

Policy analysis:

Promoting SICS adoption in Viborg, Denmark

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Policy name	Crop rotation	Green manures, cover crops, catch crops	Integrated nutrient management	Enhanced efficiency irrigation	Controlled drainage	Reduced tillage	Integrated pest management	Smart weed control	Smart residue management	Controlled traffic management	Integrated landscape management
Bekendtgørelse af lov om drift af landbrugsjorder (Act on Management of Agricultural Land)											
Husdyrgødningsbekendtgørelsen (The Livestock Manure Order)											

Research and stakeholder interviews indicate 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:

- 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

Recommendations for actions to promote the uptake of SICS

Based on this analysis, and feedback collected from stakeholders, this report presents actions for the national and/or (sub)regional level with the potential of promoting the uptake of SICS. Drawing on these insights, the following general recommendations can be made:

- **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 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:** 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.

1 Introduction

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

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

Research aim and questions

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

Table 2: List of promising general SICS³

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

¹ e.g. Lahmar 2010. Adoption of conservation agriculture in Europe: Lessons of the KASSA project. *Land Use Policy* 27(1): 4-10.

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

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

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

The main aim of the work presented here was to formulate policy alternatives⁴ and actions at EU and study site level to facilitate the adoption of soil-improving cropping systems. Understanding common barriers to the adoption of soil improving practices is an important prerequisite for identifying and designing policy measures to encourage farmers to adopt effective soil conservation practices. A second important foundation for developing appropriate policies is an appreciation of the effectiveness of soil conservation policies in agriculture.

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

Table 3: Summary of policy approaches

Policy approach	Premise	Positive attributes	Negative attributes
Regulatory instruments	Force farmers to adopt SICS	<ul style="list-style-type: none"> Levels the playing field between competitors, as everyone must play by the same rules Fairly consistent (often long-term) 	<ul style="list-style-type: none"> Inflexible regardless of individual situations May be costly to implement Monitoring and enforcement can be costly Discourages innovation
Economic instruments	Incentivise farmers to adopt SICS	<ul style="list-style-type: none"> Encourages innovative methods 	<ul style="list-style-type: none"> Can be subject to fluctuations as the market fluctuates

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

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

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

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

This report presents an inventory and analysis of bottlenecks and opportunities in sectoral and environmental policies to facilitate the adoption of SICS in Switzerland and fits into a larger research initiative involving 16 European countries in total.⁵ Based on this analysis, it presents policy alternatives and actions for the national and/or (sub)regional level with the potential of promoting the uptake of SICS.

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

Methods

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

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

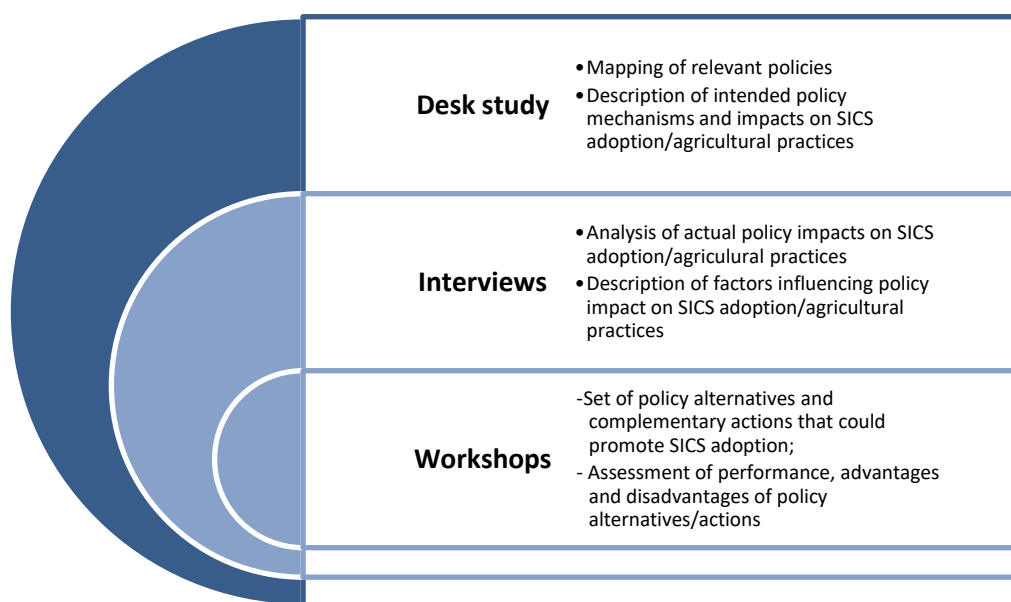


Figure 1: Research strategy

Data collection and analysis involved the following three activities:

