

## **Policy analysis:**

# **Promoting SICS adoption in the English East Midlands, United Kingdom**

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## Executive summary

The soil-improving cropping systems (SICS) tested at the SoilCare study site “Loddington” located in the English East Midlands (UK), test measures for compaction alleviation in no tillage systems (*ploughing, low disturbance sub-soiling and mycorrhizal inoculant*), and soil-improving crops (*incorporation of deep-rooting grass leys into arable rotations*). SICS were selected to address the main soil threats found at the site: compaction, low soil organic matter and blackgrass. They therefore represent important practices that might benefit soil health in the region if widely taken up. The main aim of the work presented here was to formulate policy alternatives and actions and to facilitate the adoption of soil-improving cropping systems.

## Policy shortcomings and opportunities for facilitating the uptake of SICS

SICs adoption is already promoted through a range of existing regulatory, economic, and voluntary policy instruments and measures in the English East Midlands (shaded in green). The analysis shows that several policies address the SICs that were tested in the study site: the incorporation of grass leys into arable rotations is incentivised under the CAP's cross-compliance standards as well as the Rural Development Programme for England 2014 - 2020, although deep-rooting cultivars are not specifically supported. Reduced or no tillage is encouraged by some policies, but mandatory requirements or economic incentives are not established by any of the policies analysed.

Table 1: Coverage of SICS in current regional policies, instruments, and measures in the English East Midlands (UK)

Policy	Crop rotation	Green manures, cover crops, catch crops	Integrated nutrient management	Enhanced efficiency irrigation	Controlled drainage	Reduced or no-tillage	Integrated pest management	Smart weed control	Smart residue management	Controlled traffic management	Integrated landscape management
CAP GAEC Cross-compliance Standards											
The Guide to Cross-compliance in England 2017											
CAP Rural Development Programme 2014 - 2020											
Countryside Stewardship											
Organic regulation											
Nitrate Pollution Prevention Regulations											
Plant Protection Products Regulations											
Pesticides Control legislation											
Campaign for the Farmed Environment											
Water Environment Regulations											
Sludge Regulations											

Evidence gathered through desk research, interviews and a stakeholder workshop show that different factors contribute to and undermine the uptake of SICS in general, and of the practices tested at Loddington in particular. These include:



- Lack of soil-specific policies
- Extent of farmer input to policymaking
- Limited coherence between policy instruments
- Lack of monitoring and enforcement
- High adoption costs
- Limited flexibility of financial instruments
- Pressure from market demands
- Lack of education and training

The table below provides an overview of barriers and enablers for the SICS tested at the study site and which were identified by stakeholders during the adoption workshop.

*Table 2: Adoption barriers, enablers, and actions to increase uptake of the SICS tested at study site identified by stakeholders: Participants were asked to identify actions for the most important factors affecting SICS adoption; therefore, not all adoption factors were discussed in detail. The effectiveness and feasibility of an action was not assessed.*

<b>Soil-improving crops: Introduction of grass leys in rotation</b>	
<b>Adoption barriers (-) and enablers (+)</b>	<b>Actions</b>
Simple to implement with existing practices (+)	<i>None identified</i>
May offer blackgrass control measure (+)	<i>None identified</i>
Limited knowledge of costs/benefits (-)	Identify/demonstrate benefits, e.g., for nutrition quality
Lack of awareness about financial support (-)	Make funding available for public benefits delivered, e.g., contribution to flood control; ensure wider reach of available guidance and handbooks for farmers
Lack of legislation protecting the soil (-)	Design soil specific legislation, taking into account climate change
Lack of knowledge about soil (-)	Training of farmers, wider use of bottom-up voluntary initiatives
Crops grown at unsuitable places due to high market demand (-)	Using payments to encourage sustainable crops to counter market forces or actively discouraging certain crops with higher taxes
Lack of monitoring for funding schemes (-)	Better monitoring of funding schemes to ensure farmers are fulfilling their obligations
Might not be attractive to wholly arable farmers (-)	<i>None identified</i>
Conflicts with objective of increasing food supply (cereal yield decline at catchment scale) (-)	<i>None identified</i>
5-year rule for permanent pastures (-)	<i>None identified</i>
Stewardship scheme prevents conservation of forage (-)	<i>None identified</i>
<b>Compaction alleviation experiments: Plough, sub-soiling and mycorrhizal inoculation</b>	
<b>Adoption barriers (-) and enablers (+)</b>	<b>Actions</b>
Sub-soiling acceptable agronomic / known practice (+)	<i>None identified</i>
Limited knowledge of costs/benefits (-)	Research/demonstrate benefits of application in the region
Not applicable to all soils (shallow/stony soils) (-)	<i>None identified</i>
Lack of knowledge of practical application in combination with inoculant (-)	Knowledge transfer needed through advisory services
Availability of equipment needed (-)	<i>None identified</i>

### *Recommendations for actions to promote the uptake of SICS*

Based on this analysis, and feedback collected from stakeholder, the following recommendations are formulated. Whilst the actions outlined here specifically aim to promote the uptake of the practices tested at Loddington, they are likely to encourage the adoption of soil-improving cropping systems in general.

- **Consider the development of a dedicated soil policy:** legislation focusing on soil is needed for a more concrete impact on farmers and the adoption of SICS. Such an intervention should be designed to accommodate farm diversity, featuring a robust monitoring and enforcement system. The 25-year Environmental Plan (25YEP) provides an important step in the right direction, but appropriate management approaches, instruments, and metrics are needed, which are commitments established by the 25YEP. While SMR's (Statutory Management Requirements) will be preserved in English law following Brexit, a similar mechanism to preserve the aims of the GAECs is needed.
- **Increase policy coherence:** some of the soil-improving practices might not align with existing policy objectives. For example, a reduced yield (but increased soil quality) contrasts with the aim of increasing food production. By the same token, some policy objectives foster unsustainable agricultural practices. Policy conflicts and synergies therefore need to be carefully analysed and aligned, in order not to discourage the transition to sustainable farming practices. Ultimately, this might require a prioritisation of certain objectives and targets (and operationalised by the right policy interventions) as a certain level of conflict is unavoidable to ensure the right balance between environmental, social, and economic sustainability. On a practical level, it is important for farmers to have clear, unambiguous information on the legal conditions they need to comply with – especially if they are tied to subsidies - and those that may be rewarded.
- **Make economic instruments more flexible to provide tailored support to farmers transitioning to sustainable practices:** financial instruments should allow long-term change in practices rather than finance one off interventions. They should be designed in a way that offers integral solutions to farmers, for instance they should cover costs associated with machinery or other investments associated with change, which are important barriers for farmers.
- **Reward farmers for benefits delivered to society (and discourage unsustainable practices):** make funding available for public benefits delivered to compensate for a potential reduction in yield. At the same time, soil-improving cropping systems should be encouraged to counter market forces which pressure farmers into unsustainable production and an overexploitation of their natural resources.
- **Offer regular training and information services to keep farmers informed about new developments and insights:** dissemination of knowledge, awareness raising, and education are important components of policy interventions and they should be used in parallel with economic and legislative instruments. Regular training, informative



sessions on latest innovations are preferred to one off training sessions which have limited impact.

