 1= replacement available; 0=replacement not available) • Professional replacement in cases other than illness (Categories: 1= replacement available; 0=replacement not available) • Average age of machinery (years) • Average age of agricultural buildings (years) • Farm net value added/AWU • Total labour (AWU) • Family labour (AWU)

Social engagement	• Social diversification index (number of organizations and local events in which the farm operator participates)
	  • Social engagement
	  (Categories: 1=participation in organizations; 0=no participation)
	  • Local participation
	  (Categories: 1=participation in local events; 0=no participation in local events)

Job satisfaction	• Satisfaction with daily job task (scale from 0 to 10) • Satisfaction with work life balance (scale from 0 to 10) • Satisfaction with being a farmer (scale from 0 to 10) • Satisfaction with freedom of making decision (scale from 0 to 10) • Stress perception (scale from 0 to 10) • Overall job satisfaction (scale from 0 to 10)
Quality of life	• Satisfaction with quality of life (scale from 0 to 10) • Overall quality of life (scale from 0 to 50)
Succession and farm continuity	• Quit farm in the next 5 years (Categories: 1 = Give up for retirement; 2 = Give up for other reason; 3 = No plan to give up for the next 5 years; 4 = Don't know) • Presence of successor (Categories: 1 = Husband/spouse or partner; 2 = One or more of the children; 3 = Somebody else from the family; 4 = Somebody outside the family; 5 = Irrelevant; 6 = None) • Perception towards farming (Categories: 1 = Would like their children to farm, full time; 2 = Would like their children to farm, part time; 3 = Would not like their children to farm; 4 = Do not know

3.5 Summary of findings and feedback loops

The evidence review has used an analytical framework based around farmers' willingness to engage, capacity to engage and level of farmer engagement with others to identify factors that affect the quality of engagement with AES and the social outcomes of AES. Overall, the willingness to engage and the level of farmer engagement with others factors were found to be the most influential in affecting environmental outcomes. Key indicators where links between environmental and social outcomes were identified related to farmers':

- interest and awareness in the environment;
- level of engagement with advice and training;
- development of knowledge and skills in relation to environmental management;
- extent of social interaction and public acknowledgement as a consequence of AES; and
- engaging with other farmers or the public affecting norms and cultural capital.

The factors relating to farmers' capacity to engage with AES revealed less evidence of links to environmental outcomes.

A number of feedback loops were identified between engagement factors, social outcomes and environmental outcomes. For example, the more an agreement holder is engaged in receiving advice and training about their agreement, the more conscious they become of the environmental impacts of their management practices, leading to continued activity. Furthermore, the more that a farmer is involved in AES activities, the more knowledge is gained about the ease or difficulty of a particular activity and confidence can grow in their skills and abilities which means that they are more likely to continue with it. The longer the engagement in AES, the greater the likelihood of recognising and/or experiencing environmental success or benefit which result is an increased desire to continue with pro-environmental activities and the motivation to perform additional ones in the future. If these activities are then recognised as 'good farming' within the farming community, and farmers receive respect and prestige from other farmers for their AES activities, or at least public acknowledgement, then the pro-environmental behaviour will become further embedded in the farmers' self-identity.

If AES offer an opportunity for farmers to diversify their networks, this can result in a number of positive social outcomes. It can, for example, reduce social isolation, increase information and knowledge sharing and lead to the development of more trusting relationships. However, AES can also potentially produce negative social outcomes, particularly if participation increases levels of stress as a result of administrative difficulties or pressures on workloads and financial resources, or farmers feel they are losing control over the management of their land. These factors can all influence the social sustainability of farming, which can be measured in terms of working conditions, social engagement, job satisfaction, and quality of life.

3.6 Evidence Gaps

One clear evidence gap that has emerged from the review is the paucity of literature on the social outcomes of AES. Until now, most AES evaluations have focused on the environmental and economic outcomes. This lack of evidence clearly justifies the need to

develop indicators to measure the social outcomes of AES, as is the objective of this project. It is also clear that the majority of evidence to date tends to focuses on the positive, rather than the negative factors affecting the quality of AES engagement or social outcomes.

