

Policy briefings translating the scientific evidence to a policy audience

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1. Introduction

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. Such cropping systems have then been tested in 16 study sites in Europe as part of the SoilCare project, located in both EU and non-EU countries.

WP7 aims to identify, describe, and assess policies, policy instruments, and practices (and combinations thereof) inhibiting or facilitating the adoption of soil improving cropping systems. In support of this aim, the following objectives and related tasks were identified:

1. To review current policies with relevance for soil quality, soil degradation, and adoption of cropping systems (Task 7.1),¹
2. To select policy alternatives to enhance soil quality and prevent land degradation in agriculture at various scales (Europe, national, sub-national and local) following a participatory multi-actor approach (Task 7.2),²
3. To promote policies that can increase adoption of soil-improving cropping systems, by translating scientific SOILCARE results into policy briefings (Task 7.3).

This deliverable is a compilation of all policy briefings developed by WP7 and WP8 (Communication and Dissemination). Two types of briefings were developed:

1. Policy briefs targeted at European and national policy makers providing high-level conclusions and recommendations for actions to facilitate the uptake of SICS by farmers, and
2. Country policy summaries presenting conclusions on the main factors limiting the adoption of soil-improving cropping systems in the 16 study site countries and formulating recommendations tailored to these country-specific adoption challenges.

The briefings mainly draw from the work carried out under WP7 (Policy briefs 1, 2, 4, 5, and 6 and the 16 Country policy summaries) as well as WP 3 (Policy brief 3 on farmer networks).

1.1 Policy briefs

A total of six policy briefs were developed based on WP7 and WP3 findings over the lifetime of the project. The briefings were developed in close collaboration with the consortium's communication and dissemination experts (WP8) and are available in several project languages:

¹ See D7.1 Inventory of opportunities and bottlenecks in policy to facilitate the adoption of soil-improving techniques, available at: <https://soilcare-project.eu/downloads/public-documents/soilcare-reports-and-deliverables/85-report-9-deliverable-7-1-inventory-of-opportunities-and-bottlenecks-in-policy-to-facilitate-the-adoption-of-soil-improving-techniques/file>

² See D7.2 Report on the selection of good policy alternatives at EU and study site level, available at: <https://soilcare-project.eu/downloads/public-documents/soilcare-reports-and-deliverables/186-report-13-d7-2-milieu-full-v2/file>

1. Soil health policies for CAP and Agri-Environment Directives, available at: https://soilcare-project.eu/images/images/Policy_Briefs/Policy_brief_SICS_v3.pdf
2. Soil health policies towards Sustainable Development Goals, available at: https://soilcare-project.eu/images/images/Policy_Briefs/Policy_brief_SDGs_Final2.pdf
3. Farmer networks - social capital for soil health advice and policies, available at: https://soilcare-project.eu/images/images/Policy_Briefs/Policy_brief_Farmer_networks_trust_v3.pdf
4. SoilCare contribution to the EU Soil Strategy consultation, available at: https://soilcare-project.eu/images/images/Policy_Briefs/New_soil_strategy_brief2.pdf
5. SICS adoption factors and opportunities, available at: https://soilcare-project.eu/images/images/Policy_Briefs/SICS_adoption_issues_and_opps_without_table.pdf
6. Final recommendations for SICS, available at: https://soilcare-project.eu/images/images/Policy_Briefs/Recommendations_brief_V2.pdf

The English versions of the Policy Briefs can also be found in chapter 2 of this deliverable.

1.2 Country policy summaries

16 individual *Country policy reports* presenting the policy analysis and recommendations for each study site country were drafted by WP7.³ These are accompanied by 16 country briefings, the *Country policy summaries*, and of which some have been translated to the relevant national languages. These documents are available at <https://soilcare-project.eu/resources/resources-for-policy-makers/42-resources/254-policy-reports>. The English versions of the Country policy summaries can also be found in chapter 2 of this deliverable.

³ Available at: <https://soilcare-project.eu/resources/resources-for-policy-makers/42-resources/254-policy-reports>

2. Compilation of policy briefs and country policy summaries

SUMMARY

Soil is the basis for farm productivity and the health of ecosystems. The new Common Agricultural Policy (CAP) still lacks clear guidance on measures to improve and monitor soil health. With current soil health decline and the impact of agriculture on climate change and the environment, we urgently need to put soil at the forefront of agricultural policy.

SoilCare investigates and promotes the use of Soil-Improving Cropping Systems (SICS) to improve soil quality for positive effects on sustainability and profitability. SICS are a holistic approach to soil management, consisting of long crop rotations and an 'integrated' combination of inputs and management techniques. Here we present how SICS can act as a cross-cutting mechanism to improve soil health through CAP, RDP, GAECs, AECMs and multiple agri-environmental framework directives.



Woodchip amendments



Diverse cover crops

POLICY OPTIONS

Studies have shown several ways that policies can motivate farmers to take on better environmental and soil health management. The following options can increase uptake of soil health practices:

- **Build SICS clearly into CAP Pillar I as cross-cutting farm practices for public goods**
- **Increase facilitators for farmer information exchange and training for advisors in soil health practices (e.g. via Farm Advisory Services)**
- **Use SICS to cross-cut policy frameworks and directives: e.g. cover crops to address both the Water Framework and Nitrogen Directive**

**SICS
could help
Member States
to create adequate
minimum standards
for soil related
goals**



Incorporating SICS into EU policy

Agricultural Policies

The proposed post-2020 CAP includes three overarching environmental objectives which directly relate to soil and therefore provide opportunities for its incorporation more strongly via SICS:

- Contribute to climate change mitigation, adaptation and sustainable energy
- Foster sustainable development and efficient management of natural resources like soil, water and air
- Contribute to the protection of biodiversity and enhancing ecosystem services

Within CAP's Pillar 1 instrument, the incorporation of greening measures into compulsory Good Agricultural Environmental Conditions (GAECs) offers a greater chance for soil protection. These include using cover crops as a part of the rotation; acting as protection from erosion and adding nutrients. Cover crops are also a key part of SICS. In the Pillar 2 instrument, the new agri-environment climate measures (AECM) pose opportunity to address current declining soil health; soils regenerated through SICS can become carbon stores and mitigate climate change effects. It must be ensured that Member States allocate enough of the transferable Pillar 1 & 2 budget to soil health measures. Key to this will be having the long-term vision proposed by the European Commission and used in SICS.



Knowledge exchange

SICS

example

Cover crops with reduced N fertiliser

Improves:

Soil structure, biodiversity, nutrient use efficiency; leaching & erosion

Frameworks and Directives

The Frameworks and Directives in the table overleaf can be addressed jointly by using several SICS components. Efforts therefore need to regulate and incentivise their uptake by farmers through increasing awareness and facilitation of farmer groups working together at a landscape scale.

Withdrawal of the Soil Framework Directive means that EU soil policy remains without coherent legislation to address the issue of soil in its own right. Within the EU, only a few countries have a specific legislative or policy instrument with soil protection as a primary goal. European soil degradation is increasing, indicating that current policies are not effective. Farmer uptake is key and may be adversely affected by poor policy and advice, as well as socio-economic and environmental factors. See more info here: <https://www.soilcare-project.eu/resources/deliverables>



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The SoilCare project is funded by the European Union's Horizon 2020 research and innovation programme, under grant agreement No. 677407.



SUMMARY

Soil degradation is a major EU and global challenge. Many of the Sustainable Development Goals (SDGs) put forward in the UN Agenda 2030 refer to land and soil either directly (SDG 2, 3, 15) or indirectly (SDG 6, 11, 13, 14). The European Commission has stressed its intention to mainstream SDGs into EU policies and recognises the need for a concrete, long-term strategy in order to progress.

SoilCare investigates and promotes the use of Soil-Improving Cropping Systems (SICS) to improve soil quality for positive effects on sustainability and profitability. SICS are a holistic approach to soil management, consisting of long crop rotations and an 'integrated' combination of inputs and management techniques. Here we present how SICS contribute to SDGs and the need for their concrete monitoring and long-term planning.



Mulch and direct drilling



Landscape mosaics

POLICY OPTIONS








Political leadership is needed to operationalise a transition into sustainable land management, inclusive of SDGs. The following options can help provide a policy-led transition:

- **Clearly define a methodology for monitoring the SDGs - coordinate a standard approach**
- **Incorporate guidelines and quantitative targets at Member State level to reduce soil degradation**
- **Promote regionally-specific good practice via SICS with long-term vision**
- **Enable transitions to holistic SICS methods for all farmers through policy support**

SICS
address soil
health threats
and contribute to
SDGs through a
holistic approach
to farming



This table shows how each soil threat and its recommended SICS type can contribute to the SDGs shown along the top of the table.

	<div>2</div> <div>ZERO HUNGER</div> <div></div>	<div>3</div> <div>GOOD HEALTH AND WELL-BEING</div> <div></div>	<div>6</div> <div>CLEAN WATER AND SANITATION</div> <div></div>	<div>11</div> <div>SUSTAINABLE CITIES AND COMMUNITIES</div> <div></div>	<div>13</div> <div>CLIMATE ACTION</div> <div></div>	<div>14</div> <div>LIFE BELOW WATER</div> <div></div>	<div>15</div> <div>LIFE ON LAND</div> <div></div>
SOIL THREATS	SICS TYPE						
Erosion (wind and water)	Zero-tillage, landscape management, Contour traffic						
Decline in organic matter	Minimum tillage, Residue return, Mulching Manuring						
Compaction	Controlled traffic Low wheel load, low tyre pressures						
Decline in biodiversity	Minimum tillage, residue return, No pesticides, Minimal fertilizer						
Floods and landslides	Drainage Landscape management						
Local and diffuse contamination	No use of polluted inputs Trees to scavenge air-born pollution						
Salinisation	Drainage Targeted irrigation Ridging						
Acidification	Liming, manuring						
Desertification	Landscape management						

How do SICS contribute to SDGs?

Soil threats across Europe have been mapped by the SoilCare project. This gives a good basis for Member States to understand the issues that need to be addressed, which will subsequently help move towards achieving the relevant SDGs, as overleaf. The table illustrates that adopting SICS can contribute to achieving multiple SDGs.

Through assessing farms on a local scale and whole landscapes on a regional scale, the most suitable SICS can be identified for implementation. SICS allow practitioners and other stakeholders to consider multiple management techniques for multiple benefits.

For example: reducing tillage and trafficking, growing multi-species cover crops, introducing trees, reducing fertilisers and other chemicals for pests and weeds can help to reduce the physical pressure on soils thus reducing compaction, increase nutrients and organic matter to improve soil health, protect soils through plant cover from wind and rain erosion and reduce the negative effects of chemicals on biodiversity. Therefore SICS contribute to improving conditions for life on land, below water, aiding clean waterbodies for human consumption and to sustainable food production and consumption (i.e. SDGs 2, 3, 6, 11, 13-15).

Using multi-stakeholder groups of policy-makers, researchers and community groups whilst empowering farmers to take the lead can help to foster these good agricultural practices. Farmers can be empowered through support and advice in transitioning to new methods. In order to track the progression of soil threat reduction, baselines need to be measured and then monitored on farm as SICS are put into practice. Equally, the progression of SDGs will need to be tracked through wider monitoring across the landscape and society.



Farmer & stakeholder empowerment

Soil threat:
Organic matter decline

SICS example
Reduced tillage & residue management
SDGs positively affected:
2, 3, 13-15

How can SICS be implemented through EU policy?

Currently, few Member States have dedicated land or soil policies or strategies to adopt SDGs. Exceptions are Portugal who are addressing this issue through national law and Italy having committed to Land Degradation Neutrality. In order to see how best SICS can be implemented through EU policy frameworks, see our policy brief on 'Soil health policies for CAP and Agri-environment Directives': <https://www.soilcare-project.eu/en/resources/policy-briefs>

For more detail on SICS and SDGs see the European Commission report '**Providing support in relation to the implementation of soil and land related Sustainable Development Goals at EU level**' here: https://ec.europa.eu/environment/soil/index_en.htm



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The SoilCare project is funded by the European Union's Horizon 2020 research and innovation programme, under grant agreement No. 677407.



SUMMARY

Despite economic and regulatory incentives to transition to more sustainable soil management, many farmers across Europe have still not tried such practices or been motivated to change behaviour for the long-term. Complex social factors affecting farmers can be a cause of this.

SoilCare investigates and promotes the use of Soil-Improving Cropping Systems (SICS) to improve soil quality for positive effects on sustainability and profitability. SICS are a holistic approach to soil management, consisting of long crop rotations and an 'integrated' combination of inputs and management techniques.

Here we present how policy makers can support farmer networks to strengthen social capital in order to encourage the uptake of SICS practices.



POLICY OPTIONS

Building social capital has been shown to positively affect the uptake of innovative practices in farming. The following can increase uptake of sustainable soil management:

- Support information providers that farmers respect and trust e.g. farmer influencers or advisers
- Support development of diverse networks which include farmers and non-farmers
- Support farmer networks that are open to trying new things – e.g. innovative farmer networks
- Address power inequalities (e.g. farmer to landowner) through expert facilitation of multi-stakeholder groups and long-term contracts

Building trust
through long-term contact and contracts can help SICS uptake



Social capital elements needed for SICS uptake

Research has highlighted four main components of social capital that can affect the uptake of sustainable soil management by farmers. These components & policy options for strengthening social capacity include:

🌱 **TRUST** is key. If a farmer does not trust the person or institution providing information, they will probably think it is not trustworthy either. Farmers trust information from those who they feel are in a similar position e.g. other farmers, rather than researchers, government employees or environmentalists. This is partly because they feel other farmers know and understand their goals and values more than “outsiders”. Distrust can occur through lack of information or contact consistency, whilst reciprocating trust in farmers actions can help to build relationships.

🌱 **CONNECTEDNESS** affects our behaviour. Having diversity within your network really helps spur innovation. For instance, if farmers are part of a wider community network, such as EU Operational Groups, they learn from other farmers as well as agronomists and environmental advisers. Not being connected with a wider network outside of your immediate locale can stifle innovation.

🌱 **NORMS** are shared expectations about how people should act. The norm for innovation – feeling it is OK to try something new – is important for farmers to be encouraged to use more sustainable soil practices. Studies across a range of countries have shown that farmers are more willing to change practices if their peers also do so. However, this can also present a barrier if peers have had negative past experiences or perceptions of more sustainable practices, e.g. conventional farmer group views of organic farming.

🌱 **POWER** is linked to position and knowledge. Power and trust can be seen in agricultural landlord - tenant relationships, where landlords make overarching farm management decisions. Longer-term contracts and encouraging transparent knowledge exchange are good ways to redistribute power equality and create greater transparency, fairness, and procedural justice.



Knowledge exchange

**Norms
to innovate**
for SICS can be built
through working with
demonstration farms
and
better connecting
farmers

Routes to increasing Social Capital

Incentivising cooperation and collaborative approaches in a range of contexts can be effective for fostering the four key components of social capital described overleaf. European Union grants are available and some national government programmes and advisory systems facilitate interactive groups. For example, [EU Operational Groups](#) on soils provide support to enhance connections between farmers, to advisors and researchers. However, focus is needed to make SICS the norm, whilst addressing power inequalities for managing soil health. Supporting trusted, unbiased external agencies as facilitators will aid the development of multi-stakeholder soil management groups.

Read the full paper at: <https://emeraldopenresearch.com/articles/2-8/v2>

For more SoilCare info see: <https://www.soilcare-project.eu/resources/deliverables>



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SUMMARY

The SoilCare project has tested and evaluated the concept of Soil Improving Cropping Systems (SICS) to increase sustainability and profitability. The premise behind this is that there are combinations of cropping systems that improve soil quality and at the same time have positive impacts on profitability and sustainability.

SICS are composed of three elements: long crop rotations, soil improving crops and agronomic management techniques. This policy brief is SoilCare's response to the public consultation on the new EU Soil Strategy - highlighting how the findings can inform and strengthen the strategy. The findings relate directly to the consultation's questions on indicators for soil health, how the EU can better support farmers and the most important factors for adoption of SICS.



Training for empowerment



Keeping soil covered with diverse species

POLICY OPTIONS

Actions to support the uptake of SICS:

- Involve stakeholders & farmers in the development of national and sub-national policy instruments
- Use the strategic planning approach established by the new CAP to formulate, with farmers, minimum requirements and voluntary measures and schemes that meet local conditions
- Give farmers confidence in policies & grants through >7 year arrangements & flexibility for regional differences (see SICS Potential Index below)
- Strengthen capacity of Farm Advice Services & ensure independence from industry.

Support
farmers,
foresters and
other land users to
apply SICS through
the EU's CAP and
farm advisory
services



Indicators to assess current soil status and to track changes

The table below details the indicators proposed by the SoilCare project for monitoring soil quality in common cropping systems. It should be stressed that these indicators are recommended for monitoring or assessment of cropping systems over short periods (**2-3 years**), and that other indicators of soil quality may be relevant over longer periods. SoilCare proposes here to use at least one indicator for each soil quality dimension.