- **Engage with farmers and trusted organisations to deliver advice and training:** Peer to peer learning and bottom-up initiatives are powerful tools to deliver knowledge to farmers as they play a great degree of trust in their fellow producers. Partnering with farmers willing to pioneer new techniques or trusted organisations, such as the Campaign for the Farmed Environment (CFE), will ensure that target audiences are reached, and new information is heard.
- **Demonstrate the costs and benefits of new practices:** the advantages and disadvantages of the soil-improving cropping systems trialled at the study site are poorly understood by farmers. They should be widely communicated, and ideally demonstrated with field visits, to farmers in the region, by the advisory services, farmers with first-hand experience with these techniques, and other organisations trusted by the farming community.

## 1 Introduction

Soil is increasingly recognised as a crucial resource providing products such as feed, fibre, food and fuel as well as critical ecosystem services including water storage, filtration, and carbon sequestration. Soil is an essential ecosystem and is the foundation for our cities and towns. Despite its recognised importance in sustaining ecosystems functions, human life and economic activities, soil is being over-exploited, degraded and irreversibly lost due to inappropriate land management practices, industrial activities and land use changes that lead to soil sealing, contamination, erosion, and loss of organic carbon.

Agriculture occupies a substantial proportion of European land and consequently contributes significantly to various forms of degradation. The uptake of innovations associated with potential benefits to soil quality, such as precision farming and conservation agriculture is slowly expanding across Europe. However, these are often not adopted to their full potential and in some cases are eventually abandoned, and the question remains as to why support and adoption of these practices by European farmers is still considerably weak.<sup>1</sup>

### Research aim and questions

The work presented here was carried out as part of the EU-funded SoilCare project.<sup>2</sup> The overall aim of SoilCare is to identify, evaluate and promote promising soil-improving cropping systems (SICS). SoilCare defines SICS as cropping systems that improve soil quality (and hence its functions), and that have positive impacts on the profitability and sustainability of agriculture. Cropping systems refer to crop type, crop rotation, and associated agronomic management techniques (see Table 3).

*Table 3: List of promising general SICS<sup>3</sup>*

Component	Expected impact
<b>Crop rotation</b>	Improves crop productivity, soil biodiversity and system sustainability; decreases need for pesticides and risk of erosion
<b>Green manures, cover crops, catch crops</b>	Improves Soil Organic Matter (SOM) content, soil structure, soil biodiversity, nutrient use efficiency; decreases nutrient leaching, run-off, erosion
<b>Integrated nutrient management</b>	Improves crop productivity, soil nutrient status and resource use efficiency;
<b>Enhanced efficiency irrigation</b>	Improves crop productivity and resource use efficiency; minimizes risks of salinization and desertification

<sup>1</sup> E.g., Lahmar, R. 2010. Adoption of conservation agriculture in Europe: Lessons of the KASSA project. *Land Use Policy* 27(1): 4-10.

<sup>2</sup> SoilCare: Soilcare for profitable and sustainable crop production in Europe, <https://www.soilcare-project.eu/>

<sup>3</sup> D2.1 – A review of soil improving cropping systems, available at : <https://www.soilcare-project.eu/downloads/public-documents/soilcare-reports/75-report-06-d2-1-a-review-of-soil-improving-cropping-systems-wenr-oene-oenema>

Component	Expected impact
<b>Controlled drainage</b>	Improves crop productivity and resource use efficiency; minimizes the risk of waterlogging
<b>Reduced tillage</b>	Reduces energy cost and may enhance SOM content and soil structure; may increase the need for herbicides/ pesticides
<b>Integrated pest management</b>	Improves crop productivity and resource use efficiency; minimizes the loss of biodiversity.
<b>Smart weed control</b>	Improves crop productivity and resource use efficiency; may decrease the need for herbicides
<b>Smart residue management</b>	Reduces evaporation and soil temperature; may increase/decrease the success of germination
<b>Controlled traffic management</b>	Reduces energy cost and the risk of soil compaction
<b>Integrated landscape management</b>	Improves biodiversity and cropping systems sustainability

The main aim of the work presented here was to formulate policy alternatives<sup>4</sup> and actions at EU and study site level to facilitate the adoption of soil-improving cropping systems. Understanding common barriers to the adoption of soil improving practices is an important prerequisite for identifying and designing policy measures to encourage farmers to adopt effective soil conservation practices. A second important foundation for developing appropriate policies is an appreciation of the effectiveness of soil conservation policies in agriculture.

A starting point for any policy analysis is to recognise the success and failures of different types of policy – whether they are regulatory instruments, economic instruments, voluntary instruments, or educational/information instruments. There is plenty of academic research available on the efficiency and effectiveness of these instruments in general, and it is beyond the scope of this Country Report to assess them in detail. However, it is important to recognise the limitations of each, as many of the successes and failures of national soil policy may be attributed to the fundamental successes and failures of the types of policy. Table 2 below provides a summary of the different types of policies.

*Table 4: Summary of policy approaches*

Policy approach	Premise	Positive attributes	Negative attributes
<b>Regulatory instruments</b>	Force farmers to adopt SICS	<ul style="list-style-type: none"> <li>Levels the playing field between competitors, as everyone must play by the same rules</li> </ul>	<ul style="list-style-type: none"> <li>Inflexible regardless of individual situations</li> <li>May be costly to implement</li> </ul>

<sup>4</sup> Policy, loosely defined, is “officially accepted set of rules or ideas about what should be done” or “a system of courses of action with a common long-term objective (or objectives) formulated by governmental entities or its representatives” (see <http://learnersdictionary.com/definition/policy> and <https://www.thefreedictionary.com/policy>). Policy alternative refers to a set of different types of policy options including economic instruments, regulatory instruments, planning instruments and information/knowledge instruments.

Policy approach	Premise	Positive attributes	Negative attributes
		<ul style="list-style-type: none"> <li>Fairly consistent (often long-term)</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring and enforcement can be costly</li> <li>Discourages innovation</li> </ul>
<b>Economic instruments</b>	Incentivise farmers to adopt SICS using payments and taxes etc.	<ul style="list-style-type: none"> <li>Encourages innovative methods</li> <li>Can offset cost of implementation and/or discourage adverse behaviour</li> <li>Allows a certain amount of flexibility</li> </ul>	<ul style="list-style-type: none"> <li>Can be subject to fluctuations as the market fluctuates</li> <li>High likelihood of setting payments/taxes at incorrect rate (which leads to inefficiencies)</li> <li>Can be subject to game-playing behaviour</li> </ul>
<b>Voluntary instruments</b>	Encourage farmers to adopt SICS	<ul style="list-style-type: none"> <li>Sense of “ownership” as the decision was taken freely</li> <li>High degree of flexibility</li> </ul>	<ul style="list-style-type: none"> <li>Does not guarantee implementation</li> </ul>
<b>Educational/information instruments</b>	Educate farmers so they understand the importance of SICS	<ul style="list-style-type: none"> <li>Implementation as a result of truly understanding the impacts of the actions</li> <li>High degree of flexibility</li> </ul>	<ul style="list-style-type: none"> <li>Does not guarantee implementation</li> <li>Relies on interest of affected parties</li> <li>Often takes more time to become effective</li> </ul>

Against this background, the following research objectives were formulated at the outset of the work:

- A. To identify existing policies and policy instruments at EU-level as well as national and (sub)regional level in the 16 SoilCare countries promoting soil quality, and particularly the adoption of soil-improving cropping systems.
- B. To describe the intended mechanisms and impacts of existing policies, instruments, and practices.
- C. To assess the extent to which existing policies, policy instruments and practices promote the adoption of soil-improving cropping systems.
- D. To identify contextual factors, particularly institutional settings, influencing policy impact on farmer adoption.
- E. To identify existing policies, policy alternatives and complementary actions that could promote the uptake of SICS.
- F. To assess the performance of good policy alternatives, their advantages, and disadvantages.