Whilst there is more evidence focusing on the monitoring of AES engagement, rather than social outcomes, even this data tends to focus on reasons for AES participation, rather than the quality of AES engagement.

Another evidence gap relates to measuring the social sustainability of AES and therefore this review has looked at the significance of indicators identified and used for measuring the social sustainability of farms more generally.

3.7 Next Step: Selecting Social Indicators

The next step of the project was to select a short list of indicators to test from the long-list identified in this review, accounting also for practical considerations. Selection criteria were required to compare and evaluate the long-list of indicators from the review. Various selection criteria are used in sustainability assessments, and the importance given to each depends on the context and the objective of the study. Lebacq *et al.* (2013) have grouped the most common selection criteria into three classes:

- Relevance - criteria related to the appropriateness of the indicators in terms of context and quality of the analysis;
- Practicability - criteria related to the practical nature of indicator calculation and implementation;
- End user value: criteria related to the use of the indicators by end users

It was recommended that these three selection criteria were applied to produce the short-list of indicators in the next stage of the project. Further criteria that helped in assessing the relevance and practicability of the indicators discussed in this report were provided by Meul *et al.* (2008) and were also used to guide the selection process:

- an obvious and well-defined relationship between an indicator and the phenomenon being monitored (causality);
- a change in the situation is reflected in a value change of the indicator (sensitivity);
- calculation method of the indicator value minimally depends on external factors (solidness);
- benchmarks are available to evaluate the indicator value (use of benchmarks); and
- indicator values and scores are easily interpretable (comprehensibility).

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Appendix 1: Full list of reviewed papers and reports

Author	Year	Title	Journal
ADAS	2007	Evaluation of Educational Access Under Defra Agri-Environment Schemes. Report to Defra	
Adimassu, Z. Kessler., A., Hengsdijk, H.	2012	Exploring determinants of farmers' investments in land management in the Central Rift Valley of Ethiopia	Applied Geography 35 1-2 191-198
Ahnstrom, J. Hockert., J., Bergea, H. L., Francis, C. A., Skelton, P., Hallgren, L.	2009	Farmers and nature conservation: What is known about attitudes, context factors and actions affecting conservation?	Renewable Agriculture and Food Systems 24 1 38-47
Allo, M. Louriero., M. L., Iglesias, E.	2015	Farmers' Preferences and Social Capital Regarding Agri-environmental Schemes to Protect Birds	Journal of Agricultural Economics 66 3 672-689
Ambrose-Oji, B. V., Gregory, Stewart, Amy, Sarajevs, Vadims, Handley, Phil	2012	Evaluation of Better Woodlands for Wales Grant Scheme	
Ansink, E. Tesfaye., A., Bouma, J., Brouwer, R.	2017	Cooperation in watershed management: A field experiment on location, trust, and enforcement	Resource and Energy Economics 50 91-104
Barnes, A. P. Toma., L., Willock, J., Hall, C.	2013	Comparing a 'budge' to a 'nudge': Farmer responses to voluntary and compulsory compliance in a water quality management regime	Journal of Rural Studies 32 448-459
Barreiro-Hurle, J. Espinosa-Goded., M., Dupraz, P.	2010	Does intensity of change matter? Factors affecting adoption of agri-environmental schemes in Spain	Journal of Environmental Planning and Management 53 7 891-905
Bartkowski, B. Bartke., S.	2018	Leverage Points for Governing Agricultural Soils, A Review of Empirical Studies of European Farmers' Decision-Making	Sustainability 10 9 27
Batáry, P. D., Lynn V., Kleijn, David, Sutherland, William J.	2015	The role of agri-environment schemes in conservation and environmental management	Conservation Biology 29 4 1006-1016
Baur, I. Dobriki., M., Lips, M.	2016	The basic motivational drivers of northern and central European farmers	Journal of Rural Studies 46 93-101
Beedell, J. R., Tahir	2000	Using social-psychology models to understand farmers' conservation behaviour	Journal of rural studies 16 1 117-127

