

Policy analysis:

Promoting SICS adoption in Podlasie, Poland

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Contents

Executive summary	3
1 Introduction.....	6
2 Analysis of policy shortcomings and opportunities in the Podlasie region, Poland	12
2.1 Which existing policies and policy instruments shape agricultural practices in Podlasie?... 13	
2.2 To what extent do existing policies facilitate adoption of soil-improving practices in Podlasie?	16
2.3 Which factors shape success or failure of policy instruments in Podlasie?.....	19
3 Recommendations for actions to promote the uptake of SICS.....	21
4 Annex: Overview of key policies in Poland.....	23

Tables

Table 1: Coverage of SICS in current national and regional policies, instruments, and measures in Podlasie, Poland	3
Table 2: Adoption barriers, enablers, and actions to increase uptake of the SICS tested at study site identified by stakeholders: To assess the effectiveness and feasibility of an action, a scale from 1 (not at all effective/feasible) to 4 (highly effective/feasible) was proposed but not applied in the stakeholder workshop due to time constraints	5
Table 3: List of promising general SICS.....	6
Table 4: Summary of policy approaches	7
Table 5: Organisations represented by interview partners	10
Table 6: Description of the study site.....	12
Table 7: Overview of experiments carried out in the Polish study site, and the SICS category and cluster under which they are grouped	12
Table 8: Coverage of SICS in current national and regional policies, instruments, and measures in Podlasie, Poland	18
Table 9: Adoption barriers, enablers, and actions to increase uptake of the SICS tested at study site identified by stakeholders.....	21

Figures

Figure 1: Research strategy	9
Figure 2: Types of stakeholders participating in the Polish adoption workshop	11

Policy	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
wymogi wzajemnej zgodności WPR: zazielenienie, wymagania dotyczące płatności)											
Rural Development Program for the years 2014-2020 (Program Rozwoju Obszarów Wiejskich na lata 2014-2020)											
Code of Good Agricultural Practice (Kodeks Dobrej Praktyki Rolniczej)											
Act on Organic Agriculture (Ustawy o rolnictwie ekologicznym)											
Environmental Protection Act (Ustawa Prawo ochrony środowiska)											
Act on Water (Ustawa Prawo Wodne)											
Waste Act (Ustawa o odpadach)											
Plant Protection Products Act (Ustawy o środkach ochrony roślin)											
Fertilisers Act (Ustawa o nawozach i nawożeniu)											
Nature Conservation Act (Ustawa o Ochronie Przyrody)											

Evidence gathered through interviews, desk research and a stakeholder workshop 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:

- Lack of economic benefits and incentives
- Limited access to manure
- Time needed to meet organic production standards
- Limited policy coherence
- Lack of knowledge about SICS
- Unfavorable environmental conditions

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

Table 2: Adoption barriers, enablers, and actions to increase uptake of the SICS tested at study site identified by stakeholders: To assess the effectiveness and feasibility of an action, a scale from 1 (not at all effective/feasible) to 4 (highly effective/feasible) was proposed but not applied in the stakeholder workshop due to time constraints

Fertilisation/amendments: cover crops, liming, manure	
Adoption factors (+ or -)	Actions
Energy v agriculture policy - the use of harvest residues for biogas production competing with the use in agriculture (-)	Improve the current policy, institutional, administrative, technical, and economic set up to enable organic agriculture to develop.
Low level of knowledge amongst farmers to support SICS adoption (-)	Awareness raising increase training and educational activities and support with a view to educate farmers about SICS and their benefits including organic agriculture.
Weak cooperation between advisory services and universities to promote soil quality problems and support SICS adoption (-)	Strengthen the cooperation between advisory services and universities to promote soil quality problems and support SICS adoption.
High price for conservation tillage implementation (-)	Improve economic attractiveness of implementing certain SICS such as cover crops and crop rotation and reduce technical barriers and stimulate the price for conservation tillage practical implementation
Limited access to organic fertilisers resulting from the separation of agricultural and livestock production (-)	Improve the current policy, institutional, administrative, technical, and economic set up to enable organic agriculture to develop

Recommendations for actions to promote the uptake of SICS

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

- **Subsidise transition to practices benefitting 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.
- **Increase policy coherence:** there needs to be coherence between different sectoral policies (e.g., energy and agriculture), as well as steps taken to ensure farmers can easily adopt new practices policies without undue administrative burdens.
- **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. 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.