- 1) A desk-study of policy documents (in the broadest sense) and relevant literature:** policies potentially impacting the adoption of SICS in the study sites were identified. The aim of this step was to provide a broad overview of soil-related national and regional⁶ policies from which the most relevant policies could be selected for in-depth analysis. A draft inventory was compiled, including those national, regional, and sub-regional policies that were linked to a set of pre-selected EU policies (primarily

⁶ The term "region" refers in this context to the sub-national level, particularly the area of the country where the respective study site is located.

concerning environmental and agricultural topics); however, in the case of regional and sub-regional policies, these were limited to those directly relevant to the study site (i.e. not all regions and sub-regions were included). For each policy, the following information was recorded: date of adoption, governance scale, type of instrument, link to cropping system (components) etc.⁷ Based on the screening done in the first step, the national and regional policies deemed most relevant for the study site were subject to a more in-depth analysis. This was done through desk research carried out by the study site researchers.

- 2) Interviews with selected national and regional policymakers and stakeholders:** based on this analysis, Study Site Researchers then conducted interviews with policymakers and stakeholders using a semi-structured interview guide. In Denmark, four interviews were carried out.

Table 4: Organisations represented by interview partners

Organisation	Stakeholder category
Foreningen for Reduceret jordbearbejdning i Danmark (Association for reduced tillage in Denmark)	NGO
Biosamfund Samsø, Teknisk Forvaltning (Technical administration)	Farm advisory service
Miljø- og Fødevareministeriet (Danish Ministry of Food and Environment, Environment and Biodiversity section)	Environmental agency
Lejre Kommune (Lejre Municipality)	Regional/local government

- 3) An adoption workshop with national and regional policymakers and stakeholders:** To develop and assess policy alternatives, the Study Site Research Teams organised a stakeholder workshop in each site, following a common guidance document which detailed the structure and methods for the event. Study site teams mostly invited those stakeholders they were already working with, either within the context of SoilCare or as part of their regular engagement activities. In the Danish study site, no dedicated adoption workshop was organised.

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

Report outline

Section 2 of this report presents an analysis of policy instruments relevant for shaping agricultural practices in the region where the Danish study site “Viborg” is located.⁸ It examines how existing instruments may impact on the adoption of SICS and explores the factors which enable or hamper uptake of these practices.

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

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

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

2 Analysis of policy shortcomings and opportunities in Viborg, Denmark

This section provides a review and analysis of national and regional instruments relevant for shaping agricultural practices in the region where the study site is located. Policies investigated include both policies implementing EU instruments as well as those initiated by Denmark.

The study site is briefly described in the table below.

Table 5: Description of the study site

Site Name	Viborg, Denmark
Climate	Atlantic North climate
Main soil threats	Loss of organic matter, soil compaction, erosion, severe nutrient losses (N and P) to the environment (especially from livestock farms)
Current practices	Conventional agriculture (92 % of the area) and organic agriculture (8%). Intensive use of livestock manure with precision fertilization of slurry and fertilizers, ploughing, tillage, strict norms for fertilizers, irrigation, cropping systems

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

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

Table 6: Overview of experiments carried out in the Swiss study site, and the SICS category and cluster under which they are grouped

General treatment category	SICS cluster ⁹	Experiments
Crop rotation	Soil improving crops	CROPSYS crop rotations, organic and conventional / row cropping with catch crops
Reduced tillage	Soil Cultivation	CENTS / soil tillage intensities and cover crops: ploughed/harrowed/direct drilled, crop type, catch crop type, +/- straw
Cover crops	Soil improving crops	Screening different types of catch crops
Integrated nutrient management	Fertilisation/Amendments cultivation	Askov and Jyndevad: experiments with different levels of fertilisation and liming (LT)

2.1 Which existing policies and policy instruments shape agricultural practices in Denmark?

A policy analysis at the national level suggests that the adoption of the Soil-Improving Cropping Systems (SICS) may be directly and indirectly shaped by the policies described below.¹⁰ The overview provides a description of those policies identified as most important for soil-improving practices and does not intend to provide an exhaustive overview of the policy landscape governing agricultural methods in the region.