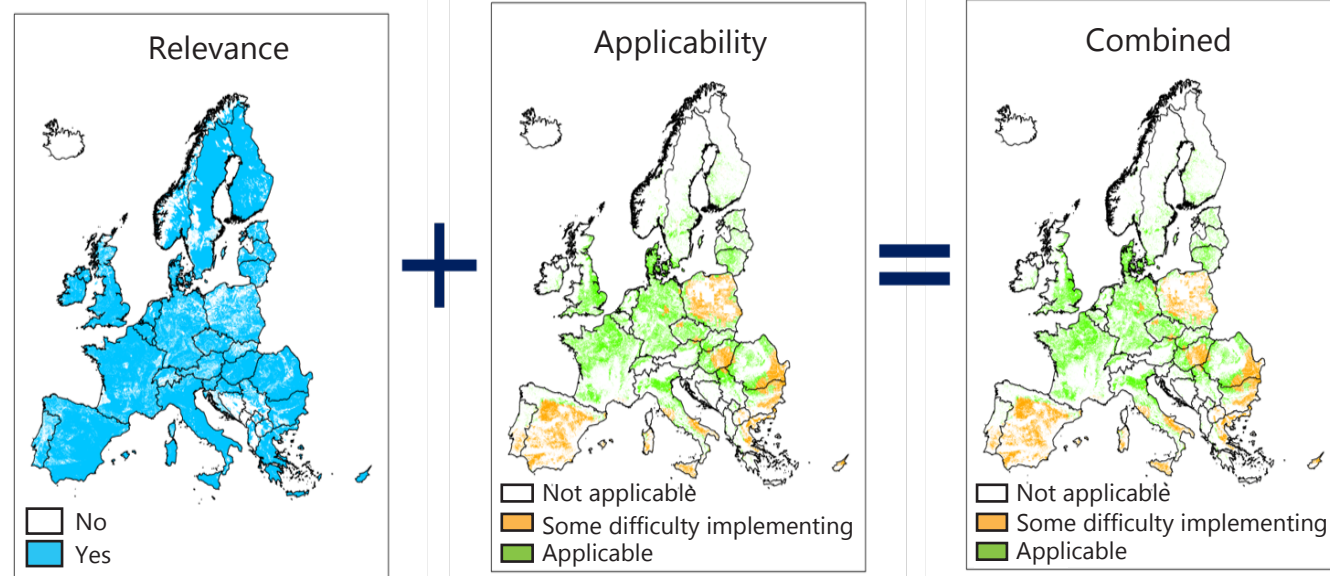
More information on the methods and results can be found in report D5.3, available at: <https://www.soilcare-project.eu/resources/deliverables>

Category	Indicator (unit)	Method
Soil productivity	Crop yield of biomass in dry matter ($\text{t ha}^{-1} \text{ year}^{-1}$)	Yield measurement or quadrat sampling
Soil physical properties	Water stable aggregates (%)	Wet sieving (250 μm - 2mm)
Soil biological activity	Earthworm presence (number / m^2)	Mustard extraction method
Soil Organic Carbon	Total Organic Carbon (%)	Walkley-Black method

Use of SICS Potential Index for understanding soil threats regionally

The SoilCare project has created a 'SICS potential index' combining Europe-wide maps and expert knowledge to identify where SICS can best be applied, taking into account both the applicability of the SICS (based on, amongst others, precipitation, aridity, soil type and land use) and their relevance to mitigate certain threats (e.g. erosion, compaction, loss of organic matter, soil fauna). The maps below are an example of the SICS potential index for cover crops, and show that they are widely applicable across much of Europe (green colouring), but in some locations it may be initially difficult to implement SICS, for example planting cover crops in an already arid climate (orange colouring).

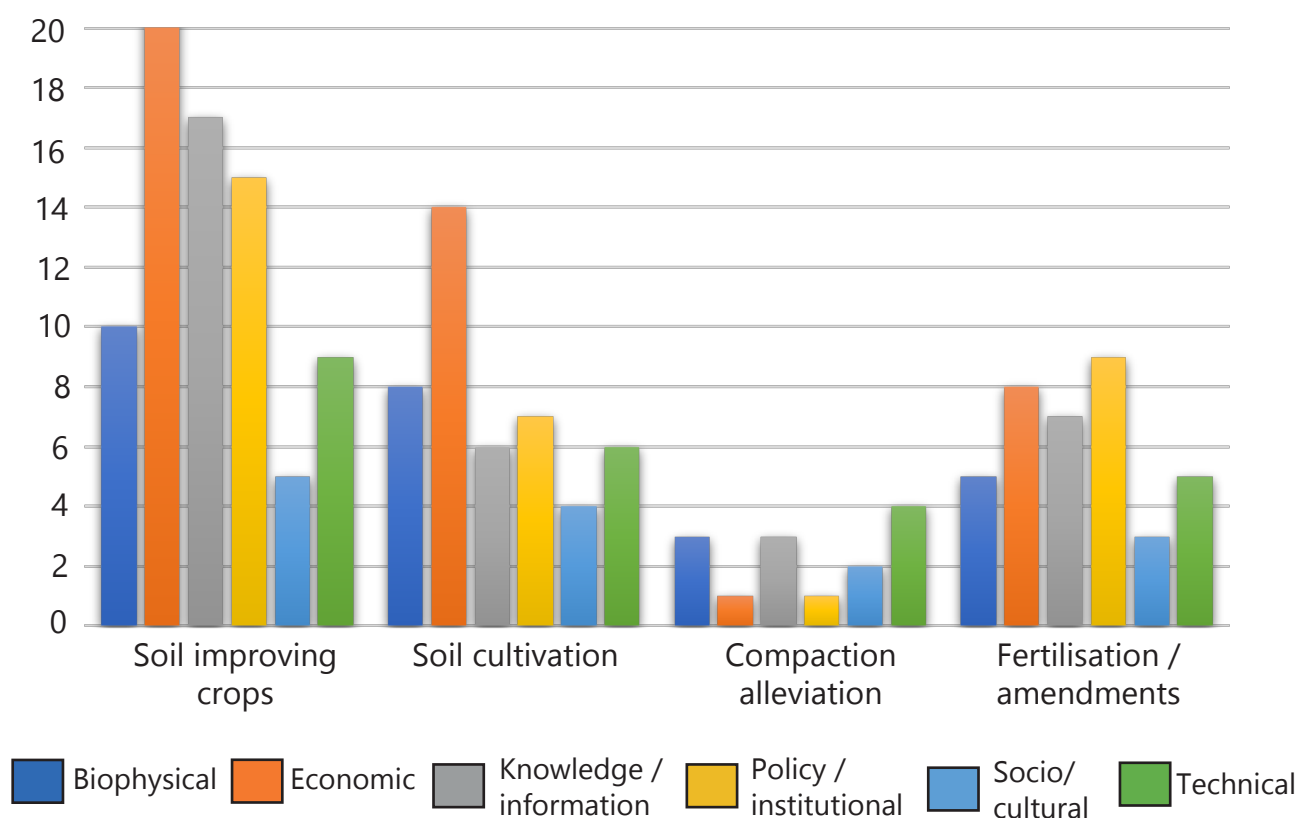
Policy can employ the use of these maps through understanding what specific threats are in specific regions and which SICS can be applied to help improve soil health and management in each region. They therefore stress the need for different strategies and SICS to be applied in different areas, in order to best improve soil health.



Factors affecting the uptake of SICS

SoilCare tested and evaluated a range of Soil-improving Cropping Systems at study sites in 16 European countries. During workshops, the total number of unique adoption factors mentioned by stakeholders (biophysical, economic, knowledge / information, policy / institutional, socio-cultural and technical) were counted. SICS practices were grouped together into the following clusters: fertilisation/amendments, soil improving crops (cover crops and crop rotations), soil cultivation, and compaction alleviation. The figure below shows, broken down by SICS cluster, the most important adoption factors identified by local stakeholders during workshops organised in 13 of the 16 study sites.

More details can be found in the country reports available at: <https://www.soilcare-project.eu/resources/resources-for-policy-makers/42-resources/254-policy-reports>. The full EU and cross-site analysis can be found in D7.2 available at: <https://www.soilcare-project.eu/resources/deliverables>



Policy at EU and Member State levels

Analysis of SoilCare farming system stakeholders suggests that the current policy framework does address key threats to the health of soil, however, the impacts of policy are largely defined by how they are implemented at regional and local levels. A greater recognition of this is needed at EU-level, in order to allow greater responsibility to flow into Member States. This should therefore be more effective at implementing policies in ways that make sense to farmers on a more local scale, taking into consideration their diverse situations and needs.

The full report from which this policy brief has been created can be accessed here (D7.2 Report on the selection of good policy alternatives at EU and study site level): <https://www.soilcare-project.eu/resources/deliverables>



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SUMMARY

The SoilCare project has tested and evaluated the concept of Soil Improving Cropping Systems (SICS) to increase sustainability and profitability. The premise behind the SICS concept is that there are cropping systems that improve soil quality and at the same time have positive impacts on profitability and sustainability.

SICS are composed of three elements: long crop rotations, soil improving crops and agronomic management techniques. Here we set out how policy can improve the adoption of SICS and how institutional, economic, socio-cultural and knowledge / education factors affect the uptake of these practices.



Soil-improving lupin crops



Organic amendments



Diverse species

POLICY OPTIONS

Actions to regulate, incentivise & promote SICS adoption:

- Develop specific targets for soil threats & integrate into Soil Thematic Strategy and other new policies
- Promote SICS through relevant policies e.g. EU-level advice on Eco Schemes & Commission recommendations for Member States
- Realign where policy conflicts arise to avoid discouraging transition to sustainable soil management
- Create a clear, robust, and reliable monitoring & enforcement system for the CAP
- Create greater consumer awareness of sustainable produce through education

Create
consistent
farm advice and
policy instruments
for sustainable soil
management



Socio-cultural factors

Society's awareness and valuing of soil -

Multiple sites: consumers need to better understand the impacts production methods had on soil for more informed purchasing decisions and increase their willingness to pay prices reflecting the costs of sustainable production

New generation of farmers open to change -

ES/BE/NO: habit makes many farmers reluctant to change practices; older farmers stuck in production-orientated habits

BE: there are always pioneers or innovators who want to try out new practices

Economic factors

High investment and/or implementation costs -

Multiple sites: change of practices involves high (short and long-term) costs for e.g., organic fertiliser, equipping machinery with the right tools (e.g., crawlers, disc harrows), purchase of new crops as well as additional seeds on top of main crop for cover crops

Holistic approaches and co-benefits to soil -

UK: changes in arable rotations due to weed and disease control have now been mainstreamed and have co-incidentally benefited the soil

Market pressures/demands -

BE: policy encourages farmers to plant cover crops and rotate crops but because of the high demand for potatoes and the consequent profitability, too many potatoes are grown; in addition, crop residues and organic materials are used for biofuels and other bio-products due to a high demand for these products instead of being returned to the soil



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Institutional/policy factors

Adverse effects of policy design -

BE: perception that policies dictate practices that need to be adopted, regardless of feasibility/practicability, sometimes resulting in adverse behaviour, e.g., converting existing grassland to avoid the “permanent grassland” status.

UK: farmer could be asked to plant a certain type of mix to favour bees and birds, and which does not provide a good soil cover

Lack of coherence between legislation/conflicting objectives -

UK: targets and subsidies for increasing woodland areas for growing bio-fuel crops fail to specify that the land must be suitable for these purposes

BE: Due to the fragmentation in different public services and departments, farmers often get contradictory advice (Nitrates Directive versus CAP)

Knowledge and education

Insufficient resources -

Multiple sites: Advisory services need more resources for experimental and demonstration farms. Advice providers are often reliant on project funding which has continuity problems

Adviser expertise and quality -

ES: The quality of advice is very heterogeneous, and is given on an ad hoc basis without continuity

BE: physical and biological soil management is often neglected due to a focus on nutrients and fertilisers/manures

NO: quality of advice from NLR (independent membership organisation) is good, knowledgeable people who know a lot about soil and try to incorporate advice to enhance soil and environmental conditions when they can



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Insights into factors affecting SICS uptake

As illustrated in the table above, there are a wide range of issues affecting sustainable soil management. Following on from this, the country-specific issues stem from fundamental EU-level factors below:

Socio-cultural Factors

A lack of awareness of soil in society and its framing as a resource to be exploited for humankind and economy engenders a disconnect between publics and impacts of agricultural production on soil. Further, mechanisation creates distance between farmers, their fields and soil, making it difficult for them to see ecosystem changes. Some SoilCare stakeholders stressed ethical convictions favouring ecological approaches to farming as an important force for change with respect to these issues.

Economic Factors

A financially difficult transition period from conventional to organic or more sustainable soil management practices can prove too risky for many farmers to take, as yields can reduce during this period. They therefore need funding to support them through this. Further, financial incentives from policy and public demand can motivate a change in practice. Global trade systems favouring monocultures also inhibit change, as power is accumulated in the retailers, rather than the producers.

Institutional / Policy Factors

Change via regulation was thought by SoilCare stakeholders to be both positive & negative, e.g. the examples on the previous page. Possible inadvertent effects can be avoided by closely working with farmers. Currently, advisory services are seen as a tool for safeguarding business as usual, and do not reflect scientific evidence for sustainable soil management. Regular training is needed for both farmers and advisors. Publics education and accessibility of sustainably produced food also needs prioritising.



Checking soil quality and health



Understanding soil health needs

Promoting SICS through policy

This policy brief has outlined the factors affecting adoption of SICS at both EU and Member State level. In order to better promote, incentivise and regulate the implementation of SICS across the EU, all factors need to be understood and addressed. A holistic approach to both society and the farming sector is needed to ensure sustainable soil management, from an appreciation by consumers of the costs and basic practices (such as organic) of food production, to advice, support and training for farmers.

The full report from which this policy brief has been created can be accessed here (D7.2 Report on the selection of good policy alternatives at EU and study site level): <https://www.soilcare-project.eu/resources/deliverables>



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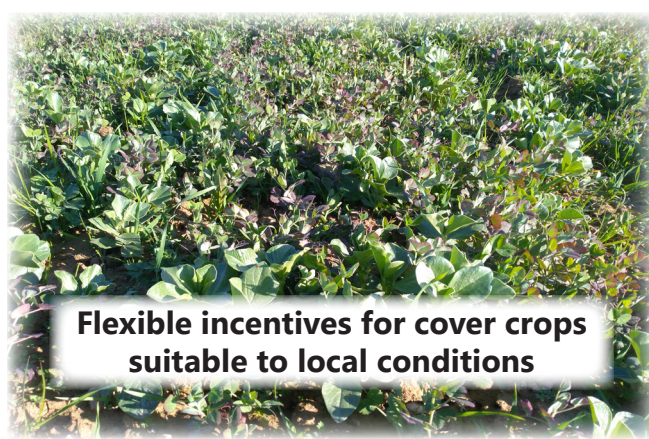


SUMMARY

There is a growing consensus that agricultural practices in Europe must change to remain both profitable and sustainable, something which is also reflected in numerous policy initiatives at the European level over the last decade which directly or indirectly promote existing beneficial agricultural practices. Most recently, the European Green Deal sets out the roadmap for making the EU's economy sustainable and formulates several key actions which will be crucial in advancing land and soil protection in Europe. With this shift comes increasing pressure on agricultural producers to change how they operate and adopt new techniques and practices, not only due to the described changes in policies, but also their own environmental concerns, private industry standards, and increasing consumer awareness.



Training for empowerment



Flexible incentives for cover crops suitable to local conditions

The SoilCare project

The overall aim of SoilCare is to identify, evaluate and promote promising soil-improving cropping systems (SICS). SoilCare defines SICS as specific combinations of crop types, crop rotations and management techniques aimed at halting soil degradation and/or improving soil quality cropping systems that improve soil quality (and hence its functions), and that have positive impacts on the profitability and sustainability of agriculture. Such cropping systems have then been tested in 16 study sites as part of the SoilCare project, located in both EU and non-EU countries. Based on the analysis of the policy framework at EU, national, and sub-national level, and feedback collected from European and national stakeholders, we can formulate a set of overarching recommendations for actions to facilitate the wider uptake of SICS across Europe.

Read more here: <https://soilcare-project.eu>

and here: SoilCare Deliverable 7.2 "Report on the selection of good policy alternatives at EU and study site level <https://soilcare-project.eu/downloads/public-documents/soilcare-reports-and-deliverables/186-report-13-d7-2-milieu-full-v2/file>



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Barriers to Sustainable Soil Management

Knowledge / information

Availability of information, fragmented services, adviser expertise / quality, costs, continuity of funding for advisory services

Policy / institutional

Adverse policy effects, lack of coherence / policy conflicts, weak monitoring / enforcement top-down policies, unstable policy frameworks, lack of soil legislation / targets

Socio-cultural

Awareness / value of soil, peer pressure, demand for sustainably produced products, traditional practices

Economic

Transition costs, time lag between change of practices and benefits, market demands, holistic approaches

How could EU and national/regional policy facilitate actions to promote the uptake of SICS?

Recommendation I: Define long-term ambitions and targets

The protection, maintenance, and improvement of land and soil at EU level and Member States relies heavily on sectoral and environmental policies. At the EU level, specific long-term targets for different pressures affecting soil functions/causing soil threats need to be integrated in new policy initiatives, such as the ongoing revision of the Soil Thematic Strategy, or the planned Zero Pollution Action Plan. In addition, EU-level advice on Eco Schemes as well as Commission recommendations issued to the Member States within the context of the formal review and approval process of the new Strategic Plans of the Common Agricultural Policy (CAP) could contribute to a wider uptake of SICS.

At the country level:

- Relevant SICS could be incentivised through measures in the CAP Strategic Plans, and particularly the Member States' Eco Schemes.
- Stakeholders, particularly farmers should be involved in the development of national and sub-national policy instruments. The Farm to Fork Strategy explicitly calls for strengthening the position of farmers in the supply chain, and the procedures for drafting national CAP Strategic Plans ask for a wide consultation process.