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 1).

Table 3: 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 trafficking	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 4: 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

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
Economic instruments	Incentivise farmers to adopt SICS using payments and taxes etc.	<ul style="list-style-type: none"> • Encourages innovative methods • Can offset cost of implementation and/or discourage adverse behaviour • Allows a certain amount of flexibility 	<ul style="list-style-type: none"> • Can be subject to fluctuations as the market fluctuates • 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 Poland 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.

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 Polish 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.

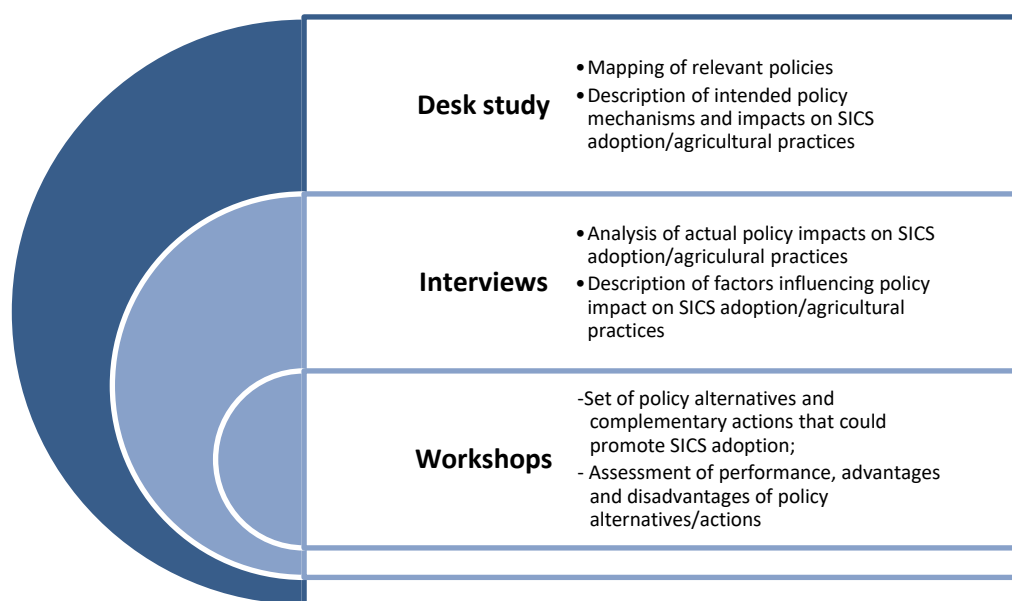


Figure 1: Research strategy

Data collection and analysis involved the following three activities:

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

⁵ The 16 countries include 14 EU Member States, i.e. Belgium, Germany, UK, France, Czech, Poland, Hungary, Romania, Denmark, Sweden, Greece, Spain, Italy, and Portugal and two non-EU countries, i.e. Switzerland and Norway.

policies potentially impacting the adoption of SICS in the study sites were identified. The aim of this step was to provide a broad overview of soil-related national and 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 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 Poland, three interviews were carried out (see Table 3).

Table 5: Organisations represented by interview partners

Organisation	Stakeholder category
Farmer producing certified organic hops	Farmer
Mayor of the Mielnik Commune	Regional/local government
Soil Science Society of Poland, Chairman of Lublin Branch	Research

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

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.