Agricultural policies

The different funding instruments established under the EU **Common Agricultural Policy (CAP)** greatly influence farming practices in the region. Direct payments are tied to farmers meeting the **Good Agricultural and Environmental Conditions (GAEC)** as well as the greening requirements set out by the policy.

Transposition of cross-compliance standards related to soil include GAEC 4 to 7 and does not differ from GAECs as set out under the regulation on direct payments and horizontal measures:

- GAEC 4 requires that a minimum soil cover is maintained,
- GAEC 5 requires minimum land management standards reflecting site specific conditions to limit erosion,
- GAEC 6 requires maintenance of soil organic matter level through appropriate practices

⁹ SICS are grouped into four clusters: (1) Soil-improving crops, (2) Fertilisation/amendments, (3) Soil cultivation, and (4) Alleviation of compaction.

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

including a ban on burning arable stubble, except for plant health reasons and

- GAEC 7 requires the preservation of landscape elements and prohibition of trees in particular seasons (bird breeding season).

CAP Greening requirements have direct impact on farmers as the land management standards are linked to payment schemes and thereby incentivise specific management practices. Greening requirements include crop diversification, maintenance of permanent grassland as well Ecological Focus Areas (EFA). Farmers with over 15 ha of arable land have had to devote 5% of their farmed area to EFAs to qualify for full direct subsidy payments the list of EFA elements which Danish farmers can choose from includes the following options: fallow, buffer strips (9 meters wide), catch crops/green cover, short rotation coppice (SRC) and ancient (landscape) monuments. Denmark has chosen a short list of eligible options because most farms are expected to comply with demands without major changes. In 2015, the following EFA elements had been applied to agricultural areas: land lying fallow (19 600 ha); buffer strips (15 575 ha); SRC (3 887 ha); landscape monuments (143 ha.)

The **Rural Development Program 2014 - 2020** (Det danske landdistriktsprogram 2014-2020) provides funding for contractual, voluntary commitments by farmers to implement certain sustainable agricultural practices. The Danish RDP acknowledges that soil erosion and soil quality problems do occur in Denmark. The three main issues identified are: (1) Compression of soils due to the use of heavy machinery, (2) Loss of organic matter in the soils due to monocultures, simplified cropping sequences, removal of straw, reduction in animal fertilisers and loss of permanent grassland, (3) Soil erosion, especially on slopes. Especially organic farming, catch crops, permanent grassland and forest are seen as land management practices addressing the soil issues, and farmers may receive area-based payments for using these environment/climate friendly management practices.

In addition, there are two agricultural policies initiated by Denmark which are relevant for farming practices. The **Act on Management of Agricultural Land** aims to promote the sustainable development of the management of agricultural land by combining soil protection as a resource for production with the need of maintaining nature, environment, and landscape values. The Act ensures that agricultural land is kept and managed as agricultural land with a focus on the border between agricultural land and nature areas. The Act and underlying Orders establish the rules and procedures for changing the status of areas from agricultural into nature area. Furthermore, it regulates actions to control unwanted plants and animals such as wild oat and giant hogweed on agricultural land. Sustainable land management practices, most notably integrated pest and landscape management methods are incentivised.

Another national level policy is the **Livestock Manure Order**. The objective of the Order is to establish a set of rules and guidelines for livestock manure management that covers production, storage, and use. These include the length of holding time and application procedures. Capacity and storage requirements stipulate that practices must meet the standards set forth in the **Order of Farm's Use of Fertiliser and Plant Cover**.

Water policies

The Water Framework Directive is implemented through the **Agreement on Food and Agriculture Package 2015**. This agreement was reached between the government and the coalition partners, and creates a new food and agriculture package that will create better conditions for the food and agriculture sector. The package contains 30 initiatives in five areas: sustainability, natural resources, improved competitive ability, development of future food production, forward looking export initiative. The Agreement establishes environmental standards which are to be reflected in the relevant sectoral and environmental regulations.