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How could EU and national/regional policy facilitate actions to promote the uptake of SICS?

Recommendation 2: Increase coherence between policies and policy objectives

Policy conflicts and synergies need to be carefully analysed and aligned, so as not to discourage the transition to sustainable farming practices. The new CAP improves the overall coherence with environmental legislative instruments. However, potential conflicts with other sectoral legislation, such as energy and waste, may remain. Mechanisms to ensure coherence between different pieces of EU legislation and policy may include future looking impact assessment which integrates soil health as a fundamental element. This means all relevant legislation would go through a set of criteria to determine whether they have an adverse impact on soil either directly or through encouraging unsustainable farming practices. Such a mechanism would recognise the cross-cutting nature of soil as a mediator of multiple land-based services, providing higher consideration in policy evaluation.

At the country level:

- Provide farmers with 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.
- A two-way communication between the policy makers, the farmers and the neutral advisory services would help to create a constant feedback loop, overcoming some of the clarity issues and avoid top-down policy design.



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How could EU and national/regional policy facilitate actions to promote the uptake of SICS?

Recommendation 3: Design targeted economic instruments

The CAP, as the main financial instrument shaping farming across Europe, should strive to be less prescriptive, avoiding one size fits all approaches but provide the farmers with a general direction, clearly defined by targets and empowering them to take steps towards these targets in a way that is best adapted to their unique circumstances. At the EU level, the new set-up proposed for the post 2020-CAP give Member States a higher degree of freedom when it comes to defining the new CAP Strategic Plans.

At the country level:

- Financial incentives need to be more targeted, both tied to specific actions and region (or environmental/geographic conditions) to result in the desired change. Priority should be given to regionally prescribed SICS that are able to be a source of food production that is both profitable and sustainable. Here, the regional and EU-level applicability maps developed by the SoilCare project for broad SICS clusters can provide important guidance.
- Financial instruments need to facilitate the transition to long-term changes in practices rather than finance one-off interventions. In addition, confidence in long-term arrangements (>7 years) enabled in policy frameworks is essential to win trust from influential farmers.
- Taxation for unsustainable products and techniques at consumer level is a way of internalising the costs on the environment and wider society and would also influence consumers' choices, creating more demand for sustainable products, giving them the price advantage. An innovation award could be an effective instrument to create awareness for sustainable producers and production methods amongst consumers and farmers alike.
- Schemes for sharing equipment and/or collective buying which would be otherwise expensive can be created, encouraged and promoted among farmers. Stakeholders from the industry can be encouraged to take part in these schemes to promote their equipment/material.



Policies supporting long-term changes



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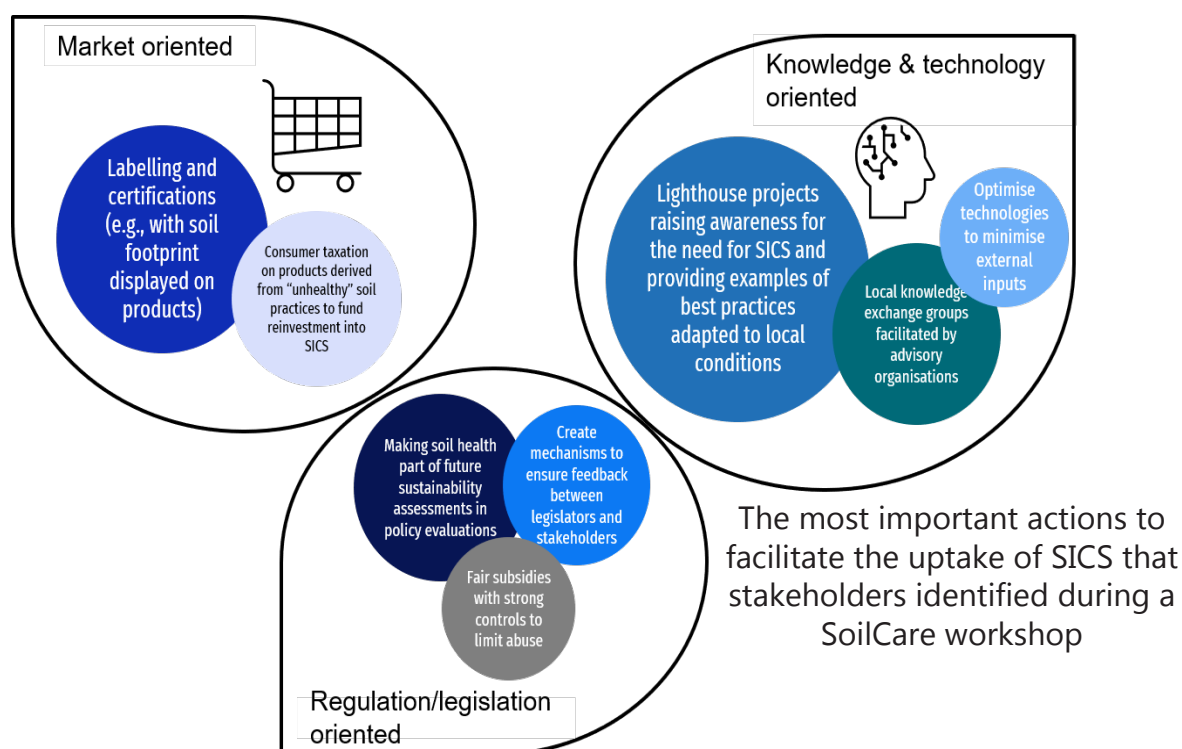
How could EU and national/regional policy facilitate actions to promote the uptake of SICS?

Recommendation 4: Strengthen policy monitoring and enforcement

Ambitious but flexible policies can only be successful if monitored and enforced properly. Whilst the new CAP proposal includes a detailed set of indicators, they mainly focus on establishing target areas/proportions which should be covered by a specific measure rather than define environmental improvements that should be achieved.

At the country level:

- Complementing the proposed CAP indicators with indicators that focus on environmental performance which assess the benefits delivered at farm level.
- Streamlining different monitoring and reporting systems set up for different pieces of EU legislation to enhance reliability and reduce administrative burden on public authorities.
- Farm inspectors are important elements of the monitoring mechanisms. Their training should be designed and updated to equip them with the latest knowledge available regarding the legislation and scientific developments.
- Setting up dedicated government units or agencies, specifically focusing on monitoring the impacts of different policies on soil health would be an additional tool to improve the implementation and monitoring.



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How could EU and national/regional policy facilitate actions to promote the uptake of SICS?

Recommendation 5: Strengthen opportunities for learning and knowledge exchange for farmers

Financial incentives such as those established by the CAP may be less effective than other types of instruments such as provision of information and advisory services, as they do not consider factors relating to farmer views and attitudes. Support of Fam Advisory Services, e.g., through CAP instruments, needs to continue.

At the country level:

- Make soil health a stronger component of vocational training and continued education of farmers. It should underline the basic principles of sustainability such as generational fairness, the importance of soil health for all other systems on the planet and the impacts of unsustainable practices.
- Establish regular training; some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits in order to change any misconceptions about these methods. Stakeholders suggest that well-organised and continuous interactions with farmers such as free group talks are successful in bringing change in attitudes and beliefs.
- 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 put a great degree of trust in their fellow producers. Partnering with farmers willing to pioneer new techniques or trusted organisations, will ensure that target audiences are reached, and new information is heard.
- Collaborate with scientists and other researchers to promote innovation which would optimise technologies to allow farming to become more sustainable across the board and to make research findings accessible and ensure their wide dissemination
- Consider the establishment of a network of model farms demonstrating how to use and adapt different SICS in the region.



Advice sharing



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SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

Policy analysis:
PROMOTING SICs
ADOPTION IN
FLANDERS, BELGIUM

SOIL HEALTH RELATED PROBLEMS ON SITE



Compaction



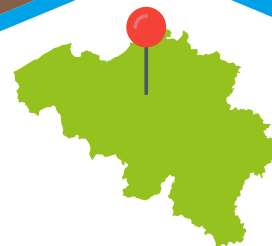
Erosion



Acidification



Nutrient loss



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN FLANDERS

The following Soil-Improving Cropping systems (SICs) were tested in Flanders, Belgium, to address the main soil threats identified above:

1. **Integrated nutrient managements (Organic soil amendments in wheat fields),**
2. **Reduced tillage: Strip till and soil cover in maize ("Grass undersowing in maize"),**
3. **Demonstration fields (Soil improving crops, controlled traffic management).**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

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 in Flanders, Belgium in particular. These include:

- "Fitness" and complexity of policies
- Limited coherence of policies
- Lack of financial incentives
- Timeframe of policies:
- Limited soil education/knowledge dissemination

COVER CROPS FOR COMPACTION ALLEVIATION AND TO IMPROVE SOIL QUALITY

Factors encouraging the adoption of cover crops:

- Erosion prevention
- Prevention of soil compaction
- Deletion of contractor crop

Barriers preventing the adoption of cover crops:

- Lower yield in some conditions
- Increased need for pesticides
- Need for new machinery

Factors encouraging the adoption of integrated nutrient management:

- Sufficient supply of woodchips
- Cooperative purchase of machinery
- Awareness and knowledge of advantages
- Possibility of management agreements

Barriers preventing the adoption of integrated nutrient management:

- Sufficient supply of woodchips
- Costs of implementation
- Inconsistencies in the legislation
- Insufficient knowledge about the advantages

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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 Flemish part of Belgium. The analysis shows that that several policies address the SICS that were tested in the study site: cover crops and reduced tillage are incentivised under the Common Agricultural Policy's (CAP) cross-compliance standards and the greening measures, respectively. Integrated nutrient management is to a great extent regulated by the Nitrates Directive and the Manure Decree, but also influenced by greening requirements under the CAP which incentivises the use of nitrogen-fixing crops and crops with lower fertilization demands.

Blue circles= SICS tested in the study site; Red circles = Other SICS promoted through existing mandatory, economic, or voluntary policy instruments in Flanders, Belgium

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance Standards (Randvoorwaarden Norm voor een goede landbouw- en milieueconditie van grond (GLMC))	●	●			●	●			●		●
CCAP Greening Payment Requirements (Vergroeningspremie: vergroening in het kader van het Gemeenschappelijk Landbouwbeleid)		●	●			●	●				●
CCAP Agro-environmental measures (Agromilieumaatregelen)		●				●		●	●		●
Management Agreements (Flemish Land Agency) (Beheerovereenkomsten (VLM))					●						●
CAP RDP (Programma voor Plattelandsontwikkeling (derde))	●										
Decree on Integrated Water Management (Decreet betreffende het integraal waterbeleid)					●						
Manure Decree - Action Programme for the Implementation of the Nitrate Directive 5th Manure Action Plan (Mestdecreet - Actieprogramma ter uitvoering van de Nitraatrichtlijn 2015-2018 (het 5de Mestactieplan))		●	●								
National Action Plan (NAPAN - National Actie Plan d'Action National)							●				
Decree on the Sustainable Use of Pesticides and Associated Decisions (Decreet duurzaam gebruik van pesticiden en de bijhorende besluiten)							●				
Decision of the Flemish Government on Erosion Control (Besluit van de Vlaamse Regering betreffende de erosiebestrijding)					●	●					●



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Based on the results of this study, the following policy recommendations can be made:

INCREASE POLICY
COHERENCE AND
ADAPT CURRENT
LEGISLATION



SOIL-SPECIFIC AND
REWARDING
REGULATIONS

REWARD FARMERS
FOR THE BENEFITS
THEY DELIVER TO
SOCIETY



INTRODUCE
BETTER DESIGNED
ECONOMIC
INSTRUMENTS

ENCOURAGE WIDE-
SPREAD VOLUNTARY
PRACTICES



GRASS-ROOTS
VOLUNTARY
MECHANISMS
(FARMERS CO-OPS)

ESTABLISH MECHANISMS
FOR EFFECTIVE
KNOWLEDGE
DISSEMINATION AND
EXCHANGE



AWARENESS RAISING
EXCHANGE OF
PRACTICES
GUIDANCE

ESTABLISH MECHANISMS
FOR EFFECTIVE
KNOWLEDGE
DISSEMINATION AND
EXCHANGE



AWARENESS RAISING
EXCHANGE OF
PRACTICES
GUIDANCE

Support awareness-raising and dissemination of good practices:

The role of education and knowledge dissemination cannot be underestimated. In the Flanders case study, several farmers were adopting SICS or other beneficial practices only to “pass a test” or gain a subsidy. This means that the adoption of SICS is very precarious – if the subsidy was to be discontinued or a specific monitoring requirement changed, farmers would likely revert back to old practices. Similarly, when adoption practices do not go as planned and are subsequently deemed a failure, the causes need to be systematically investigated and documented to shape future initiatives. Similarly, successes need to be disseminated as good practice. By investing in education and knowledge dissemination, the adoption of SICS becomes much more sustainable. In Flanders, there are organisations such as the B3W (Advisory Service to improve Soil and Water Quality), established in January 2021. This service includes all practical research stations in Flanders, the Soil Service of Belgium and ILVO (Flanders Research Institute for Agriculture, Fisheries and Food). This service will focus on a limited number of topics linked to soil and water quality. It offers three services: individual coaching, focus groups and thematic exchange events. This study did not uncover any evidence of conflicting messages or over-information, however, in general, care should be taken to ensure farmers are met with a consistent message, based on scientific evidence, which is presented without being overwhelming and confusing.



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INCREASE POLICY
COHERENCE AND
ADAPT CURRENT
LEGISLATION



SOIL-SPECIFIC
AND REWARDING
REGULATIONS

Increase policy coherence and adapt current legislation:

Most policies affecting soil quality in Flanders are regulatory instruments, and there is evidence that these can be improved. Highly complex legislation and a lack of policy coherence mean that the existing regulations do not inspire adoption. In addition, regulation in Flanders is seen as being punishing rather than rewarding, which is an additional barrier to adoption. There is also evidence to suggest that having general regulations (rather than soil-specific regulations) have a limited impact – the Sustainable Use of Pesticides Directive has affected the types of pesticides available but has done little to improve the soil quality.

ENCOURAGE
WIDE-SPREAD
VOLUNTARY
PRACTICES



GRASS-ROOTS
VOLUNTARY
MECHANISMS
(FARMERS CO-OPS)

Better explore ways of encouraging voluntary practices:

There was little evidence of wide-spread grass-roots volunteer mechanisms (such as farmers' cooperatives), however, it is clear that certain voluntary measures, such as reducing tillage, are already being implemented. While our research was not able to confirm that these practices were adopted because of a specific voluntary measure, it does show that farmers in Flanders are willing to adopt voluntary measures, and perhaps more can be done to encourage them.

REWARD FARMERS
FOR THE BENEFITS
THEY DELIVER TO
SOCIETY



INTRODUCE
BETTER
DESIGNED
ECONOMIC
INSTRUMENTS

Introduce better designed economic incentives to counter costs associated with SICs:

Economic instruments are primarily found within CAP. There is, however, potential to further develop economic instruments in Flanders, as one of the key barriers to adoption are the costs – whether they are direct costs (such as investing in new machinery) or opportunities costs (such as foregoing revenue from potatoes or biomass).



SOIL HEALTH RELATED PROBLEMS ON SITE



Erosion



Loss of organic
matter



Compaction

SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN VIBORG

The following Soil-Improving Cropping systems (SICs) were tested in Viborg, Denmark, to address the main soil threats identified above:

1. **Introduction of soil improving crops (CROPSYS crop rotations, screening of different types of catch crops)**
2. **Soil cultivation measures (different soil tillage intensities)**
3. **Fertilisation/soil amendments (different levels of fertilisation and liming)**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

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 in Viborg, Denmark, in particular. These include:

- Costs of transitioning to new cropping systems
- Prioritisation of short-term financial benefits
- Lack of policy coherence
- Reluctance to abandon traditional practices
- Lack of continued learning and integration of emerging knowledge in practices



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 Viborg, Denmark. The analysis shows that several policies regulate and incentivise the use of crop rotation, cover crops, reduced tillage, and integrated nutrient: CAP cross-compliance standards, greening requirements as well as RDP measures incentivise the uptake of crop rotations/crop sequencing, reduced tillage methods, and to a lesser extent, cover crops. However, provision included in the Act on Agricultural Use of Fertilisers and on Plant Cover has the potential to increase the adoption of cover crops. Nutrient input from agriculture is regulated through several pieces of water legislation, mostly with a view to protecting water quality rather than soil. Policies such as the Act on Agricultural Use of Fertilisers and on Plant Cover define limitation for fertiliser use in certain areas, mandate the establishment of buffer strips, and establish rules for the use of plant cover/catch crops.