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

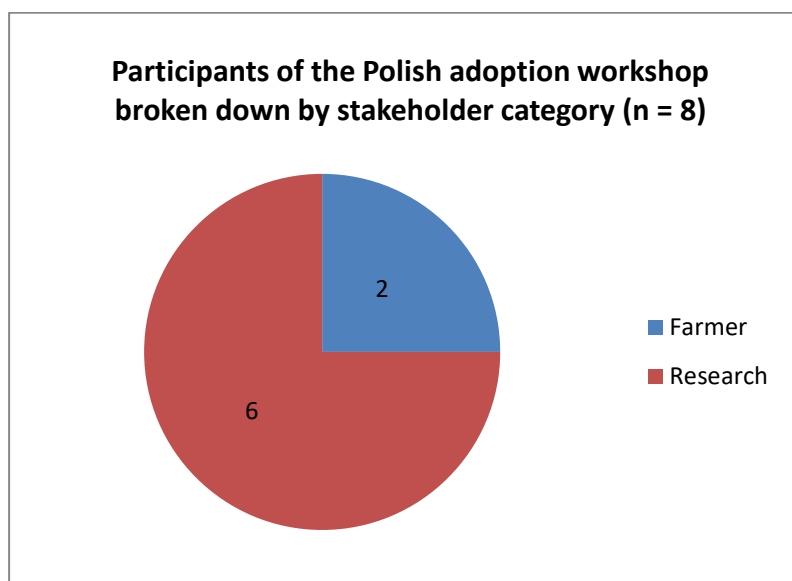


Figure 2: Types of stakeholders participating in the Polish adoption workshop

Report outline and where to find supplementary information

Section 2 of this report presents an analysis of policy instruments relevant for shaping agricultural practices in the Podlasie region in Poland, where the study site 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/outputs/deliverables>.

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

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

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

2 Analysis of policy shortcomings and opportunities in the Podlasie region, Poland

This section provides a review and analysis of national instruments relevant for shaping agricultural practices in the Podlasie region, Poland, where the study site, “Szaniawy”, is located. Policies investigated include both policies implementing EU instruments as well as those initiated by national and regional institutions⁹: The information is drawn from the policy inventories compiled by the Study Site Researchers as well as interviews and an adoption workshop conducted with key stakeholders.

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

Table 6: Description of the study site

Site Name	Szaniawy, Poland
Climate	Continental
Temperatures	Average annual air temperature is 7.3 °C
Soil type	Sandy and loamy soils are present.
Main soil threats	high acidity of soils, low Soil-organic matter content (SOM), water deficit during growing season, inadequate use of legume crops to increase Nitrogen fixation and reduce fertilizer needs.
Current practices	Conventional farming, tillage, some crop rotation, application of mineral fertilizers, animal manures or farmyard manure., rain-fed crop production. Pest management practices like trapping or weeding or selective spraying of pesticides.

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

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

General treatment category	SICS cluster ¹⁰	Experiments
Integrated nutrient management, cover crops	Fertilisation/ amendments	Soil management practices <ul style="list-style-type: none"> – Control- mineral fertilization – Liming (CaCO₃ 5,6 t/ha) – Cover crops (Lupines +Serradella + Phacellia, respectively: 130 + 30 + 4 kg/ha) – Manure (30t/ha) – Liming (CaCO₃ 5,6 t/ha) + Lupines + Serradella + Phacellia (130 + 30 + 4 kg/ha) + manure (10 t/ha)

⁹ See the Annex for a more detailed overview of the policies described in this section.

¹⁰ SICS are grouped into four clusters: (1) Soil-improving crops, (2) Fertilisation/amendments, (3) Soil cultivation, and (4) Alleviation of compaction.

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

A policy analysis at the national and regional level identified the following policies which may directly or indirectly shape agricultural practices in the Podlasie. The overview below 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 policy

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.

The following GAEC standards are relevant for soil protection in Poland¹¹:

- GAEC 4 requires farmers operating in areas at risk of water erosion¹² to grow winter cover crops (1 November to 15 February) on at least 30% of their arable land. In addition, green cover or mulch is required in inter-row spaces for perennial crops grown on slopes greater than 20°.
- GAEC 5 restricts ploughing on certain slopes.
- GAEC 6 bans stubble burning.
- GAEC 7 requires that ditches, ponds, and trees, are protected.

Greening requirements were first introduced in 2015 and apply to direct payments under Pillar 1 of the CAP. Cover cropping is one of the options farmers may implement for Ecological Focus Areas (EFAs). 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 Polish farmers can choose from includes five of the seven elements that can protect soils and soil carbon: fallow land, buffer strips, catch crops/green cover, afforested areas and short rotation coppice (SRC). In addition, Poland has designated 256,396 ha of environmentally sensitive permanent grassland (ESPG) within Natura 2000 areas but not outside of Natura 2000 sites. Farmers are not allowed to plough or convert this grassland.

In addition to these conditional payments, the **Rural Development Plan (RDP) 2014-2020**

¹¹ GAEC standards were first published in 2015 through the Regulation of the Minister of Agriculture and Rural Development on standards of good agricultural culture compatible with environmental protection and amended in 2018.