The **Act on Agricultural Use of Fertilisers and on Plant Cover** implements the Nitrates Directive. Farmers are directly impacted by the requirements set forth in the Act relating to fertiliser use and additional land management practices. The objective of the Act is to regulate the agricultural use of fertilisers and to set requirements to plant cover and other management practices to reduce leaching of nitrate. The act set rules on the total amount of fertilisers to be used at farm level based on crops, type of fertiliser etc. The act also authorises the Ministry of Environment and Food to set rules on plant cover and catch crops. Finally, according to the Act farmers are required to carry out fertiliser planning and accounting.

Chemicals policies

The Sustainable Use of Pesticides Directive is implemented via **Act on Tax on Pesticides**. Farmers' pest management activities are directly impacted by pricing schemes relating to pesticide use. Higher prices incentivize farmers to purchase less and maximize utility to reduce costs. Since 2013, the tax on pesticides has been targeted to reflect the effect of the pesticide on health and on the environment to guide the use towards the least harmful pesticides. Soil protection is not directly targeted, but for example the effect of the pesticides on earth worms is included in the calculation of the tax. The tax aims to have a direct positive effect on the environment in general by encouraging use of least harmful products and an indirect effect by allocating the funds from the taxation to reduce impact of pesticides further.

2.2 To what extent do existing policies facilitate adoption of soil-improving practices in Denmark?

The main soil threats in Viborg include loss of organic matter, soil compaction, erosion, severe nutrient losses (N and P) to the environment (especially from livestock farms). SICS that are being tested at the study site are thought to address these soil threats and include the introduction of soil improving crops (CROPSYS crop rotations, screening of different types of catch crops), soil cultivation measures (Different soil tillage intensities), and fertilisation/soil amendments (Different levels of fertilisation and liming).

This section takes the policies identified in the previous section and evaluates how they can mitigate the soil threats in Denmark:

Crop rotation and cover crops

CAP cross-compliance standards, greening requirements as well as RDP measures incentivise the uptake of crop rotations/crop sequencing. Impact practices related to tillage management, integrated management, crop sequences/rotation.

The use of cover crops is mandated by GAEC 4 which requires minimum land cover. Furthermore, the Act on Agricultural Use of Fertilisers and on Plant Cover has the potential to increase the adoption of cover crops since it allows the Ministry of Environment and Food to establish rules on this practice. In practice, stakeholders stated that cover crops were indeed being actively promoted by these policy instruments, but one also mentioned the discrepancies between the restrictions on cover crops and the requirements for improving soil fertility. This might hinder the actual positive impact. Another point mentioned was that different policies targeted different cover crops which might make it difficult for farmers to understand what kind of financial incentives were available to them and how to implement the requirements.

Reduced tillage

Reduced tillage is encouraged through CAP instruments via regulatory as well as economic incentives. The most relevant one is the GAEC 5 which stipulates that the land must be managed according to the site-specific conditions to protect the soil from erosion. For instance, there is a ban on ploughing arable parcels of 5 hectares or more between harvest and 15th of February, when the slope is greater than 12°.

Greening payments incentivises reduced/no tillage practices through the EFA options available to farmers, particularly land lying fallow. As of 2015, there were 19 600ha of set aside areas in Denmark. On the other hand, EFA are not obligatory measures and some farmers in Denmark opted not to comply with EFA demands and instead accepted a reduction in the support. This implies that this non-regulatory measure has limited impact on the farmers.

Of the RDP measures, only few focus on soil erosion as primary target and none has carbon conservation and sequestration as primary target. There is no specific budget allocated for soil erosion under Priority 4C Soil erosion and management, meaning that measures targeting soil erosion are part of the 64% of the RDP budget allocated to three priority areas. The soil related targets are mentioned as secondary targets for several measures.

Some of the experts consulted noted that extensive tillage was recognised as an important problem among farmers, therefore awareness on the issue was growing. One stakeholder mentioned that about a quarter of the agricultural land in Samsø adopted no-tillage practices.

Integrated nutrient management

Well-managed nutrient input is essential to address and prevent the loss of soil organic matter and to avoid excessive nitrogen fertilisation, which is an issue in the region where the study site is located. 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.