This report presents an inventory and analysis of bottlenecks and opportunities in sectoral and

environmental policies to facilitate the adoption of SICS in The United Kingdom and fits into a larger research initiative involving 16 European countries in total.<sup>5</sup> Based on this analysis, it presents policy alternatives and actions for the national and/or (sub)regional level with the potential of promoting the uptake of SICS.

## Methods

The research and preparation of this report were undertaken by two groups of researchers – the core team of the task, who were responsible for the preparation and research for EU-level policy and all 16 study sites, working in close coordination with researchers with specific knowledge about the study site – the study site researchers. This approach ensured that there was both consistency between the 16 country reports, of which this UK report is but one, but local knowledge and documents and information in local languages were also well utilised.

Figure 1 illustrates the overall study design and methods, which were applied to answer specific research questions. Whilst each data collection activity focused on a sub-set of the research questions, they are closely related, and the information gathered through the mix of methods applied were used to feed into different research questions.

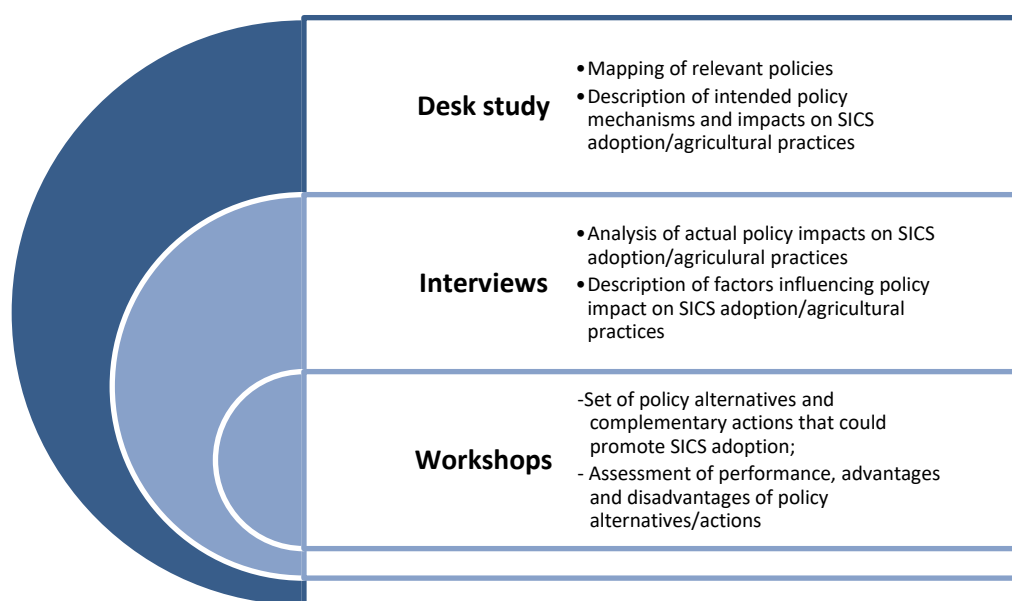


Figure 1: Research strategy

Data collection and analysis involved the following three activities:

### 1) A desk-study of policy documents (in the broadest sense) and relevant literature:

<sup>5</sup> The 16 countries include 13 EU Member States, i.e. Belgium, Germany, France, Czech, Poland, Hungary, Romania, Denmark, Sweden, Greece, Spain, Italy, and Portugal and three non-EU countries, i.e. UK, Switzerland and Norway.

policies potentially impacting the adoption of SICS in the study sites were identified. The aim of this step was to provide a broad overview of soil-related national and regional<sup>6</sup> policies from which the most relevant policies could be selected for in-depth analysis. A draft inventory was compiled, including those national, regional, and sub-regional policies that were linked to a set of pre-selected EU policies (primarily concerning environmental and agricultural topics); however, in the case of regional and sub-regional policies, these were limited to those directly relevant to the study site (i.e. not all regions and sub-regions were included). For each policy, the following information was recorded: date of adoption, governance scale, type of instrument, link to cropping system (components) etc.<sup>7</sup> Based on the screening done in the first step, the national and regional policies deemed most relevant for the study site were subject to a more in-depth analysis. This was done through desk research carried out by the study site researchers.

- 2) Interviews with selected national and regional policymakers and stakeholders:** based on this analysis, Study Site Researchers then conducted interviews with policymakers and stakeholders using a semi-structured interview guide. In the UK, five interviews were carried out (see Table 5).

*Table 5: Organisations represented by interview partners*

Organisation	Stakeholder category
Allerton Project (GWCT)	NGO
Soils Specialist NE, Senior advisor - Farming & Environmental Policy – NE	Soil expert
Defra (Department for Environment Food & Rural Affairs)	National government
CLA (The Country Land and Business Association)	Interest group
National Farmers Union	Farmers Trade Union

- 3) An adoption workshop with national and regional policymakers and stakeholders:** To develop and assess policy alternatives, the Study Site Research Teams organised a stakeholder workshop in each site, following a common guidance document which detailed the structure and methods for the event. Study site teams mostly invited those stakeholders they were already working with, either within the context of SoilCare or as part of their regular engagement activities. The UK workshop brought together 8 stakeholders, including farmers, policymakers and (see Figure 2).

<sup>6</sup> The term “region” refers in this context to the sub-national level, particularly the area of the country where the respective study site is located.

<sup>7</sup> The policy inventory is available at: <https://www.soilcare-project.eu/outputs>



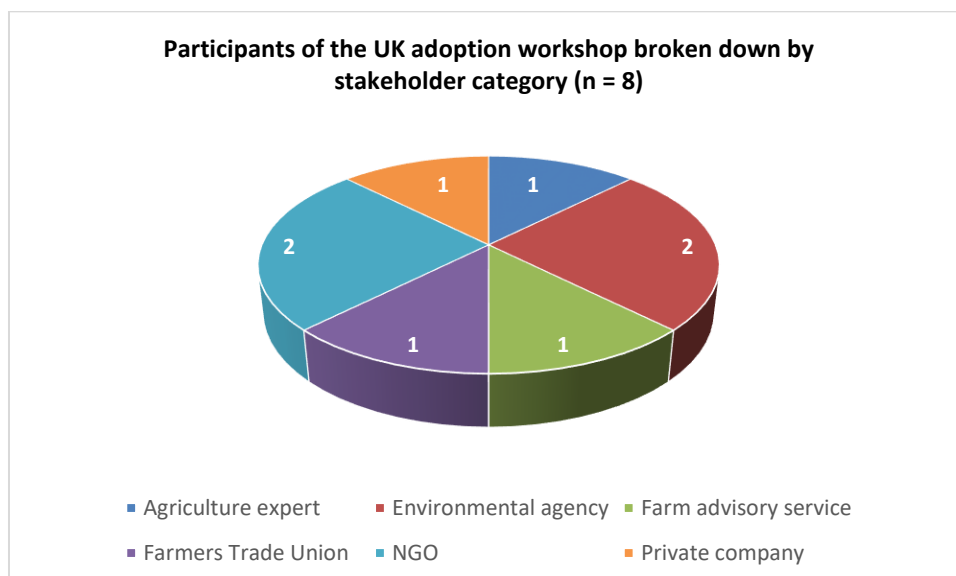


Figure 2: Types of stakeholders participating in the UK adoption workshop

## Report outline and where to find supplementary information

**Section 2** of this report presents an analysis of policy instruments relevant for shaping agricultural practices in the English East Midlands, UK, where the Loddington study site is located.<sup>8</sup> It examines how existing instruments may impact on the adoption of SICS and explores the factors which enable or hamper uptake of these practices.