Bell, S.	2007	Assessing the contribution of forestry grants to equal access for disabled people to recreation goods, facilities and services in Scottish Forests: evaluation framework. OPENspace report to the Forestry Commission, Edinburgh, 45	
Bergsten, S. S., Olof, Pettersson, Orjan	2018	Experiences and emotions among private forest owners versus public interests: Why ownership matters	Land Use Policy 79 801-811
Bjarstig, T. K., E.	2016	Forest social values in a Swedish rural context: The private forest owners' perspective	Forest Policy and Economics 65 17-24
Boardman, J. B., S., Seymour, S.	2017	Understanding the influence of farmer motivations on changes to soil erosion risk on sites of former serious erosion in the South Downs National Park, UK	Land Use Policy 60 298-312
Boatman, N. J., Naomi, Bishop, Julie, Blackburn, James, Conyers, Simon, Elliott, John, Hallam, Caroline, Huntly, Alistair	2013	Monitoring the Impacts of Entry Level Stewardship. Natural England Report NECR133	
Boon, T. E. B., Stine Wamberg, Meilby, Henrik	2010	How financial compensation changes forest owners' willingness to set aside productive forest areas for nature conservation in Denmark	Scandinavian Journal of Forest Research 25 6 564-573
Bremer, L. L. Farley., K. A., Lopez-Carr, D.	2014	What factors influence participation in payment for ecosystem services programs? An evaluation of Ecuador's SocioParamo program	Land Use Policy 36 122-133
Brouwer, R. L., Nele, Oosterhuis, Frans	2015	Incentivizing afforestation agreements: Institutional-economic conditions and motivational drivers	Journal of Forest Economics 21 4 205-222
Burgess, J. Clark., J., Harrison, C. M.	2000	Knowledges in action: an actor network analysis of a wetland agri-environment scheme	Ecological Economics 35 1 119-132
Burton, R. J. F.	2014	The influence of farmer demographic characteristics on environmental behaviour: A review	Journal of Environmental Management 135 19-26
Burton, R. J. F. Paragahawewa., U. H.	2011	Creating culturally sustainable agri-environmental schemes	Journal of Rural Studies 27 1 95-104
Burton, R. J. F. Schwarz., G.	2013	Result-oriented agri-environmental schemes in Europe and their potential for promoting behavioural change	Land Use Policy 30 1 628-641

Cao, Y. E., John, Tweedie, Fiona, Jones, Naomi, Short, Chris	2018	Initial Evaluation of the Implementation of Countryside Stewardship (CS) in England Objective 4 Initial Evaluation of CS Implementation. Final Report to Natural England	
The Farm Life Cente	2016	Opening The Gate: Helpful hints for on - farm advisors about developing positive working relationships with farmers	
Church, A. Ravenscroft., N.	2008	Landowner responses to financial incentive schemes for recreational access to woodlands in South East England	Land Use Policy 25 1 1-16
Clarke, R. M., David, Anteric, Marija	2011	Evaluation of the Heritage Lottery Fund Landscape Partnership Programme: report to the Heritage Lottery Fund	
Cramb, R. A.	2006	The role of social capital in the promotion of conservation farming: The case of 'landcare' in the southern Philippines	Land Degradation & Development 17 1 23-30
Dandy, N.	2012	Understanding Private Land-manager Decision-making: A Framework for Forestry. Forest Research	
Dandy, N.	2016	Woodland neglect as social practice	Environment and Planning A 48 9 1750-1766
de Krom, M. P.	2017	Farmer participation in agri-environmental schemes: Regionalisation and the role of bridging social capital	Land Use Policy 60 352-361
De Snoo, G. Lokhorst., AM, Van Dijk, J, Staats, H, Musters, CJM	2010	Benchmarking biodiversity performance of farmers	Aspects Appl. Biol 100 311-317
de Snoo, G. R. H., Irina, Staats, Henk, Burton, Rob J. F., Schindler, Stefan, van Dijk, Jerry, Lokhorst, Anne Marike, Bullock, James M., Lobley, Matt, Wrbka, Thomas, Schwarz, Gerald, Musters, C. J. M.	2012	Toward effective nature conservation on farmland: making farmers matter	Conservation Letters 6 1 66-72
de Snoo, G. R. H., I.: Staats, H.: Burton, R. J. F.: Schindler, S.: van Dijk, J.: Lokhorst, A. M.: Bullock, J. M.: Lobley, M.: Wrbka, T.: Schwarz, G.: Musters, C. J. M.	2013	Toward effective nature conservation on farmland: making farmers matter	Conservation Letters 6 1 66-72