The table below provides an overview of policies promoting the full range of SICS covered by the SoilCare project (shaded in light green). The analysis shows that several policies regulate and incentivise the use of *crop rotation*, cover crops, reduced tillage, and integrated nutrient management, the SICS tested at the study site (shaded in dark green).

Table 7: SICS addressed by key policies, Viborg (DK)

Policy name	Crop rotation	Green manures, cover crops, catch crops	Integrated nutrient management	Enhanced efficiency irrigation	Controlled drainage	Reduced tillage	Integrated pest management	Smart weed control	Smart residue management	Controlled traffic management	Integrated landscape management
Bekendtgørelse om krydsoverensstemmelseBEK (CAP GAEC cross compliance standards)											
CAP Greening requirements											
Det danske landområdeprogram 2014-2020 (Rural Development Programme 2014-2020)											
Bekendtgørelse af lov om jordbrugets anvendelse af gødning og om plantedække (Act on Agricultural Use of Fertilizers and on Plant Cover)											
Aftale om fødevarer- og landbrugspakken 2015 (Agreement on Food and Agriculture Package 2015)											
Bekendtgørelse af lov om afgift af bekæmpelsesmidler (Act on Tax on Pesticides)											
Bekendtgørelse af lov om drift af landbrugsjorder (Act on Management of Agricultural Land)											
Husdyrgødningsbekendtgørelsen (The Livestock Manure Order)											

2.3 Which factors shape success or failure of policy instruments in Denmark?

Research 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:

- 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

Costs of transitioning to new cropping systems

The experts interviewed for the study point out to financial barriers when it comes to the uptake of new practices. For instance, in most of the cases, growing of a particular crop goes hand in hand with specific machinery and other structural investments. If the farmer decides to invest in another set of crops, they would need to invest in new machinery, which means considerable investment, increasing costs for the farmer. This is a very important consideration since the farmers need stable revenues to keep the farms running in an economically sustainable way. One stakeholder stated that many farmers are indebted therefore are even less willing to take financial risks.

Prioritisation of short-term financial benefits

Closely related to the point above, farmers are pushed to choose short term interests (like maintaining one's farm ownership) over long term benefits. Farming is by its structure a volatile market, which adds to the difficulty. The tension between the short term gains and long term benefits therefore is an important factor and in most of the cases, short term gains prevail.

Lack of policy coherence

Lack of cohesion between different policy instruments, especially when it comes to what they are aiming to achieve, has been mentioned by several experts consulted for this study. For instance, it has been suggested that different policies addressing the same problem can create confusion among the farmers, such as in the case of cover crops. One stakeholder mentioned that there are 5 different cover crops which cover different policy areas. Some are targeted towards groundwater reservoirs and some are targeted at livestock production. Therefore, it can be difficult to understand what to do as there are different measures for different activities. This is a potential factor that might hinder the adoption. Furthermore, the restrictions on which cover crops are allowed and the timelines for when they are allowed to grow and must be cut does not fit with the requirements to boost soil fertility, creating an adverse effect on a potentially beneficial measure.

Beyond the specific issues regarding cover crops, another more general criticism voiced by one stakeholder is that the current legislation and lack of coherence between different policies is a

major obstacle for the uptake of sustainable practices. Soil health ultimately benefits from a diversified farming system, but the legislation is considered to be a barrier. For instance, if a farmer wants to have livestock and vegetables on the same farm, they will have to adhere to different sets of rules, sometimes conflicting each other. This creates an additional barrier for the farmers who are already facing other important challenges such as financial constraints, as mentioned above.

Reluctance to abandon traditional practices

Currently, farming is characterised by tradition and accumulated knowledge transmitted throughout the generations. This has an impact on the adoption of new policies, since it makes the introduction of change harder. For instance, long-learned practices are harder to change, one stakeholder gave the example of pig farming, and mentioned the persisting idea that pigs should remain indoors. Furthermore, it has been suggested that practices can be adapted if they are easier to put in practice, and if they correspond to the existing convictions requiring fewer adjustments.

Lack of continued learning and integration of emerging knowledge in practices

In order for the policies to be adopted effectively, the farmers have to be convinced of their inherent benefits. This requires a certain level of awareness and understanding. One expert mentioned that the current level of knowledge about farming is outdated among farmers and the education (or any kind of training) they received fifty years ago is not adequate to face the current challenges. There is a gap between the current knowledge, best practices and the education the farmers had.