**Section 3**, on the basis of the previous section, formulates actions which could promote a shift in agricultural practices in the study site region and facilitate a wider adoption of SICS.

A detailed analysis of all relevant EU-level policies as well as national, regional and sub-regional policies in the countries covered by this research is reported in *D7.1 Inventory of opportunities and bottlenecks in policy to facilitate the adoption of soil-improving techniques* for, available at: <https://www.soilcare-project.eu/outputs/deliverables>.

A synthesis of findings and recommendations from the EU-level and cross-country analysis can be found in *D7.2 Report on the selection of good policy alternatives at EU and study site level*, available at: <https://www.soilcare-project.eu/outputs/deliverables>.

Individual country policy inventories can be downloaded from: <https://www.soilcare-project.eu/outputs>

## 2 Analysis of policy shortcomings and opportunities

This section provides a review and analysis of national instruments relevant for shaping agricultural practices in the English East Midlands. Policies investigated include both policies

<sup>8</sup> See D7.1 at <https://www.soilcare-project.eu/outputs>

implementing EU instruments as well as those initiated by the United Kingdom and England, respectively. The information is drawn from the policy inventories compiled by the Study Site Researchers as well as interviews and a workshop conducted with key stakeholders<sup>9</sup>.

The case study site is briefly described in the table below.

Table 6: Description of the study site

Site Name	<b>Loddington</b>
Climate	Atlantic Central/ North climate
Soil type	Clay soils
Main soil threats	Compaction, low soil organic matter and blackgrass ( <i>Alopecurus myosuroides</i> ) which causes severe competition and high herbicide costs.
Current practices	Move from plough based to a no-till approach to crop establishment, crop residues are returned to the soil, grass leys, cover crops are adopted before spring sow crops. Soils are tested for P, K and Mg at least once in each rotation. Some fields mapped for soil type and nutrients. Variable rate N application using Yara's N Sensor, no irrigation.

The two experiments carried out in the study site are described below. Each field trial provides evidence on the costs and benefits of the practices tested.

Table 7: Overview of experiments carried out in the Loddington study site, and the SICS category and cluster under which they are grouped

General treatment category	SICS cluster	Experiments
<b>Crop rotations, reduced/no-tillage</b>	Compaction alleviation	<b>1. Ploughing, subsoiling, and fungal inoculation (Compaction experiments)</b> No-till; ploughing; low disturbance sub soiling; biological treatment with fungal inoculum
	Soil improving crops	<b>2. Introducing of deep-rooting grass leys in rotation</b> Five different deep-rooting grass cultivars; mixture of rye grass and clover (control)

## 2.1 Which existing policies and policy instruments shape agricultural practices in the United Kingdom?

This section provides a review and analysis of existing policy instruments relevant for shaping agricultural practices in England, where the study site is located<sup>10</sup>:

<sup>9</sup> <https://www.soilcare-project.eu/outputs/deliverables>

<sup>10</sup> See the Annex for a more detailed overview of the policies described in this section.

## *Agricultural policies*

The EU's **Common Agricultural policy (CAP)**, and its various instruments, are identified as the most relevant overarching policy affecting soil management. At national level, the Good agricultural and environmental conditions (GAEC) cross compliance standards are set out in a **guidance document published by the Department for Environment Food & Rural Affairs (DEFRA)**<sup>11</sup>. This guidance establishes the conditions farmers must comply with if they intend to claim payments, and there are various requirements that can affect soil management. For example, GAEC 4 requires farmers to take all reasonable steps to protect soil by having a minimum soil cover all year round unless there is an agronomic justification for not doing so, or where establishing a cover would conflict with requirements under GAEC 5. GAEC 5 requires measures to be put into place to limit soil and bankside erosion, through for example specific cropping practices and structures, and the more effective use of machinery. GAEC 6 prohibits farmers from burning cereal straw or cereal stubble or certain crop residues, with the aim of maintaining the level of organic matter in soil.

The **Rural Development Programme (RDP) for England**<sup>12</sup> outlines England's priorities for using the €4 billion available for the funding period 2014-2020 (national and EU contributions). The main objective of the RDP is the better management of natural resources and the wider adoption of climate friendly farming practices. More specifically, the RDP's Focus area 4C focuses on preventing soil erosion and improving soil management, since erosion and acidification have been recognised as significant soil threats in England.

**Countryside Stewardship (CS)** is one of the schemes funding the implementation of the RDP. It provides financial incentives for land managers to protect their environment through activities such as conserving and restoring wildlife habitats; flood risk management; woodland creation and management; reducing widespread water pollution from agriculture; keeping the character of the countryside; preserving features important to the history of the rural landscape and encouraging educational access.

The EU **Organic regulation (834/2007)** sets the standards for organic production, marketing and labelling organic products. The Regulation explicitly deals with soil fertility and quality in its objectives. For example, it stipulates that organic plant production should contribute to maintaining and enhancing soil fertility as well as to preventing soil erosion. It states an explicit preference for natural fertilisers over soluble versions and highlights the essential role of soil fertility management systems such as choice of species, crop rotation, recycling organic

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<sup>11</sup>This analysis used the 2016 guidance document, available here:

[https://assets.publishing.service.gov.uk/media/5684e7dbe5274a0367000002/Guide\\_to\\_cross\\_compliance\\_2016\\_-\\_v\\_1.0.pdf](https://assets.publishing.service.gov.uk/media/5684e7dbe5274a0367000002/Guide_to_cross_compliance_2016_-_v_1.0.pdf) An updated version (2018) is available here:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/668684/Cross\\_Compliance\\_2018\\_guide\\_v1.0.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/668684/Cross_Compliance_2018_guide_v1.0.pdf)

<sup>12</sup>[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/782888/rdpe-programme-doc.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/782888/rdpe-programme-doc.pdf)

materials and cultivation techniques. There is mention of maintaining and enhancing of soil life and natural soil fertility, soil stability and soil biodiversity as a means to prevent and combat soil threats such as soil compaction and soil erosion.

There are also several voluntary agricultural schemes in place, most notably the **Campaign for the Farmed Environment (CFE)**, a partnership of 15 farming and Environmental Organisations. This industry-led initiative encourages voluntary management that will benefit the environment, whilst ensuring efficient and profitable food production. CFE guidance includes voluntary measures and best practice actions to benefit wildlife and to protect natural resources on farmland and promoting resource use efficiency is a natural progression for CFE.

### *Water policies*

At the national level, the Water Framework Directive (WFD) is implemented via the **Water Environment Regulations**. River Basin Management Plans (RBMPs) are prepared under these Regulations, which set environmental objectives for water bodies as well as measures to achieve those objectives. Although the Regulations do not prescribe the use of specific agricultural practices directly, some of the formulated targets and measures indirectly place certain requirements on farming practices, specifically nutrient and pest management.