DeAngelo, M. N.-P., Max	2017	Choosing the Right Policy Tools to Encourage Watershed Stewardship through the Study of Attitude	Society & Natural Resources 30 11 1328-1342
Deuffic, P. S., Metodi, Arts, Bas	2018	"Your policy, my rationale". How individual and structural drivers influence European forest owners' decisions	Land Use Policy 79 1024-1038
Dobbs, T. L. Pretty., J.	2008	Case study of agri-environmental payments: The United Kingdom	Ecological Economics 65 4 765-775
Drescher, M. W., G. Keith, Farmer, James R., Larson, Brendon M. H.	2017	Private landowners and environmental conservation: a case study of social-psychological determinants of conservation program participation in Ontario	Ecology and Society 22 1
Ducos, G. D., P., Bonnieux, F.	2009	Agri-environment contract adoption under fixed and variable compliance costs	Journal of Environmental Planning and Management 52 5 669-687
Duesberg, S. D., Aine Ni, O'Connor, Deirdre	2014	Assessing policy tools for encouraging farm afforestation in Ireland	Land Use Policy 38 194-203
Dwyer, J. Mills., Jane, Ingram, Julie, Taylor, James, Burton, Rob, Blackstock, Kirsty, Slee, Bill, Brown, Katrina, Schwarz, Gerald, Matthews, Keith	2007	Understanding and influencing positive behaviour change in farmers and land managers	CCRI, Macaulay Institute
Emery, S. B. Franks., J. R.	2012	The potential for collaborative agri-environment schemes in England: Can a well-designed collaborative approach address farmers' concerns with current schemes?	Journal of Rural Studies 28 3 218-231
Feliciano, D. B., Laura, Brahic, Elodie, Deuffic, Philippe, Dobsinska, Zuzana, Jarsky, Vilem, Lawrence, Anna, Nybakk, Erlend, Quiroga, Sonia, Suarez, Cristina, Ficko, Andrej	2017	Understanding private forest owners' conceptualisation of forest management: Evidence from a survey in seven European countries	Journal of Rural Studies 54 162-176
Fish, R. Seymour., S., Watkins, C.	2003	Conserving English landscapes: land managers and agri-environmental policy	Environment and Planning A 35 1 19-41
Franks, J. R.	2011	The collective provision of environmental goods: a discussion of contractual issues	Journal of Environmental Planning and Management 54 5 637-660