3 Conclusions and recommendations

This report presented an inventory and analysis of bottlenecks and opportunities in sectoral and environmental policies to facilitate the adoption of Soil-Improving Cropping Systems (SICS) at the EU-level as well as the region of Viborg in Denmark.

The policy analysis and evidence of their implementation in Denmark show that the SICS in question are to some extent regulated and incentivised by the existing policy framework.

Based on the evidence set out in this section, the following recommendations can be made:

- **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 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:** 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.

Annex: Overview of key policies in Denmark

Policy name	English translation	Scale	EU or MS-based policy	Impact on SICS	Description of policy
Bekendtgørelse om krydsoverensstemmelse BEK nr 100 af 30/01/2015	CAP GAEC Cross-Compliance standards	National	EU (CAP)	Integrated landscape management Integrated nutrient management Cover crops Reduced tillage	<p>The cross-compliance standards set forth in the Danish legislation based upon CAP requirements directly affect agricultural practices adopted by farmers. The standards explicitly address how farmers are to manage land and livestock, including soils. Transposition of cross-compliance relating to soil is as follows, and does not differ from GAECs as set out under the regulation on direct payments and horizontal measures:</p> <ul style="list-style-type: none"> – GAEC 4 Establishment and maintenance of plant cover on fallow land. Uncultivated agricultural land must have plant cover established by the 31st of May in the year of the land lying fallow. – GAEC 5 Protection of agricultural land against erosion. Ban on ploughing arable parcels of 5 hectares or more between harvest and 15th of February, when the slope is greater than 12°. – GAEC 6 Burning of stubble or similar parts of agricultural crops. Ban on burning stubble, except in some of Denmark's smaller islands without bridge connections and stubble from grass grown for seeds where a crop is to be grown in the following year. – GAEC 7 Preservation of landscape elements. Mandatory preservation of natural and artificial ponds and lakes and ancient monuments of up to 0.2 ha. Prohibition of pruning of shrubs and trees in the breeding period of birds. The ban covers the period from 15th of March to 31st of July.
CAP Greening requirements	--	National	EU (CAP)	Reduced tillage management Integrated landscape management Crop rotation Cover/catch crops	<p>Farmers are directly impacted as land management standards are linked to payment schemes and thereby incentivise particular management practices. The list of EFA elements which Danish farmers can choose from includes five options: fallow, buffer strips (9 meters wide), catch crops/green cover, short rotation coppice (SRC) and ancient monuments (GAEC 7 landscape element). Denmark has chosen a short list of eligible options because most farms are expected to comply with demands without major changes. In 2015 the EFA elements covered: Fallow land (19 600 ha); Buffer strips (15 575 ha); Short rotation coppice (3 887 ha); Ancient monuments (143 ha.) The total agricultural area of Denmark is 2 600 712 ha. 87 farmers</p>

Policy name	English translation	Scale	EU or MS-based policy	Impact on SICS	Description of policy
					with a total agricultural area of 3 062 ha chose in 2015 not to comply with the EFA demand and accept a reduction in the support.
Det danske landdistriktsprogram 2014-2020	Rural Development Programme 2014-2020	National	EU (CAP)	Integrated landscape management Integrated pest management Crop rotation Reduced tillage	<p>Farmers are directly impacted as the level of financial support can either inhibit or support policy implementation in terms of capacity to carry out particular objectives. The Danish RDP acknowledges that soil erosion and soil quality problems do occur in Denmark. The three main issues identified are: (1) Compression of soils due to the use of heavy machinery. (2) Loss of organic matter in the soils due to monocultures, simplified cropping sequences, removal of straw, reduction in animal fertilisers and loss of permanent grassland. (3) Soil erosion, especially on slopes. However, the RDP also points out that there is a lack of knowledge on the threats and on affected risk areas. In the implemented measures, only a few have soil erosion as primary target and none has carbon conservation and sequestration as primary target. The soil related targets are mentioned as secondary targets for several measures. Especially organic farming, catch crops, permanent grassland and forest are seen as land management practices addressing the soil issues.</p> <p>Under Priority 4C Soil erosion and management there is no specific budget identified because the expenditure is programmed for the priority as a whole, not for individual focus areas. In total Focus area 4A (Biodiversity) 4B (Water management) and 4C (Soil erosion) amounts to 576.136.862 € corresponding to 63.5 % of the total RDP programme. Under priority 5E Carbon conservation / sequestration – no specific budget has been allocated.</p>
LBK nr 388 af 27/04/2016 Bekendtgørelse af lov om jordbrugets anvendelse af gødning og om plantedække	Act on Agricultural Use of Fertilisers and on Plant Cover	National	EU (Nitrates Directive)	Integrated nutrient management	Farmers are directly impacted by the requirements set forth in the Act relating to fertiliser use and additional land management practices. The objective of the Act is to regulate the agricultural use of fertilisers and to set requirements to plant cover and other management practices in order to reduce leaching of nitrate. The act set rules on the total amount of fertilisers to be used at farm level based on crops, type of fertiliser etc.. The act also authorise the Ministry of Environment and Food to set rules on plant cover and catch crops. Finally, according to the Act farmers are required to carry out fertilizer planning and accounting. In relation to soil protection the Act protects against excess use of fertilisers and, as a consequence of the plant cover rules, against erosion.
Aftale om fødevarer- og landbrugspakken 2015	Agreement on Food and	National	EU (WFD)	Integrated nutrient management	The Danish government with coalition parties reached an agreement on a new food and agriculture package that will create better