¹² Areas at risk of water erosion are listed in the annex of the ordinance.

provides funding for contractual, voluntary commitments by farmers to implement certain sustainable agricultural practices. The national RDP outlines priorities for allocating the € 13.6 billion of public money (€ 8.7 billion from the EU budget and € 4.9 billion of national co-funding) available over the seven-year funding period. The RDP funds actions under all six Rural Development priorities – with a particular emphasis on "Promoting the competitiveness of the agricultural and agro-industry sector" and "Restoring, preserving and enhancing ecosystems related to agriculture and forestry." For Focus Area (FA) 4C Soil erosion and management, the RDP establishes the target of "10.44% of agricultural land under contracts". Measures implemented through these contracts should improve biodiversity, water management or soil management and prevent soil erosion. Most funds under this priority are used for area-based payments to farmers for using environment/climate friendly management practices as well as to support physical investments. In addition, 7.99% of the agricultural land will be under contract for biodiversity, and 7.85% for water management. For FA 5C Carbon conservation and sequestration, Poland aims for only 0.02% of agriculture and forest land to be under management contracts contributing to carbon sequestration and conservation.¹³

In 2004, the Ministry of Agriculture and Rural Development and the Ministry of Environment Jointly published the **Code of Good Agricultural Practice** which aims to implement national, EU and international environmental legislation in agriculture, including e.g., the Nitrates Directive but also elements of the CAP. The Code formulates requirements to which a farmer must (or should) adapt his farm in accordance with the statutory provisions applicable in the EU. These standards mainly relate to fertiliser management, water and soil protection, the conservation of valuable habitats and species in agricultural areas and the protection of landscape values. Requirements should be implemented across all agricultural land, not just those areas that are covered by financial support programs. One chapter in the Code is dedicated to soil protection and includes guidance on preventing erosion and organic matter loss. Specific requirements are as follows:

- The optimal crop rotation should include three to four species on light soils and four to five species on heavy soils. The crop rotation should be designed in such a way that the largest possible arable area is under the plant cover all year round.
- Maintaining the appropriate structure through careful tillage and fertilisation, especially with natural fertilisers, to reduce soil compaction. It is recommended that a subsoiler be used every four years at a depth suitable for a given soil.
- The prerequisite for high quality products and high-quality plants is the guarantee of an optimal soil reaction for a certain species and the supply of the plants with all nutrients in an amount that is appropriate for a certain development stage of the plant. The content of available forms of phosphorus, potassium and magnesium in the soil and the pH of the soil should be checked at least every four years.

In recent years, organic farming in Poland has increased in both the number of farms as well

¹³ European Commission. 2014. Factsheet on 2014-2020 Rural Development Programme for Poland.
https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/key_policies/documents/rdp-factsheet-poland_en.pdf

as area under organic production. This is also reflected in the number of processing plants and the range of organic products available on the market. The requirements farmers have to meet in order to market their products as organic are detailed in the **Act on Organic Agriculture** which implements the EU Organic Regulation. In 2018, the Commission published a new Organic Regulation (EU) 2018/848 on organic production. Production rules detailed in Annex II of the Regulation include a section on soil management and fertilisation (Part I, section 1.9).

General environmental policy

Poland's **Environmental Protection Act** establishes general rules for the protection of the environment and formulates conditions for the use of its resources. It contains a chapter on "land surface protection" which the definition of land surface including inter alia soil. Rules detailed for land surface protection relate to the application of management practices protecting soil against water and wind erosion, the decline of organic matter content and excessive compaction, salinity, and acidification.

Water protection policy

Adopted in 2017, the **Act on Water** is the main piece of legislation in Poland to implement the EU Water Framework Directive. It regulates water management in line with the principle of sustainable development. The Act on Water Law plays an important role in soil protection as it regulates water management practices (mainly irrigation and drainage) that affect water balance in soils. The aim of water balance regulation, according to Article 70 of the Act on Law, is to "increase productivity of soil, facilitate its cultivation, and protect utilised agricultural land from flooding." The Act also protects water resources from pollution and by doing so it also protects soils (both topsoil and subsoil).

Waste and chemicals policy

The **Waste Act** transposes the EU Sewage Sludge Directive which regulates the application of municipal sewage sludge on agricultural land with the aim of preventing soil and water contamination with heavy metals. The Decree establishes restrictions on the volume of sludge and areas where it can be applied to land, its uses, composition, type of treatment in sewage treatment plants, and areas where sludge can be used.