Franks, J. R.	2014	An Application of Boundary Organisation Theory to Develop Landscape-scale Conservation in Formal Agri-environment Schemes	Sociologia Ruralis 56 1 48-73
Franks, J. R. McGloin., A.	2007	Joint submissions, output related payments and environmental co-operatives: Can the dutch experience innovate UK agri-environment policy?	Journal of Environmental Planning and Management 50 2 233-256
Franks, J. R. M., McGloin, A.	2007	Environmental co-operatives as instruments for delivering across-farm environmental and rural policy objectives: lessons for the UK	Journal of rural studies 23 4 472-489
Gabel, V. M. H., R., Stolze, M., Birrer, S., Steinemann, B., Kopke, U.	2018	The influence of on-farm advice on beliefs and motivations for Swiss lowland farmers to implement ecological compensation areas on their farms	Journal of Agricultural Education & Extension 24 3 233-248
Gorman, M. M., Joe, Kinsella, Jim, Bogue, Pat	2001	Connecting environmental management and farm household livelihoods: The Rural Environment Protection Scheme in Ireland	Journal of Environmental Policy and Planning 3 2 137-147
Gregoire, A.	2002	The mental health of farmers	Occupational Medicine 52 8 471-476
Guillem, E. E. Barnes., A.	2013	Farmer perceptions of bird conservation and farming management at a catchment level	Land Use Policy 31 565-575
Hammes, V. E., M., Isselstein, J., Kayser, M.	2016	The attitude of grassland farmers towards nature conservation and agri-environment measures-A survey-based analysis	Land Use Policy 59 528-535
Hanley, N. Banerjee., S., Lennox, G. D., Armsworth, P. R.	2012	How should we incentivize private landowners to 'produce' more biodiversity?	Oxford Review of Economic Policy 28 1 93-113
Haugen, K.	2016	Contested Lands? Dissonance and Common Ground in Stakeholder Views on Forest Values	Tijdschrift Voor Economische En Sociale Geografie 107 4 421-434
Hejnowicz, A.P., Rudd, M.A. and White, P.C.,	2016	A survey exploring private farm advisor perspectives of agri-environment schemes: The case of England's Environmental Stewardship programme	Land Use Policy 55 240-256
Herzon, I. Birge., T., Allen, B., Povellato, A., Vanni, F., Hart, K., Radley, G., Tucker, G., Keenleyside, C., Oppermann, R.,	2018	Time to look for evidence: Results-based approach to biodiversity conservation on farmland in Europe	Land Use Policy 71 347-354

Underwood, E., Poux, X., Beaufoy, G., Prazan, J.			
Herzon, I. M., Merit	2007	Farmers' perceptions of biodiversity and their willingness to enhance it through agri-environment schemes: A comparative study from Estonia and Finland	Journal for Nature Conservation 15 1 10-25
Hopkins, J. S., Lee-Ann, Ehlers, Melf-Hinrich, Matthews, Keith, Barnes, Andrew, Toma, Luiza	2017	Scottish farmers' intentions to afforest land in the context of farm diversification	Forest Policy and Economics 78 122-132
Hounsome, B. Edwards., R. T., Edwards-Jones, G.	2006	A note on the effect of farmer mental health on adoption: The case of agri-environment schemes	Agricultural Systems 91 3 229-241
Howley, P.	2013	Examining farm forest owners' forest management in Ireland: The role of economic, lifestyle and multifunctional ownership objectives	Journal of environmental management 123 105-112
Huttunen, S. P., J.	2016	Agri-environmental policies and 'good farming' in cultivation practices at Finnish farms	Journal of Rural Studies 44 217-226
Hynes, S. Garvey., E.	2009	Modelling Farmers' Participation in an Agri-environmental Scheme using Panel Data: An Application to the Rural Environment Protection Scheme in Ireland	Journal of Agricultural Economics 60 3 546-562
Ingram, J. G., Peter, Mills, Jane, Short, Chris	2013	Incorporating agri-environment schemes into farm development pathways: A temporal analysis of farmer motivations	Land Use Policy 31 267-279
Ingram, J. S., Christopher J, Gaskell, Peter, Mills, Jane, Lewis, Nick, Clark, Michael, Dennis, E, Fisher, R, Owen, I	2009	Entry and exit from agri-environmental schemes in Wales	
Ipsos MORI	2016	Catchment Sensitive Farming Catchment Reports 1-40. Report for the Environment Agency	
Ipsos MORI	2016	Catchment Sensitive Farming Survey. Summary of results from the 2015-16 Survey	
Ipsos MORI	2016	Countryside Stewardship Baseline Report for the Environment Agency	