The **Nitrate Pollution Prevention Regulations** implement the EU Nitrates Directive. The regulations lay down rules for the management of animal manure and the use chemical fertilisers. The Regulations mandate the establishment of nitrate vulnerable zones where the application of manure and fertiliser is limited. Outside these zones, a code of good agricultural practices guides farmers toward sustainable nutrient management practices.

### *Chemicals and waste policies*

At national level, the **Control of Pesticides Regulations** are high-level regulations that set out the details of pesticides subject to control and a system of the approvals required for supply, storage, and use. In addition, the **Plant Protection Products Regulations** transpose the European Directive on the Sustainable Use of Pesticides (SUPD). Users of plant protection products/pesticides are required to take all reasonable precautions to protect, inter alia, soil.

The **Sludge Regulations** implement the EU Sewage Sludge Directive (SSD) The Regulations aim to provide protection for the environment when sludge is used for agricultural purposes. For instance, the Regulations prohibit the use of sludge on agricultural land when the limit concentrations of heavy metals are breached (both in sludge and the land it is applied to).

## 2.2 To what extent do existing policies facilitate adoption of soil-improving practices in the United Kingdom?

The main soil threats identified at the study site are compaction, low soil organic matter and blackgrass. SICS that are being tested at the study site are thought to address these soil threats and test measures for compaction alleviation (ploughing, low disturbance sub-soiling and mycorrhizal inoculant), and soil-improving crops (incorporation of deep-rooting grass leys into arable rotations). This section assesses how the policy instruments identified above already promote the agricultural practices tested in the study site.

### *Reduced/no-tillage*

Tillage management is an important tool to alleviate soil compaction. CAP instruments address tillage management, especially GAEC 5, although indirectly, as it stipulates that farmers must take measures to limit soil and bankside erosion. In a similar fashion, the Organic Regulation impacts tillage management since it lays down the rules for use of tillage and cultivation practices that maintain or increase soil organic matter. These policies do not impose any practices pertaining to tillage, but they have the potential to encourage tillage management that is beneficial for soils.

There is little information on the extent to these policies work to promote the uptake of minimum or no tillage. One expert interviewed stated that there was uptake for conservation tillage without providing further detail. A move to no-tillage implies an increased need for the use of pesticides, which certainly proves to be a barrier to the practice being taken up in organic systems. Another interviewee noted that due to the soil conditions in the country, reduced tillage is not always applicable as it is not considered an appropriate practice for wet soils and heavy clay soils. The reason for this is that crop yields can be compromised, and there is a risk of soil compaction that is shallower but has equally severe economic and environmental impacts to compaction in plough-based systems. This was the driver for testing compaction alleviation methods in no-tillage systems at Loddington.

### *Crop rotation/soil-improving crops*

Introducing grass leys in the rotation improves soil quality by controlling blackgrass, improving soil organic matter, structure, and fertility. Crop rotation practices as a means of addressing poor soil health are incentivised to some extent by the various CAP instruments. The CAP cross-compliance standard GAEC 5 mandates that soil erosion should be limited. DEFRA's guide to cross-compliance<sup>13</sup> lists cropping practices as one of the measures suitable to meet the GAECs and identifies establishing crops early in the autumn that ensure good soil structure

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<sup>13</sup>Department for Environment, Food and Rural Affairs (DEFRA). 2017. The guide to cross-compliance in England 2017. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/579836/Cross\\_Compliance\\_2017\\_rules\\_FINAL.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/579836/Cross_Compliance_2017_rules_FINAL.pdf)

and good crop cover over the winter as a management option.

Another important CAP element that links direct payments to environmental protection is the so-called greening measures. In order to receive the last 30% of their land-based payments, farmers must comply with conditions relating to a) crop diversity b) permanent pasture c) Ecological Focus Areas (EFA). In England, cover cropping is an option for Ecological Focus Areas (EFAs) which form part of the compulsory greening measures under the CAP. Farmers with over 15 ha of arable land have had to devote 5% of their farmed area to EFAs to qualify for full direct subsidy payments. The introduction of grass leys could potentially be regarded as a cover crop. However, rules currently in force stipulate that cover crops must be a visible mixture of at least two different crops from a prescribed list of eight species, where one species in the mixture must be a cereal and the other a non-cereal species. Additionally, cover and catch crops must remain over a specified period. However, grass leys tested in the study site represent perennial vegetation cover which, as opposed to annual cover crops, are currently not incentivised by the CAP or any other legislation.

The national level initiative, Campaign for Farmed Environment, also promotes the introduction of soil-improving crops, such as leys, into the rotation through the guidance and support they provide to farmers.<sup>14</sup>

Finally, preventing soil erosion and improving soil management is one of the priorities identified in the Rural Development Programme (RDP) 2014 – 2020 for England (Focus Area 4C). The target is to improve soil management and/or prevent soil erosion on 14.3% of agricultural land. Financial support for improved soil management is provided through different measures established by the RDP, including agri-environment-climate (M10), organic farming (M11), and cooperation (M16). Sub-measures spell out specific options farmers can adopt to contribute to RDP targets. The Countryside Stewardship scheme lists the introduction of soil improving crops in arable rotations (AB15: Two year sown legume fallow) as an option eligible for funding.

Experts interviewed for the study stated that cover crops were one of the practices promoted extensively. However, no further information is available on the real impact on the farmers. Some interviewees stated that there is an increasing uptake of soil improving practices in general, although this trend might not be visible in the official surveys. Another said the uptake might be low, based on what they are seeing during the inspections.

The table below provides an overview of policies promoting the full range of SICS covered by the SoilCare project (shaded in light green). The analysis shows that existing policies incentivise the incorporation of grass leys into arable rotations, although deep-rooting cultivars are not specifically supported. Reduced or no tillage is encouraged by some policies, but mandatory requirements are not formulated by any of the regulations analysed.

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<sup>14</sup> e.g. CFE (no date). Managing Soil for a sustainable future, available at <https://www.cfeonline.org.uk/cfe/resources/managing-soils-for-a-sustainable-future/>



Table 8: Direct and indirect coverage of SICS in current regional policies, instruments, and measures in the English East Midlands (UK)

Policy	Crop rotation	Green manures, cover crops, catch crops	Integrated nutrient management	Enhanced efficiency irrigation	Controlled drainage	Reduced or no- tillage	Integrated pest management	Smart weed control	Smart residue management	Controlled trafficking	Integrated landscape management
CAP GAEC Cross-compliance Standards											
The Guide to Cross-compliance in England 2017											
CAP Rural Development Programme 2014 - 2020											
Countryside Stewardship											
Organic regulation											
Nitrate Pollution Prevention Regulations											
Plant Protection Products Regulations											
Pesticides Control legislation											
Campaign for the Farmed Environment											
Water Environment Regulations											
Sludge Regulations											

## 2.3 Which factors shape success or failure of policy instruments?

Evidence gathered through the desk research, interviews and stakeholder workshop show that different contextual factors contribute to and undermine the uptake of SICS in general, and of the practices tested in the study site in particular. Some of the findings suggest that the uptake of SICSs is improving. On the other hand, barriers to the uptake of these practices remain.