The **Fertilisers Act** regulates the conditions and procedures for placing fertilisers on the market, covering those products not falling under the EU Fertilisers Regulation. It sets the maximum level of doses of nitrogen fertiliser at 170 kg of nitrogen in a pure ingredient per hectare of agricultural land.

The **Plant Protection Products Act** implements both the EU Sustainable Use of Pesticide Directives (SUPD) as well as the Plant Protection Products Regulation. The Act aims to ensure

that plant protection products are used in such a way that they do not endanger human health, animals, or the environment. It regulates a) the introduction of plant protection products on the market, b) the use of plant protection products, c) the confirmation of technical efficiency of equipment used for plant protection products, e) conducting training on plant protection products, f) collecting information on plant protection products poisoning. The Act also mandates Poland to develop a National Action Plan to Reduce the Risk Associated with the Use of Plant Protection Products. The first National Action Plan was published in 2013 and updated in 2018. Whilst the plan identifies the risk of soil (and water) pollution through plant protection products, no specific measures are recommended.

Nature protection policy

The **Nature Conservation Act** is the main legal tool for nature protection in Poland. It aims to conserve, ensure the sustainable use and restoration of natural resources. It protects soils from contamination, sealing and other threats as part of the landscape, fauna, and flora conservation measures. The Act includes the [conditional] obligations

- to conduct soil contamination analysis,
- to ban soil contamination and degradation within the limits of the protected areas
- to ban soil degradation in wild fauna or flora refugia
- to provide information on any undertaking affecting the water-soil balance in nature conservation areas
- to establish management rules of inanimate nature protective of soil profiles
- to ban soil degradation and land use change in national parks and wildlife reserves.

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

The main soil threats in the study site include:

- **Soil erosion**, due to conventional (plow) tillage on slopes, plant cultivation on steep slopes, inappropriate crop rotation.
- **Soil organic matter decline**, due to monoculture, limited organic fertilization, separation of agricultural and animal production, inadequate use of legume crops to increase nitrogen fixation and reduce fertiliser needs.
- **Soil compaction** caused by heavy equipment, working field with very low/high soil moisture, limited organic fertilization.
- **Soil acidification** due to limited soil liming and organic fertilisation.

SICS that are being tested at the study site are thought to address these soil threats and include integrated nutrient management measures and cover crops. They therefore represent

important practices that might benefit soil health in the region if widely taken up. This section takes the policies identified in the previous section and evaluates how they can mitigate the soil threats in the Polish study site region.

Cover crops

Cover crops are incentivised through GAEC 4 of the CAPs cross-compliance standards which farmers must meet to receive direct payments, although on certain areas: green cover is required in inter-row spaces for perennial crops grown on slopes greater than 20°, and farmers operating in areas at risk of water erosion¹⁴ must grow winter cover crops (1 November to 15 February) on at least 30% of their arable land. Cover cropping is included in the list of EFA options available to Polish farmers. In addition, area-based payments under FA 4C of the RDP may also be used to incentivise the use of cover crops.

Whilst the Act on Organic Agriculture which implements the EU Organic Regulation does not prescribe the use of cover cropping, it does oblige organic producers to maintain and enhance soil quality as well as prevent soil compaction and soil erosion. Whilst the revised 2018 EU Regulation is not yet reflected in the Polish Act on Organic Agriculture, the EU Regulation is directly applicable to all Member States. Production rules detailed in Annex II, Part I, Section 1.9 mandate that in organic plant production, the fertility and biological activity of the soil shall be maintained and increased: *“(a) except in the case of grassland or perennial forage, by the use of multiannual crop rotation including mandatory leguminous crops as the main or cover crop for rotating crops and other green manure crops.”*

Integrated nutrient management

Well-managed nutrient input is essential to address and prevent the loss of soil organic matter and to avoid acidification, which is an issue in the region of Podlasie. Nutrient input in agriculture is regulated through several pieces of legislation, mostly with a view to protecting water quality rather than soil. It is covered by most of the policies discussed in section 3.1, such as the organic production legislation, water protection legislation including legislation on fertiliser and sewage sludge use. For instance, the Code of Good Agricultural Practice establishes rules for the application of fertilisers across all agricultural land, not just those areas that are covered by financial support programs. In addition, both the Environmental Protection Act and the Nature Conservation Act establish requirements for or limit nutrient input on arable land and agricultural sites in protected areas, respectively. Organic producers need to comply with the new EU Organic Regulation which requires farmers to maintain and increase soil fertility through livestock manure and organic matter and bans the use of mineral fertilisers.