Jacobson, S. K. S., Kathryn E, Jones, Gregory A, Van Doorn, Annamaria	2003	Assessment of farmer attitudes and behavioral intentions toward bird conservation on organic and conventional Florida farms	Conservation Biology 17 2 595-606
Jones, N. S., Christopher, Elliot, John, Cao, Yiying, Gaskell, Peter, Hallam, Caroline, Laybourn, T, Breyer, H, Conyers, Simon, Boatman, Nigel	2015	ES quality assurance programme 2013/4: assessing the role of advice and support on the establishment of HLS agreements. Report to Natural England	
Josefsson, J. L., Anne Marike, Pärt, Tomas, Berg, Åke, Eggers, Sönke	2017	Effects of a coordinated farmland bird conservation project on farmers' intentions to implement nature conservation practices–Evidence from the Swedish Volunteer & Farmer Alliance	Journal of environmental management 187 8-15
Karppinen, H. H., Maria, Valsta, Lauri	2018	Forest owners' views on storing carbon in their forests	Scandinavian Journal of Forest Research 1-8
Kelemen, E. N., G., Gomiero, T., Kovacs, E., Choisis, J. P., Choisis, N., Paoletti, M. G., Podmaniczky, L., Ryschawy, J., Sarthou, J. P., Herzog, F., Dennis, P., Balazs, K.	2013	Farmers' perceptions of biodiversity: Lessons from a discourse-based deliberative valuation study	Land Use Policy 35 318-328
Kleijn, D. B., F., Smit, R., Gilissen, N., Smit, J., Brak, B., Groeneveld, R.	2004	Ecological effectiveness of agri-environment schemes in different agricultural landscapes in the Netherlands	Conservation Biology 18 3 775-786
Koster, T. V., K., Koorberg, P., Selge, I., Viik, E., Lithuanian Univ, Agriculture	2009	Do We Need Broad and Shallow Agri-environment Schemes? - Outcomes of Ex-post Evaluation of Estonian Rural Development Plan 2004-2006	Rural Development 2009, Proceedings, Vol 4, Book 1, Proceedings 219-224
Kross, S. M. Ingram., K. P., Long, R. F., Niles, M. T.	2018	Farmer Perceptions and Behaviors Related to Wildlife and On-Farm Conservation Actions	Conservation Letters 11 1
Kuhfuss, L. P., R., Thoyer, S., Hanley, N., Le Coent, P., Désolé, M.	2015	Nudges, Social Norms and Permanence in Agri-Environmental Schemes	Uni of St Andrews
Kumer, P. M., Špela Pezdevšek	2018	Factors Hindering Forest Management Among Engaged and Detached Private Forest Owners: Slovenian Stakeholders' Perceptions	Small-scale Forestry 1-21