Blue circles= SICS tested in the study site; Red circles = Other SICS promoted through existing mandatory, economic, or voluntary policy instruments in Viborg, Denmark

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC cross compliance standards (Bekendtgørelse om krydsoverensstemmelseBEK)	●		●			●					●
CAP Greening requirements	●	●				●					●
Rural Development Programme 2014-2020 (Det danske landdistriktsprogram 2014-2020)	●					●	●				●
Act on Agricultural Use of Fertilizers and on Plant Cover (Bekendtgørelse af lov om jordbrugets anvendelse af gødning og om plantedække)		●	●								
Agreement on Food and Agriculture Package 2015 (Aftale om fødevarer- og landbrugspakken 2015)	●		●								●
Act on Tax on Pesticides (Bekendtgørelse af lov om afgift af bekæmpelsesmidler)							●				
Act on Management of Agricultural Land (Bekendtgørelse af lov om drift af landbrugsjorder)							●				●
The Livestock Manure Order (Husdyrgødningsbekendtgørelsen)			●								

Based on the results of this study, the following policy recommendations can be made:

SUBSIDISE TRANSITION TO PRACTICES BENEFITING SOIL HEALTH



ADDITIONAL SEEDS AND MACHINERY PURCHASE MACHINERY EXCHANGE

Subsidise transition to practices benefitting soil health:

The cost of transition to more sustainable practices is identified as an important barrier for the farmers. Forced to choose between short term and long-term gains, farmers often have no real motivation to forego their immediate revenues. The uptake of certain SICS, such as reduced tillage or cover crops might require upfront investments, such as the purchasing of additional seeds and new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a 'machinery exchange'. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.

INCREASE POLICY COHERENCE



POLICY CONFLICTS AND SYNERGIES CAREFULLY ANALYSED AND ALIGNED

Increase policy coherence:

Policy conflicts and synergies 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.

OFFER REGULAR TRAINING AND INFORMATION SERVICES TO KEEP FARMERS INFORMED ABOUT NEW DEVELOPMENTS AND INSIGHTS



SOIL TO BE HIGHLY FEATURED ON THE CURRICULUM FOR FARMERS TRAINING

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. Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits to change their misconceptions about these methods. To this end, research findings should be made accessible and widely disseminated and educational activities should be encouraged. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits and demonstration days. Workshops, encouraging peer to peer learning, and long-term experiments that will show the benefits of SICS are promising initiatives that can be supported.





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SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

Policy analysis:
**PROMOTING SICs
ADOPTION IN
KESZTHELY, HUNGARY**

SOIL HEALTH RELATED PROBLEMS ON SITE



Compaction



Erosion



Nitrates
contamination



Nutrient loss



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN KESZTHELY, HUNGARY

The following Soil-Improving Cropping systems (SICs) were tested in Keszthely, Hungary, to address the main soil threats identified above:

1. **Integrated nutrient managements (Organic/inorganic N fertilization, mineral fertilisation in continuous maize cropping)**
2. **Integrated nutrient management in combination with crop rotations (organic/inorganic fertilisation in different rotations)**
3. **Reduced tillage practices (Tillage in maize-wheat biculture).**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.



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 in Keszthely, Hungary in particular. These include:

LIMITED COHERENCE
BETWEEN POLICIES



WEAK
ENFORCEMENT

AVAILABILITY OF
GRANTS/SUBSIDIES



LACK OF INFORMATION

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POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The existing policy framework in Keszthely, Hungary, already promotes the SICS covered by the SoilCare project through a range of existing regulatory, economic, and voluntary policy instruments and measures. The analysis shows that several economic policies promote the use of cover crops, the SICS tested at the study site, a practice which is relevant to alleviating compaction, halting erosion, and generally improving soil health. The same instruments incentivise reduced tillage practices which also reduce compaction and erosion while smart residue and controlled traffic management, which could address the same soil threats, are not incentivised, or regulated by existing policies.

Blue circles= SICS identified as potentially beneficial to the main soil threats and subsequently tested in the study site; Red circles = Other SICS promoted through existing mandatory, economic, or voluntary policy instruments in Keszthely, Hungary

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance Standards	●	●					●				●
Act on the General Rules of Environmental Protection			●				●				●
Rules for Action Program against Agricultural Nitrate Pollution, Data Reporting and Record Keeping			●								
Decree on the Protection of Waters against Nitrates Pollution from Agricultural Origin			●								
Decree on Protection of Geological Medium and Groundwater against Pollution	●		●				●				
Rules about Agricultural Utilization of Sewage Sludge and Waste Water			●								
Decree authorizing the placing on the market and use of plant protection products and packaging, marking, storage and transport of plant protection							●				
Rules about Authorization, Storage, Marketing and Utilization of Fertilising Products			●								
National Action Plan to Improve Organic Farming	●	●	●	●	●	●	●	●	●	●	●
Ministerial Decree on Preparation of Soil Protection Plan		●	●	●							●
Act on Cultivated Land			●		●	●					
Act on the Protection of Cultivated Soil			●		●	●					●



Based on the results of this study, the following policy recommendations can be made:

SIMPLIFY POLICY
FRAMEWORK AND
ENFORCE IT BETTER



COHERENT, EASY TO
ENFORCE
REGULATIONS

Simplification of the policy framework and better enforcement:

Policies are viewed by stakeholders as complicated, incoherent, and poorly enforced. This makes it challenging for farmers to comply with policy requirements, especially if they observe that they face little consequence for non-compliance. While it is found that there are a number of policies already in place that impact soil, they require simplification both at EU and national level legislation. In addition, they need to be more effectively enforced to produce the intended outcomes and impacts. This also concerns ensuring policy is coherent and not working towards contradictory goals.

ESTABLISH MECHANISMS
FOR EFFECTIVE
KNOWLEDGE
DISSEMINATION AND
EXCHANGE



SOIL-SPECIFIC
AND REWARDING
REGULATIONS

Raising awareness of the environmental benefits of SICS:

There is need to provide farmers with information on SICS. There is very little awareness of the benefits of soil bacteria in the soil and what technique can facilitate its maintenance. Information needs to also be aimed at consumers, who should be encouraged to purchase from sustainably managed farms.

REWARD FARMERS
FOR THE BENEFITS
THEY DELIVER TO
SOCIETY



INTRODUCE
BETTER DESIGNED
ECONOMIC
INSTRUMENTS

Using available funding to promote SICS adoption:

Funding opportunities are the main driver for SICS adoption, especially funding from EU level. With the post-2020 CAP, new funding rules will be introduced. The Good Agricultural Environmental Conditions (GAECs) now offer a greater chance for soil protection. New conditions with the potential to improve soil health have been added, e.g., crop rotation is introduced under GAEC 8. The new agri-environment-climate measures present opportunities to address declining soil health. It will be key that Member States allocate enough available budget available to implementing soil health measures.



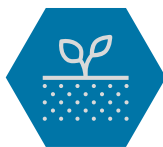
SOIL HEALTH RELATED PROBLEMS ON SITE



Soil
compaction



Low soil
organic
matter



Deterioration
of soil
structure



Soil
erosion



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN PRAGUE, CZECH REPUBLIC

The main soil threats in region where the study site Prague - Ruzyne, Czech Republic is located include soil compaction, loss and limited input of soil organic matter (SOM), deterioration of soil structure, and erosion. Soil-improving Cropping Systems (SICS) that are being tested within the context of the SoilCare project include:

1. **Application of manure**
2. **Use of catch crops and growing of legumes**

In addition, several long-term experiments (LTE) with various tillage methods (conventional, reduced and no tillage), as well as different fertiliser applications and organic farming methods are being carried out in the study site. Crop rotation systems are also used, which include the use of legumes and other soil improving crops.

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.



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FACTORS AFFECTING THE UPTAKE OF SICS

Evidence indicates that there are several factors that shape the success or failure of policy instruments in the study site region, and the uptake of SICs tested in the sites in general. These factors include:

1. **The Regulatory framework is perceived as complex and excessive by farmers:** Stakeholders emphasised that SICs were regulated by multiple laws, including the Water Act. Rules were perceived as quite complex and difficult to understand for many farmers. It was pointed out that it was unclear to farmers how to interpret some of the rules and the conditions they are supposed to meet.
2. **Weak/incorrect enforcement of policy measures:** A complex regulatory framework hampers compliance and thus limits the achievement of the positive impacts intended by the various policy instruments. Weak enforcement of these policies limits their impacts on the ground. In this context, it was mentioned that sometimes individual inspectors lack understanding of the funding requirements, e.g. in the case of the CAP, and stakeholders report that this has led to an unjustified reduction of subsidies in some cases.
3. **Cost of modern machinery for soil-improving cultivation methods:** Stakeholders identified the costs of purchasing new equipment and technology as financial factors impeding the wider uptake of certain SICs, such as reduced tillage tested in the study site.
4. **Existing non-governmental bodies have the potential of facilitating change:** There are already a number of non-governmental bodies, such as the Czech Agrarian Chamber, dedicated to the issue of agricultural policy and farming, which could support the transition to more sustainable agricultural practices, e.g. through educational offers to farmers.



POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below provides an overview of policies promoting the full range of SICS covered by the SoilCare project and the SICS (including the LTE) tested at the study site. The analysis shows that all of the identified policies regulate and incentivise the SICS trialled to some degree.

The use of crop rotation, green manure, and reduced tillage practices are incentivised through CAP GAEC Cross-compliance Standards, greening payments and are further specified by the national Anti-Water Erosion Measures Guidance. CAP cross-compliance establishes nutrient management requirements for farmers receiving direct payments. In addition, water policies place limitations on fertiliser use in certain areas.

Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Prague, Czech Republic. Blue circles = SICS uptake promoted as part of the wider SoilCare project.

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance standards	●		●			●					●
CAP greening payment requirements	●	●									●
Cross-compliance (anti-water erosion measures guidance)	●	●				●			●		
Act on fertiliser usage			●								
Water Act	●		●								
Ordinance Concerning the Establishment of Vulnerable Zones and Action Plan	●		●								●
Waste Act			●								



POLICY RECOMMENDATIONS

Based on the results of this study, the following policy recommendations can be made:

REVIEW, ADAPT, AND EFFECTIVELY COMMUNICATE POLICY REQUIREMENTS



IMPROVE POLICY MONITORING AND ENFORCEMENT

Review, and if needed, adapt and effectively communicate policy requirements: Highly complex legislation and possibly a lack of policy coherence mean that the existing regulations do not inspire adoption. In addition, compliance with regulation in the study site region is seen as being burdensome rather than rewarding, which is an additional barrier to adoption. Farmers struggle to interpret and comply with rules.

Improve policy monitoring and enforcement: while it was found that there are a number of policies already in place that (directly and indirectly) regulate and incentivise different SICS, stakeholders report that outcomes on soil health are limited due to weak enforcement mechanisms. It is clear mechanisms for checking compliance with existing regulations need to be strengthened and expanded. Regulatory instruments need to be monitored and effective sanctions put in place for non-compliance in order to be successful in prompting adoption. This needs to include the training of farm inspectors who, like farmers, need to understand the regulatory requirements and their practical implementation.

OFFER REGULAR TRAINING AND INFORMATION



ENGAGE WITH FARMERS AND TRUSTED ORGANISATIONS TO DELIVER ADVICE AND TRAINING

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 Czech Agrarian Chamber, will ensure that target audiences are reached, and new information is heard.

SUBSIDISE TRANSITION TO SUSTAINABLE PRACTICES



The uptake of certain SICS, such as reduced tillage, might require upfront investments, such as the purchasing of additional seeds and new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a 'machinery exchange'. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.



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SOIL HEALTH RELATED PROBLEMS ON SITE



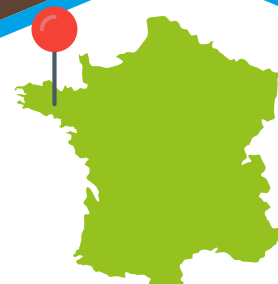
Compaction



Low soil
fertility



Weeds



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN BRITTANY, FRANCE

The following Soil-Improving Cropping systems (SICs) were tested in Brittany, France, to address the main soil threats identified above:

1. **Use of different cover crops (e.g., oats versus mixed cover crops, interseeding cover crops in maize)**
2. **Soil cultivation measures to reduce or eliminate tillage (e.g., early sowing of wheat)**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

Evidence gathered through desk research, interviews and a stakeholder workshop show that several factors affect SICs uptake. These include:

- Environmental conditions
- Lack of solidarity between farmers
- Changing policy objectives
- Top-down approaches to policy design and implementation
- Lack of a dedicated oil policy
- Insufficient policy enforcement and impact monitoring
- High transition costs
- Lack of targeted incentives
- Need for education and training

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THE CASE STUDY SITE

The French study site consists of two areas in Brittany, namely the Semnon catchment area and the Linon catchment area. Dairy farming is the main agricultural sector in both of these catchments, with many large companies farming in the area. Organic farming and alternative growing methods have been growing much for 10 years, driven by societal demand.

Annual climate hazards, due to climate change, are becoming stronger. This is a major problem for the cattle management, because food autonomy is threatened. Farms have to be more resilient to climate hazards. They are developing new approaches: innovative crops, new grass management methods.



Top: Cover crops (experiment 1)
Bottom: Early sowing of wheat (experiment 2)



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POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below indicates that SICs adoption is already promoted through a range of existing regulatory, economic, and voluntary policy instruments and measures in Brittany, France. The analysis shows that several policies regulate and incentivise the use of cover crops and reduced tillage, including the CAP GAEC standards, and the CAP Greening Payment Requirements. In addition, environmental and water policies establish cover crop and tillage management requirements for certain areas.

Red circles = SICs uptake promoted through existing mandatory, economic, or voluntary policy instruments in Brittany, France. Blue circles = SICs covered by the wider SoilCare project.

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-Compliance Standards		●	●	●	●	●			●	●	●
CAP Greening Payments	●	●									●
Rural Development Programme for Brittany	●		●				●	●			
Law for the Future of Agriculture, Food and Forests							●				
Investment Supports for Farms			●				●		●		
Environmental Code	●	●	●								
Rural and Marine Fishing Code	●	●	●	●	●	●	●	●	●		●
Law on Water and Aquatic Environments	●	●	●			●			●		
Nitrates Regulation		●	●			●			●		
Plan Ecophyto II	●		●				●	●			



POLICY RECOMMENDATIONS

Based on this analysis and feedback collected from stakeholders, the following recommendations were formulated:

CONSIDER DEVELOPING A DEDICATED SOIL POLICY



Despite the existence of policies incentivising and regulating the use of SICS in Brittany, their focus is not specifically soil related. While it is clear, both from the interviews and looking at the issues reported by grass-root organisations, that farmers are aware of soil threats in the region, the instruments in place may potentially reward behaviour which, while not detrimental to the environment, cannot be considered soil-improving. The development of a dedicated soil policy should therefore be considered. Such an intervention should be designed to accommodate farm diversity, featuring a robust monitoring and enforcement system.

REVISE THE EXISTING POLICY FRAMEWORK TO INCLUDE LONG-TERM TARGETS

Different priorities put forward by policies over time can create undesirable effects which are sometimes hard to remedy. An example from the region is the focus modernisation of farming in the last decades which led to practices that are today considered unsustainable. Policy design should incorporate the longer-term benefits and integrate a more holistic approach so that elements like soil which necessitate longer cycles can also be considered.

INVOLVE FARMERS IN POLICY-DESIGN AND IMPLEMENTATION

To ensure compliance with policy instruments, design appropriate measures, and foster innovation, farmers not only need to be better informed about policy instruments but should also be involved in their design and implementation, to the extent possible. This will be especially crucial for the national and regional implementation of EU policies, most importantly the post-2020 CAP which will give greater flexibility to Member States when designing their Strategic Plans. In this regard, one stakeholder at the adoption workshop suggested experimenting with new instruments or policy tools at a local or sub-regional scale first before analysing the impact of their adoption on national/regional level.



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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.

INTRODUCE MORE TARGETED FINANCIAL INCENTIVES

Incentives should be more targeted and tied to specific actions to result in the desired change. For example, a subsidy could be tied to the use of a specific crop rather than a target such as “reduce the amount of maize grown” as it is currently done by the RDP for Brittany.

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 ADVISE 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. There are examples of successful voluntary initiatives that are considered very effective in changing convictions and practices. Among those, farmers' groups are especially important. Such groups have a greater success of convincing farmers to adopt SICS for several reasons and can help demonstrate how to adapt practices and targets to specific geographic or other constraints, which may make SICS adoption more attractive to farmers in the region. These voluntary initiatives can be supported by direct education to provide a better understanding of the benefits of SICSs to farmers, especially targeting the older generation of farmers.





SoilCare

SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

**Policy analysis:
PROMOTING SICs
ADOPTION IN
AKERSHUS, EASTERN
NORWAY**

SOIL HEALTH RELATED PROBLEMS ON SITE



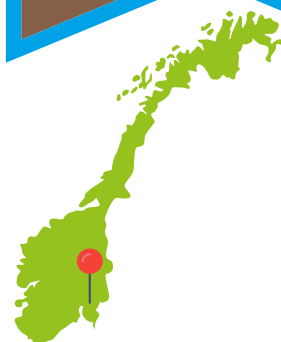
Compaction



Erosion



Nutrient loss



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH AT AKERSHUS

The following Soil-Improving Cropping systems (SICs) were tested in Akershus, Eastern Norway, to address the main soil threats identified above:

1. **Compaction alleviation through cover crops, including biological compaction release**
2. **Soil-improving crops (cover crops and catch crops)**
3. **Precision agriculture**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

Evidence gathered through desk research, interviews and a stakeholder workshop show that several factors affect SICs uptake. These include:

- Weak financial incentives
- Lack of explicit soil objectives in existing legislation/soil-specific legislation
- Low coherence between policies
- Land tenure
- Lack of knowledge sharing/dissemination
- Climate change impacts

COVER CROPS FOR COMPACTION ALLEVIATION AND TO IMPROVE SOIL QUALITY

Factors encouraging the adoption of cover crops:

- Longer growth season due to climate change impacts
- Farmers have already experienced damages caused by compaction
- Positive experiences with advisory services and farm visits
- Cover crops are already incentivised by the Regional Environmental Programme
- Access to the right information

Barriers preventing the adoption of cover crops:

- Costs associated with purchasing of seeds and financial risks
- Lack of information about the use of cover crops
- Design of subsidy schemes limiting use of certain types of seeds, methods and dates for sowing
- Lack of experience with using cover crops under Norwegian conditions

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The SoilCare project is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 677407.



POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS






The existing policy framework in Eastern Norway already promotes the SICS covered by the SoilCare project through a range of existing regulatory, economic, and voluntary policy instruments and measures. The analysis shows that several economic policies promote the use of cover crops, the SICS tested at the study site, a practice which is relevant to alleviating compaction, halting erosion, and generally improving soil health. The same instruments incentivise reduced tillage practices which also reduce compaction and erosion while smart residue and controlled traffic management, which could address the same soil threats, are not incentivised, or regulated by existing policies.

Blue circles= SICS identified as potentially beneficial to the main soil threats and subsequently tested in the study site; Red circles = Other SICS promoted through existing mandatory, economic, or voluntary policy instruments in the Eastern Norway

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
Regulations on subsidies for regional environmental measures in agriculture	●	●	●			●					
Regulation on water management framework (FOR-2006-12-15-1446 Forskrift om rammer for vannforvaltningen)		●	●				●				
Regulation on organic fertilisers (FOR-2003-07-04-951 Forskrift om gjødselvarer mv. av organisk opphav)		●	●								
Regulation on plant protection products (FOR-2015-05-06-455 Forskrift om plantevernmidler)		●					●				



Based on the results of this study, the following policy recommendations can be made:

REVISE THE EXISTING POLICY FRAMEWORK		AMBITIOUS, LONG TERM TARGETS
REWARD FARMERS FOR THE BENEFITS THEY DELIVER TO SOCIETY		MAKE ECONOMIC INSTRUMENTS MORE FLEXIBLE
MAINSTREAM SOIL OBJECTIVES AND GOOD SOIL MANAGEMENT PRACTICES IN EXISTING LEGISLATION		OTHER SECTORAL OR ENVIRONMENTAL POLICIES
ESTABLISH MECHANISMS FOR EFFECTIVE KNOWLEDGE DISSEMINATION AND EXCHANGE		AWARENESS RAISING EXCHANGE OF PRACTICES GUIDANCE
REWARD FARMERS FOR THE BENEFITS THEY DELIVER TO SOCIETY		MAKE ECONOMIC INSTRUMENTS MORE FLEXIBLE

Design a more flexible system of economic incentives: Voluntary financial incentives are the main driver for the adoption of agricultural practices beneficial to soil in Eastern Norway. There is a need to consider the different conditions in which farmers operate (such as differences in tenure) to ensure funding is accessible without creating additional administrative burden. Furthermore, incentives must be adapted to changing conditions such as inflation, so they do not lose their attractiveness over time.

Revise the existing policy framework to include ambitious, long-term targets: Certain policies, most notably economic policy instruments are successful in encouraging farmers to adopt SICS. To expand these positive outcomes, policies may be adapted to accommodate a wider range of farm types and to include more ambitious targets. In addition, experience shows that changes to the policy framework and subsidy schemes, such as the Regional Environmental Programme, could act as a barrier to implementation. Providing sustained funding and legislative security will be crucial in motivating farmers to adapt their practices.

REVISE THE EXISTING POLICY FRAMEWORK



AMBITIOUS, LONG TERM TARGETS

Revise the existing policy framework to include ambitious, long-term targets: Certain policies, most notably economic policy instruments are successful in encouraging farmers to adopt SICS. To expand these positive outcomes, policies may be adapted to accommodate a wider range of farm types and to include more ambitious targets. In addition, experience shows that changes to the policy framework and subsidy schemes, such as the Regional Environmental Programme, could act as a barrier to implementation. Providing sustained funding and legislative security will be crucial in motivating farmers to adapt their practices.

MAINSTREAM SOIL OBJECTIVES AND GOOD SOIL MANAGEMENT PRACTICES IN EXISTING LEGISLATION



OTHER SECTORAL OR ENVIRONMENTAL POLICIES

Mainstreaming of soil objectives and good soil management practices in existing legislation: Many benefits to soil health are achieved through other sectoral or environmental policies. While this is not considered a barrier to SICS adoption, there is a risk that key soil threats are not addressed if they do not fall under legislation for other sectors.

ESTABLISH MECHANISMS FOR EFFECTIVE KNOWLEDGE DISSEMINATION AND EXCHANGE



AWARENESS RAISING EXCHANGE OF PRACTICES GUIDANCE

Establish mechanisms for effective knowledge dissemination and exchange:

There is anecdotal evidence that awareness raising, exchange of practices, guidance from farm advisory services will have an influence in changing farmers' practices by increasing their awareness about the potential benefits of SICS. To this end, research findings should be made accessible and widely disseminated and educational activities should be encouraged. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits and demonstration days





SoilCare

SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

**Policy analysis:
PROMOTING SICs
ADOPTION IN LOW
MONDEGO VALLEY,
PORTUGAL**

SOIL HEALTH RELATED PROBLEMS ON SITE



Erosion



Pollution/
Contamination



Compaction



Low soil
organic matter
content



Acidification



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN CALDEIRAO, PORTUGAL

The following Soil-Improving Cropping systems (SICs) were tested in Caldeirao, Portugal to address the main soil threats identified above:

1. **Soil improving crops (organic rice in rotation with perennial lucerne and conventional grain corn in succession with legumes winter cover)**
2. **Integrated nutrient methods (conventional grain corn fertilised by urban sludge).**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

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 in Caldeirao, Portugal in particular. These include:

- Funding priorities
- Costs of adopting SICs
- Economic incentives mostly reward existing practices
- Lack of knowledge and technical support
- Policy instruments not flexible enough to take into account regional/structural differences
- Bureaucratic permitting procedures for sewage sludge application
- Unwillingness to give up traditional practices
- Limited influence of producer organisations
- Lack of monitoring and enforcement
- Market demands/pressures

SOIL IMPROVING CROPS AND ORGANIC AMENDMENTS

Factors encouraging the adoption of soil improving crops:

- Subsidies in place for rice cultivation
- Favourable climate and soil conditions
- New generation of farmers open and interested to try the organic rice in rotation with lucerne
- Technical support from cooperatives, open days (rice)
- Policy support for organic rice cultivation

Factors preventing the adoption of soil improving crops:

- Lack of subsidies
- Cost of seeds and access to them
- Lack of farmer interest and supportive networks
- Lack of training in green fertilisation
- Difficult to access relevant information
- No political incentives to adopt the green manure technique
- Mild climate
- High cost of installing lucerne

Factors preventing the adoption of organic amendment with sludge:

- Low cost for farmer
- Easy access to information

Barriers preventing the adoption of organic amendment with sludge:

- Lack of knowledge about the sludge application and need for a specific machinery
- Bad smell of sludge
- High bureaucracy (administrative permits for the sludge application)
- Specific rules for sludge application (crop type, soil type, quantities, application dates, waiting times before sowing)
- Lack of knowledge about the environmental benefits
- Bad reputation of sludge application amongst the public and farmers



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 Caldeirao, Portugal. The analysis shows that several policies regulate and incentivise the use of cover crops, crop rotations and integrated nutrient management, the SICS tested at the study site: direct payments, greening measures, and rural development plans under the CAP all provide financial rewards to farmers adopting crop rotation and cover crops. Nutrient input in agriculture is regulated through several pieces of legislation, mostly with a view to protecting water quality rather than soil, such as the national Water Law, regulations dealing with the sustainable use of pesticides, sewage sludge, and nitrates on agricultural land.

Blue circles= SICS tested in the study site; Red circles = Other SICS promoted through existing mandatory, economic, or voluntary policy instruments in Caldeirao, Portugal

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFIC MANAGEMENT	INTEGRATED LANDSCAPE MANAGEMENT
CAP - Complementary National Direct Payments Requirement (Greening included)	●	●				●					●
Cross compliance - Statutory Management Requirements (SMR) and standards of good agricultural and environmental condition (GAEC).	●	●				●				●	●
CAP - Rural Development Programme 2014 - 2020	●	●	●	●	●	●	●	●	●	●	●
National Water Law			●								
National Nitrates Directive - Law on the Protection of Water from Pollution Caused by the Use of Nitrates in Agriculture			●								
National Groundwater Law			●				●				
National legal framework for agricultural use of sewage sludge			●								
National sustainable Use of Pesticides Law							●				
National Action Program to Combat Desertification (PANCD)	●		●	●		●	●		●		



Based on the results of this study, the following policy recommendations can be made:

ESTABLISH MECHANISMS
FOR INFORMATION
SHARING BETWEEN
FARMERS



EFFECTIVE
KNOWLEDGE
DISSEMINATION
EXCHANGE OF PRACTICES

DESIGN TARGETED
INCENTIVES THAT
REWARD UPTAKE OF
APPROPRIATE
PRACTICES



PRIORITY GIVEN TO
CONSERVATION
FARMING TECHNIQUES

STRENGTHEN POLICY
ENFORCEMENT



MECHANISMS FOR
COMPLIANCE
CHECKING TO BE
STRENGTHENED AND
EXPANDED

SUBSIDISE TRANSITION TO
PRACTICES BENEFITING SOIL
HEALTH



REVISION OF
CERTIFICATION COSTS
LAND REPARCELING
NATIONAL SEED
MULTIPLICATION PROGRAM

SIMPLIFY PERMITTING
PROCEDURES FOR SEWAGE
SLUDGE APPLICATION



LESS BUREAUCRATIC
COMPLICATIONS FOR
FARMERS

INVEST IN AND BUILD
CAPACITY OF FARM
ADVISORY SERVICES



STRENGTHENING
TECHNICAL SKILL OF FAS
SETTING UP MECHANISM
FOR CONTINUOUS
LEARNING

COMMUNICATE
ENVIRONMENTAL BENEFITS
GENERATED BY SICS



PROSPECT OF A FAIR PRICE
EDUCATING CONSUMERS



ESTABLISH MECHANISMS FOR INFORMATION SHARING BETWEEN FARMERS



EFFECTIVE KNOWLEDGE DISSEMINATION EXCHANGE OF PRACTICES

Establish mechanisms for effective knowledge dissemination and exchange between farmers:

Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits (and risks) to change their misconceptions about these methods. To this end, research findings should be systematically compiled, and widely disseminated and educational activities should be encouraged. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits, demonstration days, and social media. Since farmers tend to place a lot of trust in their peers, establishing a network of model farms demonstrating how to use and adapt different SICS in the region would effectively support farmers in learning and sharing experiences about these practices

DESIGN TARGETED INCENTIVES THAT REWARD UPTSKE OF APPRIOPRIATE PRACTICES



PRIORITY GIVEN TO CONSERVATION FARMING TECHNIQUES

Design targeted incentives that reward uptake of appropriate practices:

As mentioned above, subsidies and other economic incentives play a large role in Portuguese agriculture, however, evidence suggests that financial measures might finance practices already in place or which are not appropriate in specific locations. At the same time, regional and local policies must be flexible enough to allow for regional differences. A financial measure on cover crops may well be appropriate in the south of the country, but less appropriate in the north. Financial incentives need to be more targeted, both tied to specific actions and region (or environmental/geographic conditions) to result in the desired change. Priority should be given to conservation farming techniques that are also able to be a source of food production that is both profitable and sustainable.

STRENGTHEN POLICY ENFORCEMENT



MECHANISMS FOR COMPLIANCE CHECKING TO BE STRENGTHENED AND EXPANDED

Strengthen policy enforcement:

While it was found that there are several policies already in place that – directly and indirectly - regulate and incentivise different SICS, stakeholders report that outcomes on soil health are limited due to weak implementation and enforcement mechanisms. It is clear mechanisms for checking compliance with existing regulations need to be strengthened and expanded. With the post-2020 CAP, new funding rules funding rules will be introduced. The Good Agricultural Environmental Conditions (GAECs) now offer a greater chance for soil protection. New conditions with the potential to improve soil health have been added, e.g., the new GAEC 7 requires “No bare soil in most sensitive period(s)”. Cover crops will be an important strategy for meeting this requirement. The payment agencies should seek to ensure that these conditions are complied with and verified through, e.g., more frequent inspections and farmer reporting (including for example images of the implemented practices).



SUBSIDISE TRANSITION
TO PRACTICES
BENEFITING SOIL
HEALTH



REVISION OF CERTIFICATION
COSTS
LAND REPARCELING
NATIONAL SEED
MULTIPLICATION PROGRAM

Subsidise transition to practices benefitting soil health:

The uptake of certain SICS might require upfront investments, such as the purchasing of seeds or new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers. A revision of certification costs might encourage a move to organic production, such as organic rice cultivation tested at the study site. Land reparacling and the establishment of a national national seed multiplication program were identified as actions which could facilitate a transition and reduce costs in the long run.

SIMPLIFY PERMITTING
PROCEDURES FOR
SEWAGE SLUDGE
APPLICATION



LESS BUREAUCRATIC
COMPLICATIONS FOR
FARMER

Simplification of permitting procedures for sewage sludge application:

A simplification of permitting and management plan approval process is necessary, as currently, many farmers prefer to avoid bureaucratic complications related to the use of sludge, even if it is free.

INVEST IN AND BUILD
CAPACITY OF FARM
ADVISORY SERVICES



STRENGTHENING
TECHNICAL SKILL OF FAS
SETTING UP
MECHANISM FOR
CONTINUOUS LEARNING

Invest in and build capacity of Farm Advisory Services:

Like framers, farm advisors also need to learn about new practices, their practical application, costs, and benefits to support farmers they assist. Strengthening the technical skills of farm advisory services and setting up mechanisms for continuous learning are therefore crucial.

COMMUNICATE
ENVIRONMENTAL
BENEFITS GENERATED
BY SICS



PROSPECT OF A
FAIR PRICE
EDUCATING
CONSUMERS

Communicate environmental benefits generated by SICS:

High-quality products need to be sold at fair process which compensate farmers for the benefits they generate for the environment and society as a whole. The prospect of a fair price for a product stemming from sustainable practices will make their uptake more appealing to farmers. It will be equally important to continue to educate consumers about the advantages and disadvantages of conventional farming practices vs. sustainable practices to ensure increased demand for sustainably produced products and encourage the retail sector to make these more widely available to all sections of society. To this end, cooperatives or producer associations play a major role in marketing these products, explaining production methods – especially important for practices such as sewage sludge application which might perceived as a high-risk technique – and negotiating prices with retailers.



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The SoilCare project is funded by the European Union's
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SOIL HEALTH RELATED PROBLEMS ON SITE



SOIL COMPACTION

SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN SKANE COUNTY, SWEDEN

The main soil threat in the region where the study site is located is soil compaction. SICS that are being tested within the context of the SoilCare project include sub-soil loosening which is composed of two treatments:

1. **Subsoil loosening and subsoil loosening combined with the injection of organic material (straw pellets).**
2. **Several long-term experiments (LTE) with various crop rotation, use of animal manure, no removal of crop residues in non-manured plots, and regular lime applications.**

The SICS above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICS.



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Policy analysis: PROMOTING SICS ADOPTION IN SKANE COUNTY, SWEDEN

FACTORS AFFECTING THE UPTAKE OF SICS

Research indicates that there are several factors that shape the success or failure of policy instruments in Southern Sweden, and the uptake of SICS tested in the sites in general. These factors include:

Farmers' perception of new innovative techniques:

One of the SICS trialled at the study site was subsoil loosening, tested on its own and in combination with the injection of organic material (straw pellets). Subsoil loosening takes place to a depth of about 50 cm with the added organic treatments. This means that some of the subsoil is brought up to the arable layer, while some arable soil is mixed into the subsoil. Many farmers consulted pointed out that this technique was not always well perceived since, traditionally, farmers would not plough so deeply and mixing subsoil with topsoil was an uncommon practice.

Inflexible subsidy system

Several farmers consulted during the study agreed that economic aspects were the main drivers for adopting or changing practices and noted that the existing subsidy system was not adaptive enough. For instance, the Swedish Board of Agriculture is only providing subsidies for a restricted number of cover crop species which are not necessarily the most appropriate for the area and main crops used at a specific farm.

Lack of compensation for all soil benefits delivered

Stakeholders highlighted that not all the soil (or environmental) benefits delivered by SICS were rewarded by the current payment system. The sequestration of carbon in the soil through cover crops, for example, is currently not supported.

Well functioning but limited advisory services

Farmers pointed out the good relationships and level of cooperation they have with Swedish farm extension services. At the same time, it was noted that their knowledge of different SICS might be limited. Cover crops were cited as a topic where farmers were seeking expertise and advice from Denmark which was considered to have the most advanced knowledge in this area.

POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below provides an overview of the extent to which policies promote the full range of SICS covered by the SoilCare project (blue dots). The analysis shows that several policies regulate, incentivise and encourage the use of cover crop, crop rotation, integrated nutrient and pest management practices as well as reduced tillage management. The SICS tested at the study site (red dots) are subsidised through the different CAP instruments, primarily the greening measures which provide financial rewards to farmers adopting reduced tillage practices, crop rotations and catch crops. In addition, several national policies and initiatives regulate and promote the application of integrated nutrient measures and crop rotation. There are no policy instruments that would explicitly encourage, regulate, or incentivise smart residue management practices.

Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Skåne County, Sweden. Blue circles = SICS uptake promoted as part of the wider SoilCare project.