The table below provides an overview of policies promoting the full range of SICS covered by

¹⁴ Areas at risk of water erosion are listed in the annex of the ordinance.

Policy	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
Waste Act (<i>Ustawa o odpadach</i>)											
Plant Protection Products Act (<i>Ustawy o środkach ochrony roślin</i>)											
Fertilisers Act (<i>Ustawa o nawozach i nawożeniu</i>)											
Nature Conservation Act (<i>Ustawa o Ochronie Przyrody</i>)											

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

Research indicates that whilst several policies incentivise and regulate the application of cover crops and integrated nutrient management as well as other SICS, there are several factors that shape the success or failure of policy instruments in the Podlasie region in Poland. These factors include:

- Lack of economic benefits and incentives
- Limited access to manure
- Time needed to meet organic production standards
- Limited policy coherence
- Lack of knowledge about SICS
- Unfavorable environmental conditions

Lack of economic benefits and incentives

Stakeholders identified the costs of adopting new practices as a key barrier to changing agricultural methods: e.g., cover crops require the purchasing of additional seeds to plant (on top of the main crop), establishing crop rotations or introducing new crops into the rotation requires separate equipment for cultivation and harvesting various crops, and different equipment would also be needed for conservation tillage. Additional costs and/or time when implementing SICS were also mentioned as a factor hampering uptake of certain practices (e.g., mechanical weeding vs manual weeding). Stakeholders further noted that farmers could only see limited benefits of adopting new practices, explaining that there was for instance no

economic benefit of including legumes in crop rotation, and farmers therefore preferred to grow cereals (at the expense of the soil quality). In addition, fluctuating prices of agricultural products made farmers hesitate to change their production methods. One interviewee emphasised that organic production methods would particularly benefit from incentives with many farmers likely to make the transition if payments were made available.

Limited access to manure

Stakeholders highlighted limited access to manure as a limiting factor for sustainable nutrient management practices. In their view, this resulted from the decrease in the number of small farms with their own livestock and a moved to simplified crop rotations where cereal plants dominate at the expense of legumes. However, it was also highlighted that integrating crop and livestock was more labour-intensive systems than keeping cropping systems and animal production separate, and economies of scale are lost if farmers become more generalized rather than specialized.

Time needed to meet organic production standards

Interviewees identified long time periods involved from changing to standard production methods to organic production. They explained that there were long waiting times to meet the conditions for adapting fields from conventional to organic agriculture.

Limited policy coherence

Several interviewees highlighted the fact that crop residues were used for biogas production rather than to increase soil organic matter. This could suggest incoherence between energy and agricultural policies.

Lack of knowledge about SICS

Stakeholders noted that there was limited knowledge about the application of certain SICS as well as their benefits. The cooperation between advisory services and universities to promote soil quality issues was described as weak.

Unfavorable environmental conditions

Finally, environmental conditions might impede the uptake and effectiveness of certain SICS. For instance, limited water availability could be a barrier for the cultivation of catch crops/intercrops

The table below provide a summary of the stakeholder recommendations for actions to promote SICS adoption in the site.

Table 9: Adoption barriers, enablers, and actions to increase uptake of the SICS tested at study site identified by stakeholders¹⁵

Fertilisation/amendments: cover crops, liming, manure	
Adoption factors (+ or -)	Actions
Energy v agriculture policy - the use of harvest residues for biogas production competing with the use in agriculture (-)	Improve the current policy, institutional, administrative, technical, and economic set up to enable organic agriculture to develop.
Low level of knowledge amongst farmers to support SICS adoption (-)	Awareness raising increase training and educational activities and support with a view to educate farmers about SICS and their benefits including organic agriculture.
Weak cooperation between advisory services and universities to promote soil quality problems and support SICS adoption (-)	Strengthen the cooperation between advisory services and universities to promote soil quality problems and support SICS adoption.
High price for conservation tillage implementation (-)	Improve economic attractiveness of implementing certain SICS such as cover crops and crop rotation and reduce technical barriers and stimulate the price for conservation tillage practical implementation
Limited access to organic fertilisers resulting from the separation of agricultural and livestock production (-)	Improve the current policy, institutional, administrative, technical, and economic set up to enable organic agriculture to develop

3 Recommendations for actions to promote the uptake of SICS

SICS that are being tested at the study site include integrated nutrient management measures and cover crops and aim to address the main soil threats of soil erosion, loss of soil-organic matter, soil compaction and acidification.