Findings can be summarised around the following main points:

- Lack of soil-specific policies
- Extent of farmer input to policymaking
- Limited coherence between policy instruments
- Lack of monitoring and enforcement
- High adoption costs
- Limited flexibility of financial instruments
- Pressure from market demands
- Lack of education and training

### *Lack of soil-specific policies*

There are a number of regulatory instruments in force in England promoting soil-improving practices, however, according to those interviewed for this study, there would be benefit in

developing soil-specific legislation. As it currently stands, SICS are covered by a number of different regulations, both EU-wide and national level, however, soil is not the key objective of these policies, which means there is a risk that soil is not protected as completely as it could be – an example was given through the Nitrates Directive, which, as it focuses solely on Nitrates, has a restrictive scope.

One interviewee noted that instead of treating the cause of soil degradation, policy is often aimed at treating the symptoms of soil degradation, such as indirect policy concerning water resource protection. Dedicated soil legislation would instead seek to mitigate compaction and increase soil organic matter, as well as keeping eroded or displaced soil out of water courses by using field buffers. Most interviewees also made direct references to the importance of considering climate change when either developing new legislation or adapting what is already in place.

According to interviewees, both the DEFRA soil strategy from 2009 and the 25-year Environmental Plan (25YEP) could be expanded upon, and appropriate metrics and management approaches developed for enhancing soil health (a commitment already in the 25YEP). It should also be noted that some existing policy mechanisms, such as the CAP's While Statutory Management Requirements (SMR) will be preserved in English law following Brexit; a similar mechanism to preserve the aims of the GAECs is needed.

#### *Extent of farmer input to policymaking*

Policies and measures which include farmers in the process - from conception to implementation – are more likely to achieve good results. Indeed, one expert interviewed for this study stated that the policies are better received by the farmers if there is a process of consultation preceding it. This is also linked closely to the ability of policy making to incorporate regional differences. Soil types and physical conditions vary across the country and in order to be successful, policies need to account for these differences and should not rely on one-size-fits-all approaches imposed from the top. For instance, workshop participants at the study site highlighted that the subsoiling technique tested at the study site would not be suitable to shallow or stony soils.

#### *Limited coherence between policy instruments*

Some of the interviewees suggested that different policies are not always coherent and conflicting demands are being made, which might be confusing. An example was given of grass and heather burning regimes that can sometimes conflict with soil protection strategies on peatlands. Another interviewee noted that targets and subsidies for increasing woodland areas or growing bio-fuel crops fail to specify that the land must be suitable for these purposes. This could lead to woodland planting on high-grade agricultural soils, or crops grown in unsuitable soil for the crop type or the wrong climate. There is industry guidance in place addressing some

of these aspects, however, this feeds to a wider issue that was mentioned by all five interviewees – crops are often grown in the wrong place.

Workshop participants highlighted that the introduction of grass leys in the crop rotation which was tested at the study site might conflict with the objective of increasing food supply as cereal yield is expected to reduce at catchment scale. In the case of incoherence between different requirements, farmers may not be able to fulfil the requirements of both instruments, and it is likely that this will be a disincentive to adopt SICS.

#### *Lack of monitoring and enforcement*

Interviewees noted that monitoring is not carried out effectively, especially for EU-level financial schemes. It was noted that if basic farm payments are sought, then the cross-compliance requirements will be enforced through the Rural Payment Agency inspection, however, less than 1% of payment recipients are inspected. According to the interviewee, a risk-based approach is adopted, which means that inspections are carried out where issues are anticipated or have occurred in the past, however, this approach is unlikely to identify any new risks. On the other hand, independent certification schemes will carry out monitoring once every year or two. This means that potentially farmers are receiving payments without fully undertaking the soil-improving action and could even lead to farmers deliberately gaming the system to take advantage of the lax monitoring.

A weak monitoring regime can act as a barrier to SICS adoption, because farmers will soon realise that they can claim the incentive without changing their behaviour, which not only makes the financial incentive uneconomical, but also means the soil is not improved. Any change in legislation should therefore seek to strengthen enforcement mechanisms.

#### *High adoption costs*

Interviewees all highlighted the importance of economic instruments to encourage SICS adoption. In addition to those at EU level (CAP), there are a number of national schemes in place, which suggests that this policy instrument is well-established.

The cost of adopting new techniques, in many cases, is not insignificant, and interviewees noted that farmers often have tight financial bottom lines and, in some cases, SICS require a complete farming system change. The subsoiling technique tested at the site, for example, would require most farmers to purchase new equipment or at least have access to a machinery exchange. It was also noted that farmers have a culture of being risk-averse, not wanting to deviate from familiar practices and be the first to try a new system. On the other hand, if a farmer has diversified their income, they will have more room to experiment. Another mitigating factor would be the level of available education – if farmers are able to calculate the long-run benefits of improved soil productivity, they may be more open to initial outlays.

### *Limited flexibility of financial instruments*

At the same time, there are indications that these tools are not being used effectively. Interviewees could provide examples of the schemes being too restrictive, as well as not restrictive enough. In the case of the first point, there are concerns from the interviewees that these schemes are not flexible enough to be fully effective – a lot of money is spent on research, or to encourage the farmer to switch cropping practices, but not necessarily to maintain the practice once the transition is complete. There were also several examples where farmers could not get subsidies to build the required infrastructure, such as a shed to store manure until it can be used as fertiliser.

Even if financial means are available, it is not always guaranteed that those resources are allocated where needed. For instance, one interviewee mentioned that financial means should target farmers more and not only research since both (research and real application on the ground) are very much needed to make a real change. Financial mechanisms should be flexible enough to ensure farmers can feasibly adopt a SICs. For example, dairy farmers need access to grants to improve infrastructure so they can store slurry instead of spreading it on soils at inappropriate times, if they are going to adopt smart nutrients regimes. It is thus clear that financial incentives need to be tailored to the needs of the farmer, as well as to the broader picture of soil research.

### *Pressures from market demands*

All interviewees highlighted that crops are often grown in the wrong place. This may indicate that the market for these crops exceeds sustainable demand. This was confirmed by interviewees who noted the high demands from food chains and supermarkets. This situation could be potentially mitigated by addressing the market failures without having to change legislation forbidding the growing of certain crops in certain places (which might end up with a lack of supply for the food chains/supermarkets). By encouraging sustainable crop placement (for example through a subsidy) or discouraging a bad one (for example through a tax or tariff), the food chains or supermarkets are guaranteed their supply, while ensuring the price the supermarkets is offering is not disproportionately attractive to farmers.

### *Lack of education and training*

Increased knowledge about the soil and its complex ecosystem interactions have the potential to convince the farmers to adopt SICs more efficiently than other instruments. If the farmers are equipped with the necessary knowledge, they can identify and resolve their own issues with adequate support. However, during the interviews, a common theme was the lack of education and knowledge on the part of the farmers. During the adoption workshop, participants

highlighted that, although subsoiling was already an established practice in the region, there was limited knowledge on the economic or environmental implications of this technique.

Several interviewees mentioned that farmers are often not aware of the financial assistance available, and that there was in general a limited understanding of the costs and benefits associated with some of soil-improving practices. For instance, workshop participants concluded that there was a need to communicate the benefits of introducing grass leys in the crop rotation, one of the techniques tested at the study site. This suggests that these economic tools need to be used in conjunction with the knowledge-based tools. According to the interviewees, there are already several knowledge-based initiatives in place to educate farmers, and there are certainly a number of guidance documents and handbooks available to help farmers apply for economic schemes. However, there still seems to be room for improvement. Interviewees mentioned that in some cases training is limited to a single one-off training session, while others noted that not enough is being done to keep farmers updated on new innovations – just because something did not work well 10 years ago, technology may have since improved making the technique more feasible. An example was given by an interviewee of farmers sometimes citing past failures and blaming them on machinery, not knowing the technology has improved since then and this barrier does not exist anymore.