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance standards	●	●				●					
CAP greening payment requirements	●	●	●			●					
Rural Development Programme 2014-2020			●								
Focus on Nutrients Initiative	●		●								
Environmental Quality Objectives			●								
National Action Plan for the Sustainable use of Pesticides 2013-2017							●				



Based on the results of this study, the following policy recommendations can be made:

SET UP A MORE FLEXIBLE SUBSIDY SYSTEM



REVIEW AND BROADEN THE ENVIRONMENTAL BENEFITS ELIGIBLE FOR PAYMENTS

Set up a more flexible subsidy system: Payments for farmers should cover the use of a larger group of cover crops and taking into account local conditions. Currently, the system only provides subsidies for a restricted number of cover crop species which are not necessarily the most appropriate for the area and individual farms.

Review and broaden the practices and associated environmental benefits eligible for payments: In 2015, the Environmental Quality Objectives report emphasised that payments under the CAP should provide more targeted support and higher levels of compensation for farmers who deliver greater environmental benefits. The proposed post-2020 CAP, and most notably the Strategic Plans which Member States will need to draft, provide greater flexibility to define the requirements farmers will need to meet in order to receive CAP funding. This opens up opportunities to review and broaden the practices and environmental benefits farmers will need to deliver in order to receive payments. Cropping systems which produce important benefits such as sequestering carbon and which are currently not covered by subsidies, could be added to the measures available to farmers applying for CAP payments.

ESTABLISH MECHANISMS FOR EFFECTIVE KNOWLEDGE DISSEMINATION AND EXCHANGE BETWEEN FARMERS



INVEST IN AND BUILD CAPACITY OF FARM ADVISORY SERVICES

Establish mechanisms for effective knowledge dissemination and exchange between farmers: some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits to change their misconceptions about these methods; for example, in this Swedish study site where a new “non traditional” sub-soiling technique was tested. Since farmers tend to place a lot of trust in their peers, establishing a network of model farms demonstrating how to use and adapt different SICS in the region would effectively support farmers in learning and sharing experiences about these practices. These activities could be linked to already existing courses organised by the region to provide training to farmers on sustainable agricultural practices.

Invest in and build capacity of Farm Advisory Services: like farmers, farm advisors also need to learn about new practices, their practical application, costs, and benefits to support farmers they assist. Strengthening the technical skills of farm advisory services and setting up mechanisms for continuous learning are, therefore, crucial.

UPDATE SUMMARY PAPERS EXPLAINING AND PRESENTING DATA AS WELL AS CONCLUSIONS FROM THE SWEDISH LONG-TERM FIELD EXPERIMENTS

Findings from the Swedish long-term field experiments should be made accessible and widely disseminated, both to farmers and advisory service workers as these results demonstrate the benefits of SICS and their applicability in the region.



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SOIL HEALTH RELATED PROBLEMS ON SITE



Compaction



Water
scarcity



High salt
content



Excessive
nutrient input



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN ALMERIA, SPAIN

The following soil-improving cropping systems (SICS) were tested in Almería, Spain, to address the main soil threats identified above:

1. Cover crops
2. Reduced tillage
3. Efficient irrigation management

In addition, there are several long-term experiments testing various tillage methods (conventional, reduced and no tillage), fertiliser applications, crop rotation systems (including legumes and other soil improving crops), as well as residue management methods (post-harvest residues left on the fields for nutrients and organic matter recovery).

The SICS above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICS.

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 in Almería, Spain in particular. These include:

- Applying for payments is too bureaucratic
- Lack of enforcement
- Trust in long-established practices
- Costs of transitioning to new practices
- Environmental conditions

COVER CROPS FOR COMPACTION ALLEVIATION AND TO IMPROVE SOIL QUALITY

Factors encouraging (+) or hindering (-) the adoption of controlled deficit irrigation and mulch cover with pruning remains and vegetable coverings sown

- Maladapted policy setup (-)
- Farmers' resistance to new practices (-)
- Lack of awareness and information (-)
- Lack of access to technology and machinery (-)
- Lack of enforcement and monitoring (-)
- Water scarcity (-)
- Operational costs (-)
- Size of exploitation (-)

Factors encouraging (+) or hindering (-) the adoption of controlled deficit irrigation and vegetative cover of adventitious herbs/plant cover planted:

- High provision of inputs (+)
- Dissemination of efficiency potential as wind erosion control (+)
- Access to technology/machinery (+)
- Possibility of management agreements (+)
- Lack of enforcement and monitoring (-)
- Farmers' resistance to new practices (-)
- Plant cover selection (-)
- Lack of training for farmers (-)

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POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS




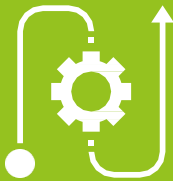
SICS adoption is already promoted through a range of existing regulatory, economic, and voluntary policy instruments and measures in Almeria, Spain. The analysis shows that that several policies regulate and incentivise the use of cover crops, reduced tillage, and integrated nutrient management, the SICS tested at the study site: direct payments, greening measures, and rural development plans under the CAP all provide financial rewards to farmers adopting reduced or no-tillage practices and cover crops (in the form of nitrogen-fixing crops) but only on certain types of land. Integrated nutrient management practices are regulated mostly through water protection legislation. In addition, policies implementing the EU Organic Regulation formulate mandatory requirements for fertiliser use and tillage practices. Most of the policies identified as relevant do not regulate or incentivise efficient irrigation practices with the exception of the National Action Programme to Combat Desertification, which, however, mainly focuses on promoting good soil management practices through information sharing and demonstration projects.


Blue circles= SICS tested in the study site; Red circles = Other SICS promoted through existing mandatory, economic, or voluntary policy instruments in Almeria, Spain

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC cross-compliance standards and greening payments	●	●				●					●
CAP Greening requirements	●	●				●					
CAP Rural Development Program of Andalucía 2014-2020	●					●					
Royal Decree on agro-ecological production and its indication in agricultural products and foodstuffs	●		●			●	●				
Decree on organic agro-food production in Andalusia	●		●			●	●				
III Andalusian Plan of Ecological Production Horizon 2020	●	●	●	●	●	●	●	●	●	●	●
Law on fiscal, administrative and social measures			●	●	●		●				●
Law on Waters for Andalusia			●	●	●		●				●
Royal Decree amending Annex II of Royal Decree 1514/2009 of 2 October, which regulates the protection of groundwater			●				●				
Royal Decree protecting waters from the pollution by nitrates derived of agricultural sources	●		●								
Order approving the action program applicable in areas vulnerable to nitrate pollution from designated agricultural sources in Andalusia	●		●								
Decree on the Use of Sewage Sludge in the Agricultural Sector			●								
Decree approving the Waste Regulations of Andalusia			●								
Royal Decree establishing the framework of action to achieve a sustainable use of phytosanitary products							●		●		
Decree on the prevention and control of pests, the sustainable use of plant protection products, the inspection of equipment for its application and the creation of a census of equipment for the application of phytosanitary products							●		●		
Royal Decree modifying the Royal Decree 506/2013, of June 28, on fertilizer products			●								
National Action Programme to Combat Desertification	●	●	●	●	●	●	●	●	●	●	●



Based on the results of this study, the following policy recommendations can be made:

ESTABLISH MECHANISMS FOR EFFECTIVE KNOWLEDGE DISSEMINATION AND EXCHANGE		AWARENESS RAISING EXCHANGE OF PRACTICES GUIDANCE
SUBSIDISE TRANSITION TO PRACTICES BENEFITING SOIL HEALTH		SETTING UP A SYSTEM FOR GRANTS DISTRIBUTION
STRENGTHEN POLICY ENFORCEMENT		STRENGTHENING AND EXPANDING COMPLIANCE CHECKING MECHANISMS
MAKE INCENTIVES MORE EFFECTIVE BY SIMPLIFYING APPLICATION PROCESS		SIMPLIFYING PROCEDURES FOR FARMERS

ESTABLISH MECHANISMS FOR EFFECTIVE KNOWLEDGE DISSEMINATION AND EXCHANGE		AWARENESS RAISING EXCHANGE OF PRACTICES GUIDANCE
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Establish mechanisms for effective knowledge dissemination and exchange between farmers:

Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits in order to change their misconceptions about these methods. To this end, research findings should be made accessible and widely disseminated and educational activities should be encouraged. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits and demonstration days. Since farmers tend to place a lot of trust in their peers, establishing a network of model farms, for example under the umbrella of the National Action Programme to Combat Desertification, demonstrating how to use and adapt different SICS in the region would effectively support farmers in learning and sharing experiences about these practices.

SUBSIDISE TRANSITION TO PRACTICES BENEFITING SOIL HEALTH



SETTING UP A SYSTEM FOR GRANTS DISTRIBUTION

Subsidise transition to practices benefitting soil health:

The uptake of certain SICS, such as cover cropping, enhanced efficiency irrigation and reduced tillage, might require upfront investments, such as the purchasing of additional seeds and new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a 'machinery exchange'. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.

STRENGTHEN POLICY ENFORCEMENT

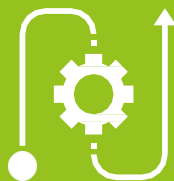


STRENGTHENING AND EXPANDING COMPLIANCE CHECKING MECHANISMS

Strengthen policy enforcement:

While it was found that there are a number of policies already in place that – directly and indirectly - regulate and incentivise different SICS, stakeholders report that outcomes on soil health are limited due to weak enforcement mechanisms. It is clear mechanisms for checking compliance with existing regulations need to be strengthened and expanded.

MAKE INCENTIVES MORE EFFECTIVE BY SIMPLIFYING APPLICATION PROCESS



SIMPLIFYING PROCEDURES FOR FARMERS

Introduce better designed economic incentives to counter costs associated with SICS:

Evidence suggest that economic incentives might not be a key driver for SICS adoption with the current system perceived to be overly bureaucratic by farmers. With the post-2020 CAP, new funding rules funding rules will be introduced. The Good Agricultural Environmental Conditions (GAECs) now offer a greater chance for soil protection. New conditions with the potential to improve soil health have been added, e.g., the new GAEC 7 requires "No bare soil in most sensitive period(s)" (European Commission, 2018b). Cover crops will be an important strategy for meeting this requirement. The payment agencies should seek to simplify procedures for farmers applying for CAP payments in order not to deter farmers from adopting SICS.





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SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

Policy analysis:
PROMOTING SICs
ADOPTION IN CRETE,
GREECE

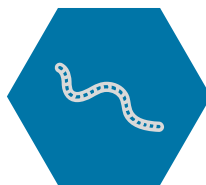
SOIL HEALTH RELATED PROBLEMS ON SITE



Crop
productivity



Low soil
organic matter



Low soil
biodiversity



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN CRETE, GREECE

The main soil threats in Greece include the imminent threat of desertification, characterised by loss of vegetation, water erosion, and subsequently loss of soil (erosion). SICs that are being tested at the study site are thought to address these soil threats and include:

1. **The introduction of soil-improving crops (Conversion from orange orchard to avocado; cover crops in organic vineyards)**
2. **Different soil cultivation measures (No till and conventional tilling in organic and conventional olive orchards).**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

Research indicates that several factors shape the success or failure of policy instruments in Crete, and the uptake of SICs tested in the study site region. These factors include:

- Weak policy coherence
- Ineffective implementation and enforcement of existing policies
- Higher costs of SICs implementation/transition costs
- Availability of conditional payments
- Reluctance to abandon traditional practices in favour of new methods
- Need for better information sharing and training opportunities

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CONVERSION FROM ORANGE ORCHARDS TO AVOCADOS

Factors influencing conversion from oranges to avocados:

- Favourable climate
- High cost of implementation associated with the purchase of avocado trees
- Policy set-up, lack of incentives
- Lack of knowledge about new/alternative crop varieties and methods

INCLUDING COVER CROPS IN ORGANIC VINEYARDS

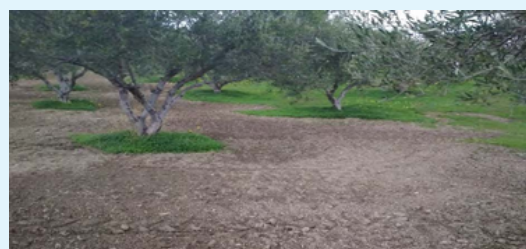
Factors influencing the inclusion of cover crops in organic vineyards:

- Resistance to change (farmers' mentalities)
- Lack of awareness about the long-term benefits

TILLAGE/NO TILLAGE IN OLIVE GROVES

Factors influencing making changes to tillage practices within olive groves:

- Geomorphological conditions (steep slopes, stones, and rocks)
- Lack of awareness and insufficient knowledge



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POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The analysis shows that several policies regulate and incentivise the use of cover crops, and reduced tillage, the SICS tested at the study site: direct payments, greening measures, and rural development plans under the CAP all provide financial rewards to farmers adopting reduced or no-tillage practices and cover crops (in the form of nitrogen-fixing crops) but only on certain types of land. In addition, policies implementing the EU Organic Regulation formulate requirements for tillage practices. The Nitrates Directive and the National Action Plan for Combating Desertification promotes the tested practices by explicitly referencing them as good agricultural practices to be adopted in specific areas. None of the policies identified as relevant do regulate or incentivise the uptake of soil-improving crops.

Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Crete, Greece. Blue circles = SICS uptake promoted as part of the wider SoilCare project.

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance standards		●		●		●			●		
CAP greening payment requirements	●	●									●
CAP Rural Development Programme 2014-2020	●	●		●		●					
Regulation on organic production and labelling of organic products	●		●			●	●				
Protection of waters against pollution caused by nitrates from agricultural sources	●	●	●			●					●
Pesticides Control Legislation							●				
Fertiliser regulation			●								
National Action Plan for Combating Desertification	●	●		●		●					



POLICY RECOMMENDATIONS

Based on the results of this study, the following policy recommendations can be made:

INCREASE POLICY COHERENCE



STRENGTHEN POLICY ENFORCEMENT

Increase policy coherence: policy conflicts and synergies 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.

Strengthen policy enforcement: While it was found that there are several policies already in place that – directly and indirectly - regulate and incentivise different SICS, stakeholders report that outcomes on soil health are limited due to weak implementation and enforcement mechanisms. It is clear mechanisms for checking compliance with existing regulations need to be strengthened and expanded. With the post-2020 CAP, new funding rules will be introduced. The Good Agricultural Environmental Conditions (GAECs) now offer a greater chance for soil protection. New conditions with the potential to improve soil health have been added, e.g., the new GAEC 7 requires “No bare soil in most sensitive period(s)”. Cover crops will be an important strategy for meeting this requirement. The payment agencies should seek to ensure that these conditions are complied with and verified through, e.g., more frequent inspections and farmer reporting (including for example images of the implemented practices).

SUBSIDISE TRANSITION TO PRACTICES BENEFITTING SOIL HEALTH



INTRODUCE MORE TARGETED FINANCIAL INCENTIVES

Subsidise transition to practices benefitting soil health: The uptake of certain SICS, such as cover cropping, and reduced tillage, might require upfront investments, such as the purchasing of additional seeds and new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a ‘machinery exchange’. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.

Introduce more targeted financial incentives: incentives should be more targeted and tied to specific actions to result in the desired change. For example, a subsidy could be tied to the use of a specific crop or crop change.



ESTABLISH MECHANISMS FOR EFFECTIVE KNOWLEDGE DISSEMINATION AND EXCHANGE BETWEEN FARMERS



INVEST IN AND BUILD THE CAPACITY OF FARM ADVISORY SERVICES

Establish mechanisms for effective knowledge dissemination and exchange between farmers:

Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits to change their misconceptions about these methods. To this end, research findings should be made accessible and widely disseminated and educational activities should be encouraged. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits and demonstration days. Workshops, encouraging peer to peer learning, and long-term experiments that will show the benefits of SICS are promising initiatives that can be supported.

Invest in and build capacity of Farm Advisory Services: like farmers, farm advisors also need to learn about new practices, their practical application, costs, and benefits to support farmers they assist. Strengthening the technical skills of farm advisory services and setting up mechanisms for continuous learning are therefore crucial.





SoilCare
SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

Policy analysis:
PROMOTING SICs
ADOPTION IN
POLAND

SOIL THREATS IN PODLASIE, POLAND



Compaction



Soil organic
matter
decline



Erosion



Acidification



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN POLAND

Experiments were carried out in the study site in Szaniawy, Podlasie, to explore the impacts of the following on soil health:

1. Integrated nutrient management and cover crops (Lupines, Serradella, Phacelia)
2. Fertilisation and amendments (liming, manure)

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

THE STUDY SITE: SZANIAWY, POLAND

Climate: Continental, average air temperature = 7.3°C

Soil types: Sandy and loamy

Main soil threats: Highly acidic soils, low soil organic matter levels, water deficits during growing season, inadequate use of legumes for increasing Nitrogen fixation thus reducing fertiliser requirements

Current practices: Conventional farming, tillage, some crop rotations, mineral fertiliser and manure applications, rain-fed crops. Crop protection includes trapping, weeding and selective spraying of pesticides.