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 study site in Podlasie, Poland. Based on this analysis, and feedback collected from stakeholder, it presented 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 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

¹⁵ Participants were asked to identify actions for the most important factors affecting SICS adoption; therefore, not all adoption factors were discussed in detail. To assess the effectiveness and feasibility of an action, a scale from 1 (not at all effective/feasible) to 4 (highly effective/feasible) was proposed but not applied in the workshop due to time limitations.

by the regional/local farm advisory services or municipalities.

- **Increase policy coherence:** there needs to be coherence between different sectoral policies (e.g., energy and agriculture), as well as steps taken to ensure farmers can easily adopt new practices policies without undue administrative burdens.
- **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. 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.
-

4 Annex: Overview of key policies in Poland

Policy name	English translation	Scale	EU- or MS based policy	SICS addressed	Description
Rozporządzenie Ministra Rolnictwa i Rozwoju Wsi r. w sprawie norm w zakresie dobrej kultury rolnej zgodnej z ochroną środowiska	Regulation on CAP GAEC Cross-compliance Standards	National	EU (CAP)	Crop rotation, green manures, cover crops, catch crops, reduced tillage, integrated landscape management	GAEC standards are in place since 2015 and were amended in 2018. Soil-relevant GAEC No. 4, 5, 6, and 7. <ul style="list-style-type: none"> GAEC 4 requires farmers operating in areas at risk of water erosion to grow winter cover crops (1 November to 15 February) on at least 30% of their arable land. In addition, green cover or mulch is required in inter-row spaces for perennial crops grown on slopes greater than 20°. GAEC 5 restricts ploughing on certain slopes. GAEC 6 bans stubble burning. GAEC 7 requires that ditches, ponds, and trees, are protected.
Normy i wymogi wzajemnej zgodności WPR: zazielenienie, wymagania dotyczące płatności	CAP Greening Payment Requirements	National	EU (CAP)	Crop rotation, green manures, cover crops, catch crops, integrated nutrient management, reduced tillage, integrated landscape management	The list of EFA elements which Polish farmers can choose from includes five of the seven elements that can protect soils and soil carbon: fallow land, buffer strips, catch crops/green cover, afforested areas, and short rotation coppice (SRC). Poland has designated 256,396 ha of environmentally sensitive permanent grassland (ESPG) within Natura 2000 areas but not outside of Natura 2000 sites. Farmers are not allowed to plough or convert this grassland.
Program Rozwoju Obszarów Wiejskich na lata 2014-2020	Rural Development Program for the years 2014-2020	Regional	EU (CAP)	Crop rotation, green manures, cover crops, catch crops, reduced tillage	It is recognized that in Poland soil quality influences the agricultural productivity of land, to the extent that 56% of agricultural land is classified as areas with natural constraints. Rural Development Plan (RDP) 2014-2020 provides funding for contractual, voluntary commitments by farmers to implement certain sustainable

Policy name	English translation	Scale	EU- or MS based policy	SICS addressed	Description
					<p>agricultural practices. The national RDP outlines priorities for allocating the € 13.6 billion of public money (€ 8.7 billion from the EU budget and € 4.9 billion of national co-funding) available over the seven-year funding period. The RDP funds actions under all six Rural Development priorities – with a particular emphasis on "Promoting the competitiveness of the agricultural and agro-industry sector" and "Restoring, preserving and enhancing ecosystems related to agriculture and forestry." For Focus Area (FA) 4C Soil erosion and management, the RDP establishes the target of "10.44% of agricultural land under contracts". Measures implemented through these contracts should improve biodiversity, water management or soil management and prevent soil erosion. Most funds under this priority are used for area-based payments to farmers for using environment/climate friendly management practices as well as to support physical investments. In addition, 7.99% of the agricultural land will be under contract for biodiversity, and 7.85% for water management. For FA 5C Carbon conservation and sequestration, Poland aims for only 0.02% of agriculture and forest land to be under management contracts contributing to carbon sequestration and conservation.</p>
Kodeks Dobrej Praktyki Rolniczej	Code of Good Agricultural Practice			Crop rotation, integrated nutrient management, reduced tillage, integrated	Released in 2004 by the Ministry of Agriculture and Rural Development jointly with the Ministry of Environment, the Code of Good Agricultural Practice aims to implement national, EU and international environmental legislation in