There are various voluntary schemes in place in England and the rest of the UK that shape agricultural management, with the CFE being the most notable in this study. These initiatives build on the regulatory foundations and have the advantage that they are mostly bottom-up, which means farmers are more likely to feel a sense of ownership in the initiatives. These voluntary schemes also highlight the importance of education – the CFE, for example, specifically highlights the financial advantage of not cropping an unproductive area by focusing on the other benefits those areas have, for example developing specific habitats will attract pollinators, which will also benefit the farmer. They also offer a forum for the sharing of good practices and can either encourage farmers to either “keep up” with their neighbours or learn from mistakes or tips discovered by those in a similar geographic location. While this study did not investigate all the different schemes in place, they are to be encouraged, as long as they can ensure that farmers are met with a consistent message, based on scientific evidence, which is presented without being overwhelming and confusing. A general conclusion from the interviews was that live demonstrations and peer learning should be encouraged, also keeping in mind that not all farmers may have access to such trainings due to time or travel constraints.

Increased knowledge and training also have the additional benefit that it might curb the number of farmers trying to gain economic incentives, as they understand that soil health has greater worth in the long run than a short-term financial pay-off.

The table below provides an overview of barriers and enablers for the SICS tested at the study site and which were identified by stakeholders during the adoption workshop. Participants were asked to identify actions for the most important factors affecting SICS adoption; therefore,

not all adoption factors were discussed in detail. To assess the effectiveness and feasibility of an action, a scale from 1 (not at all effective/feasible) to 4 (highly effective/feasible) was suggested but not applied during the meeting due to time constraints.

*Table 9: Adoption barriers, enablers, and actions to increase uptake of the SICS tested at the Loddington study site identified by stakeholders*

<b>Introduction of deep-rooting grass leys in rotation</b>	
<b>Adoption barriers (-) and enablers (+)</b>	<b>Actions</b>
Simple to implement with existing practices (+)	<i>None identified</i>
May offer blackgrass control measure (+)	<i>None identified</i>
Limited knowledge of costs/benefits (-)	Identify/demonstrate benefits, e.g., for nutrition quality
Lack of awareness about financial support (-)	Make funding available for public benefits delivered, e.g., contribution to flood control; ensure wider reach of available guidance and handbooks for farmers
Lack of legislation protecting the soil (-)	Design soil specific legislation, taking into account climate change
Lack of knowledge about soil (-)	Training of farmers, wider use of bottom-up voluntary initiatives
Crops grown at unsuitable places due to high market demand (-)	Using subsidies to encourage sustainable crops to counter market forces or actively discouraging certain crops with higher taxes
Lack of monitoring for funding schemes (-)	Better monitoring of funding schemes to ensure farmers are fulfilling their obligations
Might not be attractive to wholly arable farmers (-)	<i>None identified</i>
Conflicts with objective of increasing food supply (cereal yield decline at catchment scale) (-)	<i>None identified</i>
5-year rule for permanent pastures (-)	<i>None identified</i>
Stewardship scheme prevents conservation of forage (-)	<i>None identified</i>
<b>Compaction alleviation experiments: Sub-soiling and mycorrhizal inoculation</b>	
<b>Adoption barriers (-) and enablers (+)</b>	<b>Actions</b>
Sub-soiling acceptable agronomic / known practice (+)	<i>None identified</i>
Limited knowledge of costs/benefits (-)	Research/demonstrate benefits of application in the region
Not applicable to all soils (shallow/stony soils) (-)	<i>None identified</i>
Lack of knowledge of practical application in combination with inoculant (-)	Knowledge transfer needed through advisory services
Availability of equipment needed (-)	<i>None identified</i>



### 3 Conclusions and recommendations

This report presented an inventory and analysis of bottlenecks and opportunities in sectoral and environmental policies to facilitate the adoption of SICS in the UK, and specifically the English East Midlands where the study site “Loddington” is located.

The analysis shows that the existing policy framework promotes the practices trialled at the site, no-tillage, the introduction of grass leys, but only to a limited extent. Economic instruments were identified as being the most important policy tool for facilitating the uptake of soil-improving practices in the study site region. However, several inefficiencies were identified, and improvements are needed to ensure that all policy instruments work together to promote the adoption of SICS.

Based on this analysis, and feedback collected from stakeholder, the following recommendations are formulated. Whilst the actions outlined here specifically aim to promote the uptake of the practices tested at Loddington, they are likely to encourage the adoption of soil-improving cropping systems in general.

- **Consider the development of a dedicated soil policy:** legislation focusing on soil is needed for a more concrete impact on farmers and the adoption of SICSs. Such an intervention should be designed to accommodate farm diversity, featuring a robust monitoring and enforcement system. The 25-year Environmental Plan (25YEP) provides an important step in the right direction, but appropriate management approaches, instruments, and metrics are needed, which are commitments established by the 25YEP. While SMR's (Statutory Management Requirements) will be preserved in English law following Brexit, a similar mechanism to preserve the aims of the GAEC's is needed.
- **Increase policy coherence:** some of the soil-improving practices might not align with existing policy objectives. For example, a reduced yield (but increased soil quality) contrasts with the aim of increasing food production. By the same token, some policy objectives foster unsustainable agricultural practices. Policy conflicts and synergies therefore need to be carefully analysed and aligned, in order not to discourage the transition to sustainable farming practices. Ultimately, this might require a prioritisation of certain objectives and targets (and operationalised by the right policy interventions) as a certain level of conflict is unavoidable to ensure the right balance between environmental, social, and economic sustainability. On a practical level, it is important for farmers to have clear, unambiguous information on the legal conditions they need to comply with – especially if they are tied to subsidies - and those that may be rewarded.
- **Make economic instruments more flexible to provide tailored support to farmers transitioning to sustainable practices:** financial instruments should allow long-term change in practices rather than finance one off interventions. They should be designed in a way that offers integral solutions to farmers, for instance they should cover costs associated with machinery or other investments associated with change, which are

important barriers for farmers.

- **Reward farmers for benefits delivered to society (and discourage unsustainable practices):** make funding available for public benefits delivered to compensate for a potential reduction in yield. At the same time, soil-improving cropping systems should be encouraged to counter market forces which pressure farmers into unsustainable production and an overexploitation of their natural resources.
- **Offer regular training and information services to keep farmers informed about new developments and insights:** dissemination of knowledge, awareness raising, and education are important components of policy interventions and they should be used in parallel with economic and legislative instruments. Regular training, informative sessions on latest innovations are preferred to one off training sessions which have limited impact.
- **Engage with farmers and trusted organisations to deliver advice and training:** Peer to peer learning and bottom-up initiatives are powerful tools to deliver knowledge to farmers as they play a great degree of trust in their fellow producers. Partnering with farmers willing to pioneer new techniques or trusted organisations, such as the Campaign for the Farmed Environment (CFE), will ensure that target audiences are reached, and new information is heard.
- **Demonstrate the costs and benefits of new practices:** the advantages and disadvantages of the soil-improving cropping systems trialled at the study site are poorly understood by farmers. They should be widely communicated, and ideally demonstrated with field visits, to farmers in the region, by the advisory services, farmers with first-hand experience with these techniques, and other organisations trusted by the farming community.