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INTEGRATED NUTRIENT MANAGEMENT AND COVER CROPS EXPERIMENT

Barriers preventing the adoption of cover crops, liming, and manure:

- Limited policy coherence
- Unfavourable environmental conditions
- The use of harvest residues for biogas production competing for the use in agriculture
- Low level of knowledge surrounding SICs amongst farmers
- Weak cooperation between advisory services and universities when promoting SICs adoption
- High price for conservation tillage adoption
- Limited access to organic fertilisers due to the separation of arable and livestock farming

INVESTIGATING THE EFFICACY OF POLICIES RELATING TO SOIL IMPROVING CROPPING SYSTEMS

A desk study, interviews, and workshops were carried out in Poland (Szaniawy, Podlasie) with national and regional policymakers and stakeholders. The purpose of these methods were to:

1. **Formulate policy alternatives and actions at the EU and study site level to facilitate the adoption of soil-improving cropping systems (SICs).**
2. **Assess the extent to which existing policies, instruments and practices promote the adoption of SICs**
3. **Identify contextual factors including institutional settings which influence farmer adoption of policies**
4. **Identify existing policies, alternatives, and actions which may promote SICs uptake**
5. **To assess the performance of policy alternatives.**



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The SoilCare project is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 677407.



POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below indicates that SICS adoption is already promoted through a range of existing regulatory, economic, and voluntary policy instruments and measures in Poland. The analysis shows that several policies address the SICS that were tested in the study site: the incorporation of cover crops into arable rotations is incentivised under the CAP's cross-compliance standards and the CAP greening payments. Integrated nutrient management is also supported under several policy instruments, including CAP greening payments, the Act on Organic Agriculture, and the Fertiliser Act to name a few.

Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Podlasie, Poland.

Blue circles = SICS tested elsewhere within the SoilCare project

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance Standards	●	●				●					●
CAP Greening Payment Requirements	●	●	●			●					●
CAP Rural Development Programme 2014-2020	●	●				●					
Code of Good Agricultural Practice	●		●			●	●				
Act on Organic Agriculture	●		●			●					●
Environmental Protection Act			●				●				
Act on Water			●				●				
Waste Act			●				●				
Plant Protection Products Act							●	●			
Fertilisers Act			●								
Nature Conservation Act			●				●				



Based on the results of this study, the following actions will increase the ability of farmers to adopt SICs:

BARRIER: LIMITED POLICY COHERENCE



SOLUTION: REMOVAL OF UNDUE ADMINISTRATIVE BURDENS

Action: Improve the current policy, institutional, administrative, technical and economic set up to enable organic agriculture to develop and enable farmers to adopt new practices easily with minimal administrative burdens

BARRIER: LACK OF ECONOMIC BENEFITS/INCENTIVES AND HIGH COST OF CONSERVATION TILLAGE IMPLEMENTATION



SOLUTION: SUBSIDISE TRANSITIONS TO SICs PRACTICES

Action: Subsidise transition to practices which benefit soil health. The uptake of certain SICs, such as cover cropping, might require upfront investments, such as the purchasing of additional seeds and new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a 'machinery exchange'. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.

BARRIER: LOW KNOWLEDGE LEVELS SURROUNDING SICs



SOLUTION: MORE TRAINING AND EDUCATION

Action: Offer more awareness-raising training and educational activities to educate farmers about SICs and their benefits including to organic agriculture. Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits to change their misconceptions about these methods. Research findings should be made accessible and widely disseminated. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits and demonstration days.

BARRIER: WEAK COOPERATION BETWEEN ADVISORY SERVICES AND UNIVERSITIES



SOLUTION: STRENGTHEN COOPERATION

Action: Strengthen the cooperation between advisory services and universities to promote soil quality problems and support SICs adoption.

BARRIER: DIFFICULTIES WHEN MEETING ORGANIC PRODUCTION STANDARDS



SOLUTION: IMPROVED SET-UP IS NEEDED

Action: Improve the current policy, institutional, administrative, technical and economic set up to enable organic agriculture to develop.





SoilCare

SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

Policy analysis:
PROMOTING SICs
ADOPTION IN
DRAGANESTI VLASCA,
ROMANIA

SOIL HEALTH RELATED PROBLEMS ON SITE



Soil
compaction



Temporary
water deficit



Soil
erosion



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN DRAGANESTI VLASCA, ROMANIA

Soil quality at the Draganesti Vlasca study site is affected by compaction, temporary water deficit and excess as well as erosion. The soils in the area are naturally susceptible to compaction and water excess and/or deficit due to their high clay content. The Soil-improving cropping system (SICS) tested at the study site and which is thought to address these soil threats includes reduced tillage measures which therefore represent important practices that might benefit soil health in the region if widely taken up.



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FACTORS AFFECTING THE UPTAKE OF SICS

Evidence gathered through interviews, desk research and stakeholder workshops shows 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.

The key factors shaping the success of policy instruments include:

Outdated legislation

It is necessary to revise the Code of Good Agricultural Practices for water protection against nitrates pollution from agricultural sources to accurately reflect more the current situation.

Lack of dedicated soil policy

While such a law is not required under EU legislation, it would be an opportunity to promote and incentivise sustainable soil management practices more consistently across the country.

Exploitation of policy synergies

Several examples of synergies between different policies were identified. This should be highlighted as a good practice and an example of how legislation can be clear and help enable the adoption of SICS.

Availability of financial incentives

CAP was identified as having the biggest impact on farmers' agricultural practices in the studied site area.

Educated and innovative young farmers

It was noted that young farmers who are educated in the field of agriculture are more open to adopting new soil improving cropping systems than the older generation of farmers.

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POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below provides an overview of policies regulation, incentivising, and promoting the full range of SICS covered by the SoilCare project (blue dots) as well as the SICS tested at the study site (red dots): reduced tillage. The Code of Good Agricultural Practice established in compliance with the EU Nitrates Directive lists reduced tillage as good practice to be adopted by farmers. However, the Code is not mandatory to farmers outside of Nitrate Vulnerable Zones. In addition, reduced tillage practices are incentivised through the RDP. Crop rotation is promoted through water (and soil) protection policies such as the Action Plan for the Protection of Waters Against Pollution Caused by Nitrates, the CAP's greening measures, GAEC cross-compliance standards and the RDP. The RDP, specifically through its agri-environment and climate measures incentivises the use of nitrogen-fixing cover crops to reduce nutrients run-off and leaching, increase organic matter content and soil nutrients. Integrated nutrient management is not only incentivised through the CAP (GAEC 6), but there are also several water and environmental policies, including the Water Act, the Nitrates Action Plan, and the Groundwater Protection Plan, limiting or banning the use of fertilisers in certain areas.

Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Romania. Blue circles = SICS uptake promoted as part of the wider SoilCare project.

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance standards	●	●									●
National program for Rural Development 2014-2020	●	●	●			●					●
Ordinance on organic products no. 34/2000 modified by Ordinance no. 29/2014	●		●			●	●				
Water Law no. 107/1996 modified and improved in 2017			●				●				●

Table continued on page 3.



Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Romania. Blue circles = SICS uptake promoted as part of the wider SoilCare project.

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
Ordinance no. 990/1809/2015 related to approval of Code of Good Agricultural Practices for water protection against nitrates pollution from agricultural sources	●	●	●			●					●
National Plan for Groundwater Protection Against Pollution and Deterioration (2009)			●				●				●
Order for the approval of the Technical Norms regarding the protection of the environment and especially of the soils, when the sewage sludges are used in agriculture, with the subsequent modifications			●								
Ordinance no. 34/2012 for establishing the institutional framework for sustainable use of pesticides in Romania							●				
Decision no. 683/2013 for approving the National Action Plan on reducing the risks of using pesticides							●				
Ordinance no.12/2006 on establishing the maximum levels of pesticides							●				
Ordinance no. 1261/2007 on fertilisers			●								
Ordinance no. 756/1997 on Environmental Pollution Assessment			●				●				



POLICY RECOMMENDATIONS

Based on the results of this study, the following policy recommendations can be made:

UPDATE EXISTING POLICY INSTRUMENTS



MAINSTREAM EXISTING LEGISLATION

Update existing policy instruments: Some key policy instruments, such as the National Nitrates Action Plan, seem to be outdated. These need to be revised to reflect current needs, objectives and taking into account new insights on agricultural practices which should be promoted to meet policy objectives.

Mainstreaming of soil objectives and good soil management practices in existing legislation: Many benefits to soil health are achieved through other sectoral or environmental policies. While this is not considered a barrier to SICS adoption, there is a risk that key soil threats are not addressed if they do not fall under legislation for other sectors. The development of a dedicated soil policy should be considered. Such an intervention should be designed to accommodate farm diversity, featuring a robust monitoring and enforcement system.

EDUCATION AND TRAINING

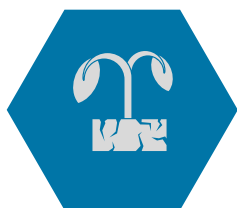


Younger farmers seem to be willing to take up new practices. It could be considered as to whether older generations can also be targeted to bring about change faster. Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits in order to change their misconceptions about these methods. To this end, research findings should be made accessible and widely disseminated and educational activities should be encouraged. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits and demonstration days.





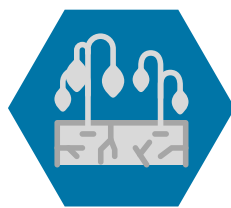
SOIL HEALTH RELATED PROBLEMS ON SITE



Erosion



Nitrate pollution



Soil fauna at risk



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN BADEN - WÜRTTEMBERG

The following Soil-Improving Cropping systems (SICs) were tested in Baden-Württemberg, Germany, to address the main soil threats identified above:

1. **Cover crops**
2. **Reduced/no tillage**
3. **Glyphosate-free management of conservation agriculture**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

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 in Baden-Württemberg, Germany in particular. These include:

- Lack of adequate financial incentive
- Influence of and information sharing within farmer communities and networks
- Strength and consistency of the regulatory framework

COVER CROPS FOR COMPACTION ALLEVIATION AND TO IMPROVE SOIL QUALITY

Factors encouraging the adoption of cover crops:

- Reduced need for fertilisers
- Biodiversity enhancement

Barriers preventing the adoption of cover crops:

- Insufficient knowledge of farmers
- Cost of seeds
- Crop rotation management is complicated (i.e. establishment and timing of tillage must be precisely matched)

Factors encouraging the adoption of reduced tillage:

- Reduced fuel consumption, reduced workload
- Heavy soils can be cultivated
- Decreased erosion
- Societal demand for sustainable products
- Field demonstrations

Barriers preventing the adoption of reduced tillage:

- Possibly lower yields, increased need for pesticides/new machines
- Crop rotation management is complicated
- Application of practice on stony soils
- "It looks wild"; pest management not possible without chemical plant protection
- Impact of market forces, particularly on glyphosate debate
- Promotion of organic farming with derogations from the ploughing ban

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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 Baden-Württemberg, Germany. The analysis shows that several policies regulate and incentivise the use of cover crops and reduced tillage, the SICS tested at the study site: direct payments, greening measures, and rural development plans under the CAP all provide financial rewards to farmers adopting reduced or no-tillage practices. In addition, several national pieces of legislation, such as the Erosion Protection Ordinance establish tillage management requirements for certain areas. Many of these policies also incentivise the use of cover crops by farmers

Blue circles= SICS tested in the study site; Red circles = Other SICS promoted through existing mandatory, economic, or voluntary policy instruments in Baden-Württemberg, Germany

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
National policies											
Organic Farming Act	●	●	●			●	●				
Fertiliser Act and Ordinance on good fertilising practices		●	●				●				
National Action Plan on the Sustainable Use of Pesticides							●				
Plant Protection Act							●				
Sewage Sludge Ordinance			●								
Regional policies											
Rural Development Programme for Baden-Wuerttemberg 2014-2020	●	●	●	●	●	●	●	●	●	●	●
Ordinance on the Implementation of the Common Agricultural Policy 2014-2020	●	●	●		●		●				●
Act on Nature Protection, Landscape Management and Recreation Baden-Württemberg	●			●		●					●
Water Act Baden-Württemberg			●	●	●						
Management plan sub-catchment 41 - Neckar below Starzel and above Fils (RBD Rhine, Neckar catchment, Baden-Wuerttemberg)			●	●	●	●	●				●
Funding Program for Agronomic Environment, Climate Protection and Animal Welfare	●	●	●	●	●	●	●	●	●	●	●
Compensation for agriculture in disadvantaged location	●	●	●	●	●	●	●	●	●	●	●
Ordinance on safeguards and compensation in water and spring protection zones	●		●			●	●				
Soil Protection Act Baden-Wuerttemberg)	●	●	●		●	●	●				●
Erosion Protection Ordinance Baden-Wuerttemberg						●					



Based on the results of this study, the following policy recommendations can be made:

ESTABLISH MECHANISMS FOR INFORMATION SHARING BETWEEN FARMERS		AWARENESS RAISING EXCHANGE OF PRACTICES GUIDANCE
SUBSIDISE TRANSITION TO PRACTICES BENEFITING SOIL HEALTH		SETTING UP A SYSTEM FOR GRANTS DISTRIBUTION
MAKE SOIL HEALTH A STRONGER COMPONENT OF VOCATIONAL TRAINING AND CONTINUED EDUCATION OF FARMERS		SOIL TO BE HIGHLY FEATURED ON THE CURRICULUM FOR FARMERS TRAINING
REWARD ENVIRONMENTAL BENEFITS GENERATED BY SICs AND TALK ABOUT IT		MARKET FORCES TO BE COUNTERWEIGHTED BY SUBSIDIES
DESIGN MORE COHESIVE POLICIES AND EFFECTIVE ENFORCEMENT MECHANISMS		EFFECTIVE AND CONSISTENT MONITORING OF IMPLEMENTATION SYNERGY BETWEEN POLICIES

ESTABLISH MECHANISMS FOR INFORMATION SHARING BETWEEN THE FARMERS		AWARENESS RAISING EXCHANGE OF PRACTICES GUIDANCE
--	---	--

Establish mechanisms for information sharing between farmers:

Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits. Since farmers tend to place a lot of trust in their peers, establishing a network of model farms demonstrating how to use and adapt different SICs in the region would effectively support farmers in learning and sharing experiences about these practices.



SUBSIDISE TRANSITION TO PRACTICES BENEFITING SOIL HEALTH



SETTING UP A SYSTEM FOR GRANTS DISTRIBUTION

Subsidise transition to practices benefitting soil health:

The uptake of certain SICS might require upfront investments, such as the purchasing of new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a 'machinery exchange'. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.

MAKE SOIL HEALTH A STRONGER COMPONENT OF VOCATIONAL TRAINING AND CONTINUED EDUCATION OF FARMERS



SOIL TO BE HIGHLY FEATURED ON THE CURRICULUM FOR FARMERS TRAINING

Make soil health a stronger component of vocational training and continued education of farmers:

The move from conventional practices to SICS and sustainable agricultural practices requires a shift in attitudes as well as knowledge. Soil, as the main medium on which food and feed are grown, should feature highly on the curriculum for farmer training, be it basic vocational or continued adult learning.

REWARD ENVIRONMENTAL BENEFITS GENERATED BY SICS AND TALK ABOUT IT



MARKET FORCES TO BE COUNTERWEIGHTED BY SUBSIDIES

Reward environmental benefits generated by SICS and talk about it:

Market forces need to be counterweight with subsidies rewarding the environmental benefits generated through the SICS to make their uptake more appealing to farmers. It will be equally important to continue to educate consumers about the advantages and disadvantages of conventional farming practices vs. sustainable practices to ensure increased demand for sustainably produced products and encourage the retail sector to make these more widely available to all sections of society.

DESIGN MORE COHESIVE POLICIES AND EFFECTIVE ENFORCEMENT MECHANISMS



EFFECTIVE AND CONSISTENT MONITORING OF IMPLEMENTATION SYNERGY BETWEEN POLICIES

Design more cohesive policies and effective enforcement mechanisms:

Policies have great potential to shape practices, especially for large-scale farms. However, in order to achieve real impact, their implementation needs to be monitored more effectively and consistently. Furthermore, an improved synergy between different policies are considered important factors for future success.



SOIL HEALTH RELATED PROBLEMS ON SITE



Low soil
organic matter



Soil
compaction



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN VENETO, ITALY

The soil-improving cropping systems (SICS) tested at the SoilCare study site in Veneto, Italy include:

1. Cover crops
2. Reduced tillage

These practices can address loss of soil-organic matter and soil compaction, the main soil threats found at the study site. These practices, therefore, represent important practices that might benefit soil health in the region if widely taken up.

Evidence gathered through interviews, desk research and a stakeholder workshop found several factors that contribute to and undermine the uptake of SICS. Some of the findings suggest that the uptake of SICSs is increasing. On the other hand, barriers to the uptake of these practices remain.

The key factors shaping the success of policy instruments include:

- Limited influx of young farmers prevents change
- Established practices increase need for inputs and heavy machinery
- Lack of a clear vision in policy for sustainable farming
- Complex policies which focus on short-term solutions
- Translation of national policies at regional level creates different outcomes
- No-tillage management and weed control without glyphosate

DESCRIPTION OF THE CASE STUDY SITE

Location: Legnaro, Veneto

Climate: Mediterranean North pedo-climatic zone. Sub-humid, with average annual rainfall of 850 mm

Main soil threats: Loss of organic matter (SOM) in mineral soils causing GHG emissions and worsening of soil functions and soil compaction

Current practices: Conventional, different crop rotation, mouldboard ploughing, chemical weed and pest control.



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POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below indicates that SICs adoption is already promoted through a range of existing policy instruments in the Veneto region of Italy. The analysis shows that several policies regulate and incentivize the use of cover crops and reduced tillage. Cover crops are incentivised through GAEC 4 of the CAPs cross-compliance standards, particularly on land showing signs of erosion. However, cover cropping is not included in the list of EFA options available to Italian farmers. In addition, area-based payments under the RDP may also be used to incentivise the use of cover crops as well as reduced tillage, the second SICS practice tested at the site. Water policies are also relevant for tillage management in the study site area, which is located in the Nitrate Vulnerable Zone of the Veneto Region. The Veneto Region has recently implemented a specific agro-environmental measure to increase soil organic matter content through organic amendment input and conservative tillage.