Policy name	English translation	Scale	EU or MS-based policy	Impact on SICS	Description of policy
	Agriculture Package 2015			Integrated landscape management Crop rotation	conditions for the food and agriculture sector. It transposes the Water Framework Directive. The package contains 30 initiatives in 5 main areas: sustainability, natural resources, improved competitive ability, development of future food production, forward looking export initiative. The package will affect buffer strips, nitrate application standards and a number of environmental regulations in the agricultural sector. Farmers are directly impacted by environmental standards set forth which directly relate to land management practices adopted by farmers.
Bekendtgørelse af lov om afgift af bekæmpelsesmidler, LBK 232 26/02/2015	Act on Tax on Pesticides	National	MS	Integrated pest management	Farmers are directly impacted by pricing schemes relating to pesticide use. Higher prices incentivise farmers to purchase less and maximize utility to reduce costs. Since 2013, the tax on pesticides has been targeted to reflect the effect of the pesticide on health and on the environment in order to guide the use towards the least harmful pesticides. Soil protection is not directly targeted, but for example the effect of the pesticides on earth worms is included in the calculation of the tax. The tax in itself aims to have a direct positive effect on the environment in general by encouraging use of least harmful products and an indirect effect by allocating the funds from the taxation to reduce impact of pesticides further. Evaluations of the tax on pesticides are available from the Danish EPA for 2014 and 2015. The tax has a link to the Sustainable Use Directive as a program for IPM is a central theme in reducing use and volume of pesticides along with the tax.
Bekendtgørelse af lov om drift af landbrugsjorder, LBK nr 191 af 12/03/2009	Act on Management of Agricultural Land	National	MS	Integrated landscape management Integrated pest management	Farmers are directly impacted as sustainable land management practices are incentivized thereby impacting decision-making by farmers of on-site management practices. The objective of the Act is to promote the sustainable development of the management of agricultural land by combining soil protection as a resource for production and nature, environment and landscape values. The Act ensures that agricultural land is kept and managed as agricultural land with a focus on the border between agricultural land and nature areas. According to the Act, farmers have to make sure that unfarmed agricultural land is not overgrown by keeping the areas free of bushes and trees. The Act and underlying Orders establish the rules and procedures for changing the status of areas from agricultural into nature area. Furthermore, the Act and underlying Orders regulate actions to control unwanted plants and animals such as wild oat and giant hogweed on agricultural land.

Policy name	English translation	Scale	EU or MS-based policy	Impact on SICS	Description of policy
Husdyrgødningsbekendtgørelsen, BEK nr 764 af 28/06/2012 Gældende	The Livestock Manure Order	National	MS	Integrated nutrient management	Farmers are directly impacted as rules on manure management, including length of holding time and application procedures are set forth and expected to be followed. The objective of the Order is to establish a set of rules and guidelines for livestock manure management that covers production, storage and use. Capacity and storage requirements stipulate that practices must meet the standards set forth in the Order of Farm's Use of Fertilizer and Plant Cover.