## 4 Annex: Overview of key policies

Policy name	Scale	EU or MS based policy	SICS addressed	Description of policy
CAP GAEC Cross-Compliance Standards	National	EU (CAP)	Crop rotation, green manures, cover crops, catch crops, integrated nutrient management, reduced tillage, smart residue management, controlled traffic management	'Cross compliance' is a set of rules which farmers and land managers must follow on their holding if they are claiming rural payments. The cross compliance is set in the Common Agriculture Policy Regulations 2014 and further explained in the Guide to cross compliance in England 2017. Schedule 2 of the Common Agriculture Policy Regulations 2014 requires restoration of a footpath or bridleway after ploughing and prohibits crop and specified vegetation burning (section 2). The Schedule further requires the farmers to cover the soil with crops or other vegetation, although exceptions are allowed (section 3); maintain green cover, prevent erosion and refrain from applying fertilisers or pesticides to land near watercourses and hedgerow, although exemptions are allowed (sections 4 and 5).
The Guide to Cross-Compliance in England 2017	Regional	EU (CAP)	Crop rotation, green manures, cover crops, catch crops, integrated nutrient management, reduced tillage, smart residue management, controlled traffic management	The Guide contains the 'Good Agricultural and Environmental Conditions' (GAECs) which cover, inter alia, environment, climate change and good agricultural condition of land. GAEC 4 establishes that farmers must take all reasonable steps to protect soil by having a minimum soil cover all year around unless there is an agronomic justification for not doing so, or where establishing a cover would conflict with requirements under GAEC 5 that causes soil erosion. GAEC 5 requires measures to be put into place to limit soil and bankside erosion (cropping practices and structures, vehicles, trailers, and machinery). GAEC 6 prohibits farmers from burning cereal straw or cereal stubble or certain crop residues, with the aim of maintain the level of organic matter in soil.
CAP Rural Development Programme 2014 - 2020	National	EU (CAP)	Crop rotation, green manures, cover crops, catch crops	The Rural Development Programme (RDP) for England was formally adopted by the European Commission in 2015. It outlines England's priorities for using the €4 billion available from 2014-2020 (national and EU contributions). The main objective of the RDP is better management of natural resources and the wider adoption of farming practices which are climate friendly. Soil degradation has been estimated to cost the economy £0.9-1.4bn per year in England and Wales (p. 108). Soil erosion and acidification and climate change have been recognised as an important issue in England (p. 37 - 39). To tackle these issues, RDP's Focus area 4C focuses on preventing soil erosion and improving soil management. One of the measures concerns crop diversification (p. 396); buffer strips on cultivated land (p. 397); winter cover crops (p. 398); etc.

Policy name	Scale	EU or MS based policy	SICS addressed	Description of policy
Countryside Stewardship	Regional	MS	Green manures, cover crops, catch crops, integrated landscape management	Countryside Stewardship (CS) provides financial incentives for land managers to look after their environment through activities such as: conserving and restoring wildlife habitats; flood risk management; woodland creation and management; reducing widespread water pollution from agriculture; keeping the character of the countryside; preserving features important to the history of the rural landscape and encouraging educational access. The scheme is open to all eligible farmers, woodland owners, foresters and other land managers in England and is suitable for many types of land use (for example conventional and organic farmland, coastal areas, uplands and woodlands). It is a competitive scheme with application scored against local priority targets to maximise environmental benefit.
Pesticides Control legislation	National	EU (SUPD)	Integrated pest management	The Control of Pesticides Regulations (1986, as amended in 1997) provides a high-level regulatory setting with details of pesticides subject to control and a system of approvals required for supply, storage and use. In addition, the Plant Protection Products (Sustainable Use) Regulations 2012 transpose Directive on sustainable use of pesticides. Users of plant protection products/pesticides are required to take all reasonable precautions to protect, inter alia, soil.
Campaign for the Farmed Environment	Regional	MS	Green manures, cover crops, catch crops, reduced tillage	The Campaign for the Farmed Environment (CFE) is an industry-led initiative encouraging voluntary management that will benefit the environment, whilst ensuring efficient and profitable food production. CFE guidance includes voluntary measures and best practice actions to benefit wildlife and to protect natural resources on farmland and promoting resource use efficiency is a natural progression for CFE. It is a partnership of 15 farming and Environmental Organisations working together.
Organic regulation	National	EU (Organic Regulation)	Green manures, cover crops, integrated nutrient management, reduced tillage, integrated pest management, smart residue management, controlled traffic management	The regulation sets the standards for organic production, marketing and labelling organic products. Organic production standards have rules relating to crop rotation and chemical inputs that have a direct effect on soil quality. The regulation explicitly deals with soil fertility and quality in its objectives i.e.: organic plant production should contribute to maintaining and enhancing soil fertility as well as to preventing soil erosion. Plants should preferably be fed through the soil eco-system and not through soluble fertilisers added to the soil and high; and highlights the essential role of soil fertility management systems such as choice of species, crop rotation, recycling organic materials and cultivation techniques (13, 14). Art. 3 a (i) specifically addresses the relations and balance between health of soil, water plants and animals. Art 5. (a) addresses the maintenance and enhancement of soil life and natural soil fertility, soil stability and soil biodiversity as a means to prevent and combat soil threats such as soil compaction and soil erosion. The regulation also lays down the rules for use of

Policy name	Scale	EU or MS based policy	SICS addressed	Description of policy
				tillage and cultivation practices that maintain or increase soil organic matter, enhance soil stability and soil biodiversity, and prevent soil compaction and soil erosion. In addition, principles for maintaining fertility and the biological activity of the soil, such as crop rotation including green manure and crop rotation with legumes and application of composted manure or organic material.
Nitrate Pollution Prevention Regulations	National	EU (Nitrates Directive)	Integrated nutrient management	The Nitrate Pollution and Preventions Regulations implement the EU Nitrates Directive. The regime put in place in the UK establishes rules for the management of animal manures, chemical nitrogen fertilizers and other nitrogen-containing materials spread onto the land. The Regulations set up the procedure on the establishment of nitrate vulnerable zones (Part 2) and limits the application of manure and fertilizer (Parts 3 and 5), fertilizer plan including type of crops and the planted area (Part 4),
Water Environment Regulations	National	EU (WFD)	Integrated nutrient management, enhanced efficiency irrigation, controlled drainage, integrated pest management, integrated landscape management	The Regulations transpose the Water Framework Directive. The Regulations require issuance of river basin management plans which must contain environmental objectives for water bodies and a number of measures to achieve those objectives. Although, the Regulations do not concern CS directly, some of these measures concern CS indirectly (e.g. nutrient runoff, soil contamination with pesticides, etc.).
Sludge Regulations	National	EU (SSD)	Integrated nutrient management	The Sludge (Use in Agriculture) Regulations enforce the provisions of the EU Sewage Sludge Directive, which sets out the regime for the protection of the environment, particularly soil, when sewage sludge is used in agriculture. The 1989 Regulations seek to encourage the use of sewage sludge in agriculture and regulate its use in such a way to prevent harmful effects on soil. The Regulations prohibits use of sludge on agricultural land in case the sludge or the land breaches the permitted concentration of heavy metals in the sludge and in the land.