Red circles = SICs uptake promoted through existing mandatory, economic, or voluntary policy instruments in Veneto, Italy. Blue circles = SICs covered by the wider SoilCare project.

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
CAP GAEC Cross-compliance standards	●	●	●	●	●	●	●	●	●	●	●
CAP Rural Development Programme 2014-2020			●				●				●
CAP Rural Development Programme 2014-2020 for the Veneto region			●				●				●
River Basin Management Plan for the Eastern Alps			●	●	●		●				●
Regional Regulation of the agronomic use of livestock manure	●	●	●			●					●
Nitrate Directive	●	●	●			●					●
Directive on the Sustainable use of Pesticides			●				●				
Ministerial Decree on the correct use of Plant Protection Products			●				●				



Based on the results of this study, the following policy recommendations can be made:

DEVELOP HORIZONTAL, LONG TERM STRATEGIES FOR SUSTAINABLE AGRICULTURE



A strategic vision which goes beyond the regional differences and short-term political interest has great potential in facilitating a transition to sustainable agriculture and thus better soil management practices. In the same vein, policies should thrive to be more holistic. The European Farm to Fork Strategy already could provide a starting point for developing such a vision.

FLEXIBLE BUT WELL-INFORMED POLICY DESIGN



Italy has a great diversity of regions and farming systems, each with their own problems. Policy should take these differences into account so that they do not undermine the successful implementation or lead to success only in the areas which are already progressive. The policy must be based on the identification of problems and designing solutions based on scientific input.

IMPROVE FARMERS' CONNECTIONS WITH RESEARCH RESULTS

There is a need for a stronger link between research results on one hand and farming community on the other. Farmers confirmed their need for independent and objective advice and information on SICs. Researchers and technical experts underlined the need for an on-field demonstration activities and farmers' cooperation and permanent exchange of views between researcher and farming community to share the results.

DEMOGRAPHIC CHANGE



Policies, especially in the long term should aim to make the profession of farming more attractive to young farmers and people who are not farmers by family background. Furthermore, access for those who are willing to take up farming should be facilitated.

MORE EMPHASIS ON EDUCATION AND TRAINING



More emphasis should be put on training of farmers and consumers. Technical and scientific knowledge provided by regions should be better transmitted to farmers. Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits in order to change their misconceptions about these methods. To this end, research findings should be made accessible and widely disseminated and educational activities should be encouraged. Knowledge should be disseminated via multiple channels, through the provision of guidance document but also farms visits and demonstration days.

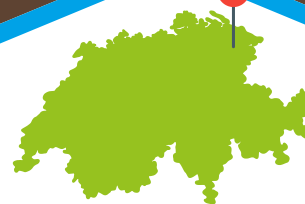




SOIL HEALTH RELATED PROBLEMS ON SITE



Soil compaction Low soil organic carbon



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH IN THURGHAU, SWITZERLAND

The main soil threats in Switzerland include low organic carbon content and compaction. SICs tested at the study site to address these soil threats include:

1. **Compaction alleviation measures (Controlled traffic management on grass verges)**
2. **Integrated nutrient management (Under-foot fertilisation after CULTAN procedure)**
3. **Green manure in combination with minimum tillage (Green manuring and minimum tillage applied between crop rotations).**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

Research indicates that several factors shape the success or failure of policy instruments in Thurgau, Switzerland, and the uptake of SICs tested in the study site region. These factors include:

- **Lack of policies incentivising development or use of more efficient machinery**
- **Costs of SICs adoption**
- **Weak monitoring and enforcement**
- **Lack of knowledge and effective dissemination**
- **Insufficient/biased information available**
- **Market pressures favour short-term priorities over long-term investment in soil health**
- **Reluctance to change due to perceived peer pressure and closed farming community**
- **Self-perception as “food suppliers”**

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FACTORS AFFECTING THE UPTAKE OF GREEN VERGES FOR COMPACTION ALLEVIATION

Barriers to adoption

Lack of knowledge transfer
Effort/practicability
Time taken before effects become visible
GPS required, width of parcel, material quality
D2 system does not fit (e.g., flower strips in favour of functional biodiversity)

Factors encouraging adoption

More yield with less effort, including manuring input
Improved soil activity (less compaction)
Green strips always passable

FACTORS AFFECTING THE UPTAKE OF CULTAN FERTILISATION

Barriers to adoption

Expensive, price must lower at every level
Stony/compacted/dry soils
Yeast concentration, working width, material quality, specialist required for the injection
Dominance of the fertiliser industry
Principles of Agricultural Crop Fertilisation in Switzerland
Sulphur content

Factors encouraging adoption

Long term pricing
Increased humus content in soils
Homogeneous and raw soils, flat roots, legumes
Precise fertilisation, chrome steel
Provides side business



POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below provides an overview of policies promoting the full range of SICS covered by the SoilCare project. Several policies contain provisions which allow the cantons to define measures to prevent soil erosion and deterioration of soil fertility, and which might include different SICS. Compliance with these measures is often linked to financial support paid out to farmers (under the Direct Payment Ordinance) and can also involve penalties if agricultural practices result in soil losses (under the Soil Damage Ordinance). Compaction alleviation measures, the use of cover crops, reduced tillage, and green manure, the SICS tested at the study site are regulated and incentivised to some extent: there are no dedicated policies regulating or incentivising controlled traffic management methods to reduce compaction other than through the pieces of legislation mentioned above. The use of crop rotation is promoted by the main national and cantonal agricultural policies. Green manure is not explicitly mentioned but the crop rotation requirements above can potentially lead to cover crops being used as green manure. In addition, the Direct Payment Ordinance stipulates that nutrient circuits should be closed as far as possible which might indirectly promote the use of green manure. Reduced tillage practices may be considered as soil protection measures under the same Ordinance and could therefore be eligible for financial support.

Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Thurgau, Switzerland. Blue circles = SICS uptake promoted as part of the wider SoilCare project.

NATIONAL POLICIES	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
Federal Act on the Protection of the Environment	●	●	●	●	●	●	●	●	●	●	●
Ordinance on Protection of Waterbodies			●		●		●	●			
Soil Damage Ordinance	●	●	●	●	●	●	●	●	●	●	●
Federal Act on Agriculture	●	●	●	●	●	●	●	●	●	●	●
Direct Payment Ordinance	●	●	●	●	●	●	●	●	●	●	●
Federal Chemicals Act							●	●			
Chemical Risk Reduction Ordinance			●				●	●			
Ordinance on Plant Protectants							●	●			
Fertiliser Ordinance			●								



Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in Thurgau, Switzerland. Blue circles = SICS uptake promoted as part of the wider SoilCare project.

REGIONAL POLICIES	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/NO TILLAGE	INTEGRATED PEST MANAGEMENT	SMART WEED CONTROL	SMART RESIDUE MANAGEMENT	CONTROLLED TRAFFICKING	INTEGRATED LANDSCAPE MANAGEMENT
Act on Agriculture	●	●	●			●	●		●	●	
Ordinance on Structural Improvements in Agriculture					●						●

POLICY RECOMMENDATIONS

Based on the results of this study, the following policy recommendations can be made:

CONSIDER INTRODUCING WEIGHT LIMITATIONS FOR AGRICULTURAL MACHINERY INTO LEGISLATION



ESTABLISH BETTER MONITORING AND ENFORCEMENT MECHANISMS

Consider introducing weight limitations for agricultural machinery into legislation: for road vehicles, legislation establishes limitations on maximum weight. This is lacking for agricultural machines and should be integrated in existing agricultural legislation or a new, dedicated technical standard. In addition, farm advisory services need to include information on lighter vehicles farmers may use in the services they offer.

Establish better monitoring and enforcement mechanisms: while it was found that there are several policies already in place that – directly and indirectly - regulate and incentivise different SICS, stakeholders report that outcomes on soil health are limited due to weak implementation and enforcement mechanisms. It is clear mechanisms for checking compliance with existing regulations need to be strengthened and expanded. Performance indicators and measurements need to be clearly specified and monitored.





FACILITATE THE EXTRACTION OF AMMONIA FROM SEWAGE TREATMENT PLANTS

The cost of applying the CULTAN procedure could be reduced if ammonia extracted from sewage treatment plants could be made available to farmers. This might require the investment in research on different methods for ammonia recovery by public institutions, a dissemination of findings and technologies and a subsequent adaptation of current guidelines on “Principles of Agricultural Crop Fertilisation in Switzerland” (PRIF).

REWARD ENVIRONMENTAL BENEFITS GENERATED BY SICS AND TALK ABOUT IT



Market forces need to be counterweight with subsidies rewarding the environmental benefits generated through the SICS to make their uptake more appealing to farmers. It will be equally important to continue to educate consumers about the advantages and disadvantages of conventional farming practices vs. sustainable practices to ensure increased demand for sustainably produced products and encourage the retail sector to make these more widely available to all sections of society. An innovation award could be an effective instrument to create awareness for sustainable producers and production methods amongst consumers and farmers alike.

MAKE SOIL HEALTH A STRONGER COMPONENT OF VOCATIONAL TRAINING AND EDUCATION



PROVIDE BALANCED INFORMATION AND ESTABLISH OPPORTUNITIES FOR PEER-TO-PEER LEARNING

Make soil health a stronger component of vocational training and continued education of farmers: the move from conventional practices to SICS and sustainable agricultural practices requires a shift in attitudes as well as knowledge. Soil, as the main medium on which food and feed are grown, should feature highly on the curriculum for farmer training, be it basic vocational or continued adult learning. Farmers also need to be shown how to observe and measure soil changes – using simple methods and instruments - to make the benefits of SICS adoption visible in the short-term (where possible).

Provide balanced information and establish opportunities for peer-to-peer learning: personal conviction of farmers to adapt to new practices is a powerful tool in the face of multi-layered challenges. Education plays a very important role in that regard. Therefore, unbiased knowledge and information must be made accessible to farmers. This information should not favour any particular interest. Some of the practices benefitting soil will require farmers to learn about these techniques, their application to different conditions as well as their benefits to change their misconceptions about these methods. Since farmers tend to place a lot of trust in their peers, establishing a network of lighthouse farms demonstrating how to use and adapt different SICS in the region would effectively support farmers in learning and sharing experiences about these practices.



SoilCare
SOILCARE FOR PROFITABLE AND SUSTAINABLE
CROP PRODUCTION IN EUROPE

Policy analysis:
PROMOTING SICs
ADOPTION IN THE
ENGLISH EAST
MIDLANDS

SOIL HEALTH RELATED PROBLEMS ON SITE



Compaction



Low soil
organic matter



Blackgrass



SOIL-IMPROVING CROPPING SYSTEMS FOR INCREASING SOIL HEALTH AT LODDINGTON

The following Soil-Improving Cropping systems (SICs) were tested in Loddington, East Midlands, England, to address the main soil threats identified above:

1. **Introducing deep-rooting grass cultivars into the rotation**
2. **Compaction alleviation through sub-soiling and mycorrhizal inoculation**

The SICs above present important practices that might benefit soil health if widely taken up. The main aim of this study was to formulate policy alternatives and actions and to facilitate the adoption of SICs.

Evidence gathered through desk research, interviews and a stakeholder workshop show that several factors affect SICs uptake. 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

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COMPACTION ALLEVIATION EXPERIMENT

Factors encouraging the adoption of subsoiling and mycorrhizal inoculation:

- Subsoiling is a well-known and accepted agronomic practice

Barriers preventing the adoption of subsoiling and mycorrhizal inoculation:

- Limited knowledge of costs/benefits
- Not applicable to shallow/stony soils
- Lack of knowledge surrounding the practical application of the inoculant
- Lack of equipment availability for subsoiling

DEEP-ROOTING GRASS CULTIVARS EXPERIMENT

Factors encouraging the adoption of grass leys in the rotation:

- Simple to implement with existing practices
- May help with blackgrass control

Barriers preventing the adoption of grass leys in the rotation:

- Limited knowledge about costs/benefits
- Lack of awareness about financial support
- Lack of legislation protecting the soil
- Lack of knowledge about soil
- Crops grown in unsuitable places due to market demand
- Lack of monitoring of funding schemes
- May not be attractive to wholly arable farmers
- Conflict with the goal of increasing food supply (cereal yields may decline at catchment scale)
- 5-year rule for permanent pastures
- Countryside Stewardship prevents conservation of forage

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POLICY SHORTCOMINGS AND OPPORTUNITIES FOR FACILITATING THE UPTAKE OF SICS

The table below indicates that SICS adoption is already promoted through a range of existing regulatory, economic, and voluntary policy instruments and measures in the English East Midlands. 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.

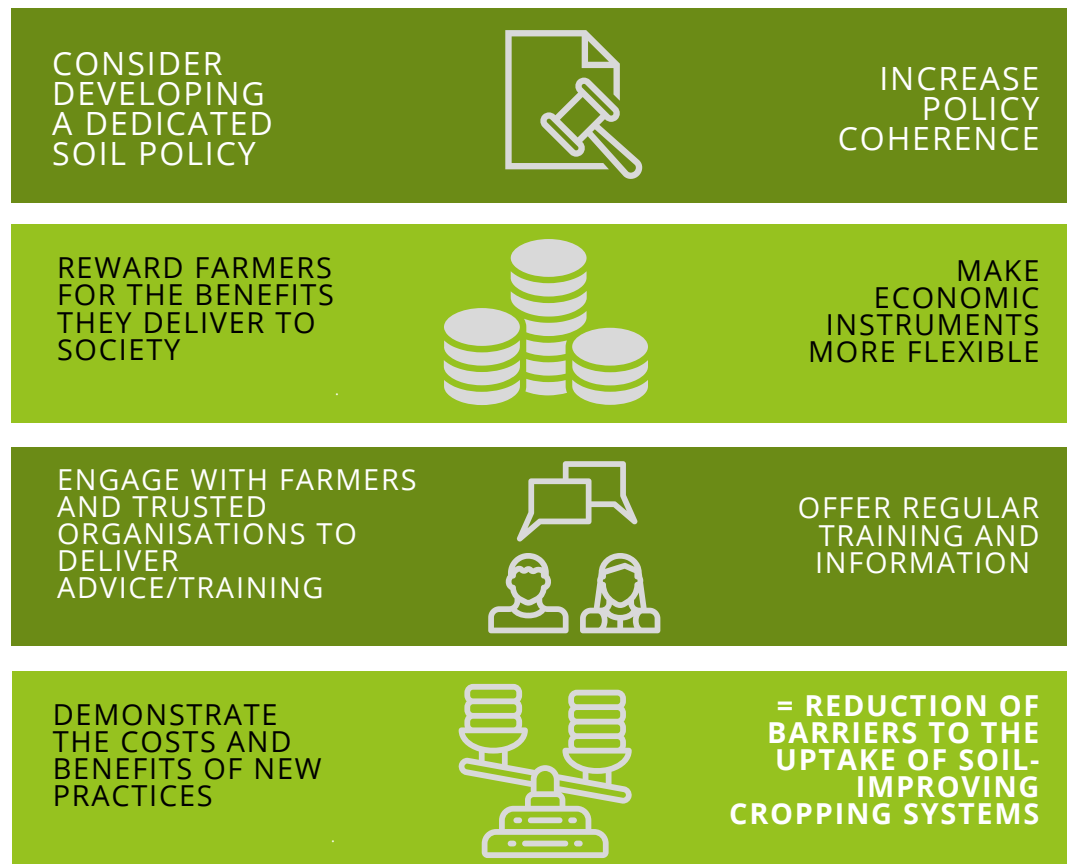
Red circles = SICS uptake promoted through existing mandatory, economic, or voluntary policy instruments in the English East Midlands

	CROP ROTATION	GREEN MANURES, COVER CROPS, CATCH CROPS	INTEGRATED NUTRIENT MANAGEMENT	EFFICIENT IRRIGATION	CONTROLLED DRAINAGE	REDUCED/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 Product Regulations							●				
Pesticides Control Legislation							●				
Championing the Farmed Environment		●				●					
Water Environment Regulations			●	●	●		●				●
Sludge regulations			●								



POLICY RECOMMENDATIONS

Based on the results of this study, the following policy recommendations can be made:



CONSIDER DEVELOPING A DEDICATED SOIL POLICY



INCREASE POLICY COHERENCE

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 provides an important step in the right direction, but appropriate management approaches, instruments, and metrics are needed. In addition, while the CAP's Statutory Management Requirements will be preserved in English law following Brexit, a similar mechanism to preserve the aims of the Good Agricultural and Environmental Conditions is needed..

Increase policy coherence: some of the SICs might not align with existing policy objectives (e.g. yield reduction vs. increasing food production. By the same token, some policy objectives foster unsustainable agricultural practices. Policy conflicts and synergies 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.



REWARD FARMERS
FOR THE BENEFITS
THEY DELIVER TO
SOCIETY



MAKE
ECONOMIC
INSTRUMENTS
MORE FLEXIBLE

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.

ENGAGE WITH FARMERS
AND TRUSTED
ORGANISATIONS TO
DELIVER
ADVICE/TRAINING



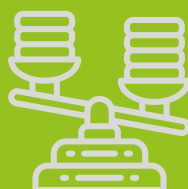
OFFER REGULAR
TRAINING AND
INFORMATION

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 were 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.