Kvakkestad, V., Rørstad, P.K. and Vatn, A.	2015	Norwegian farmers' perspectives on agriculture and agricultural payments: Between productivism and cultural landscapes	Land Use Policy 42 83-92
Laakkonen, A. Z., Rebekah, Kähkönen, Tanja, Hujala, Teppo, Takala, Tuomo, Tikkanen, Jukka	2018	Forest owners' attitudes toward pro-climate and climate-responsive forest management	Forest Policy and Economics 87 1-10
Lawrence, A.	2018	Do interventions to mobilize wood lead to wood mobilization? A critical review of the links between policy aims and private forest owners' behaviour	Forestry 91 4 401-418
Lawrence, A. Carter., C., Liz O'Brien, Lovell, R.	2009	Social benefits from the Forestry Commission Public Forest Estate in England: review of current evidence. Forest Research	
Lawrence, A. Dandy., N., Urquhart, J.	2010	Landowner attitudes to woodland creation and management in the UK. Forest Research	
Lawrence, A. Dandy., N.	2014	Private landowners' approaches to planting and managing forests in the UK: What's the evidence?	Land Use Policy 36 351-360
Lobley, M. S., Eirini, Winter, Michael, Bullock, James	2013	Training farmers in agri-environmental management: the case of Environmental Stewardship in lowland England	International Journal of Agricultural Management Volume 03 12-20
Lockie, S.	2006	Networks of agri-environmental action: Temporality, spatiality and identity in agricultural environments	Sociologia Ruralis 46 1 22-39
Lynch, J. D., Trevor, Finn, John A., Dillon, Emma, Ryan, Mary	2018	Potential development of Irish agricultural sustainability indicators for current and future policy evaluation needs	Journal of environmental management 230 434-445
Macdonald, D. W. Johnson, P. J.	2000	Farmers and the custody of the countryside: trends in loss and conservation of non-productive habitats 1981-1998	Biological Conservation 94 2 221-234
Mante, J. Gerowitt., B.	2009	Learning from farmers' needs: Identifying obstacles to the successful implementation of field margin measures in intensive arable regions	Landscape and Urban Planning 93 3-4 229-237
Marja, R. H., I., Viik, E., Elts, J., Mand, M., Tscharntke, T., Batary, P.	2014	Environmentally friendly management as an intermediate strategy between organic and conventional agriculture to support biodiversity	Biological Conservation 178 146-154

Mastrangelo, M. E. G., M. C., Laterra, P., Linklater, W. L., Milfont, T. L.	2014	Psycho-Social Factors Influencing Forest Conservation Intentions on the Agricultural Frontier	Conservation Letters 7 2 103-110
Mayer, A. L.	2018	Family forest owners and landscape-scale interactions: A review	Landscape and Urban Planning
McCracken, M. E. W., B. A., Lobley, M., Pywell, R. F., Saratsi, E., Swetnam, R. D., Mortimer, S. R., Harris, S. J., Winter, M., Hinsley, S., Bullock, J. M.	2015	Social and ecological drivers of success in agri-environment schemes: the roles of farmers and environmental context	Journal of Applied Ecology 52 3 696-705
McGinlay, J., Gowing, D.J. and Budds, J	2017	The threat of abandonment in socio-ecological landscapes: Farmers' motivations and perspectives on high nature value grassland conservation	Environmental Science & Policy 69 39-49
McKenzie, A. J. E., Steven B., Franks, Jeremy R., Whittingham, Mark J.	2013	FORUM: Landscape-scale conservation: collaborative agri-environment schemes could benefit both biodiversity and ecosystem services, but will farmers be willing to participate?	Journal of Applied Ecology 50 5 1274-1280
Mettepenningen, E. V., Valerie, Delaet, Katrien, Van Huylenbroeck, Guido, Wailes, Eric J.	2013	Investigating the influence of the institutional organisation of agri-environmental schemes on scheme adoption	Land Use Policy 33 20-30
Mills, J.	2012	Exploring the social benefits of agri-environment schemes in England	Journal of Rural Studies 28 4 612-621
Mills, J. G., David, Ingram, Julie, Reed, Matt, Short, Christopher, Dwyer, Janet	2011	Organising Collective Action for Effective Environmental Management and Social Learning in Wales	The Journal of Agricultural Education and Extension 17 1 69-83
Mills, J. G., Peter, Short, Christopher, Manley, Will	2012	Attitudes to Uplands Entry Level Stewardship	
Mills, J. G., Peter, Reed, Matt, Short, Christopher J, Ingram, Julie: Boatman, Nigel, Jones, Naomi, Conyers, Simon, Carey, Peter, Winter, Michael	2013	Farmer attitudes and evaluation of outcomes to on-farm environmental management. Report to Defra	
Mills, J. G., Peter, Ingram, Julie, Dwyer, Janet, Reed, Matt, Short, Christopher	2017	Engaging farmers in environmental management through a better understanding of behaviour	Agriculture and human values 34 2 283-299

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