Policy name	English translation	Scale	EU- or MS based policy	SICS addressed	Description
				pest management	<p>agriculture. The Code formulates requirements to which a farmer must or should adapt his farm in accordance with the statutory provisions applicable in the EU. These standards mainly relate to fertiliser management, water and soil protection, the conservation of valuable habitats and species in agricultural areas and the protection of landscape values. The principles should be implemented across the farm, including agricultural land that is not covered by financial support programs. One chapter in the Code is dedicated to soil protection, including guidance on preventing erosion and organic matter loss as well as recognition of the importance of soil biodiversity. Specific requirements are as follows:</p> <ul style="list-style-type: none"> - The optimal crop rotation should include 3-4 species on light soils and 4-5 species on heavy soils. The crop rotation should be designed in such a way that the largest possible arable area is under the plant cover all year round. - Maintaining the appropriate structure through careful tillage and fertilization, especially with natural fertilisers, to reduce soil compaction. It is recommended that a subsoiler be used every 4 years at a depth suitable for a given soil. - The prerequisite for the production of high quality and high quality plants is the

Policy name	English translation	Scale	EU- or MS based policy	SICS addressed	Description
					<p>guarantee of an optimal soil reaction for a certain species and the supply of the plants with all nutrients in an amount that is appropriate for a certain development stage of the plant. The content of available forms of phosphorus, potassium and magnesium in the soil and the pH of the soil should be checked at least every four years.</p>
Ustawy o rolnictwie ekologicznym	Act on Organic Agriculture	National	EU (Organic Regulation)	Crop rotation, green manures, cover crops, catch crops, reduced tillage, integrated nutrient management, integrated landscape management	The Act on Organic Agriculture implements the rules of the EU Organic Regulation. In 2018, the Commission published a new Organic Regulation (EU) 2018/848 on organic production. Production rules detailed in Annex II of the Regulation include a section on soil management and fertilisation (Part I, section 1.9). Whilst the revised 2018 EU Regulation is not yet reflected in the Polish Act on Organic Agriculture, the EU Regulation is directly applicable to all Member States.
Ustawa Prawo ochrony środowiska	Environmental Protection Act	National	MS	Integrated nutrient management, integrated pest management	Poland's Environmental Protection Act, adopted in 2001, establishes general rules for the protection of the environment and formulates conditions for the use of its resources. It contains a chapter on "land surface protection" which the definition of land surface including inter alia soil. Rules detailed for land surface protection relate to the application of management practices protecting soil against water and wind erosion, the decline of organic matter content and excessive compaction, salinity, and acidification. The Act contains the obligation to establish a

Policy name	English translation	Scale	EU- or MS based policy	SICS addressed	Description
					contaminated land inventory, and in 2016, the Ordinance on the Method for Assessing Land Contamination was published.
Ustawa Prawo Wodne	Act on Water	National	EU (WFD)	Integrated nutrient management, integrated pest management	Adopted in 2017, the Act on Water Law is the main piece of legislation in Poland to implement the EU Water Framework Directive. It regulates water management in line with the principle of sustainable development. The Act on Water Law plays an important role in soil protection as it frames the water management practices (mainly irrigation and drainage) that affect water balance in soils. The aim of water balance regulation, according to Article 70 of the Act on Law, is to "increase productivity of soil, facilitate its cultivation, and protect utilised agricultural land from flooding." The Act also protects water resources and soils from pollution and by doing so it also protects soils (both topsoil and subsoil).
Ustawa o odpadach	Waste Act	National	EU (Sewage Sludge Directive)	Integrated nutrient management, integrated pest management	The Waste Act transposes the EU Sewage Sludge Directive which regulates the application of municipal sewage sludge on agricultural land with the aim of preventing soil and water contamination with heavy metals. The Decree establishes restrictions on the volume of sludge and areas where it can be applied to land, its uses, composition, type of treatment in sewage treatment plants, and areas where sludge can be used.
Ustawy o środkach ochrony roślin	Plant Protection Products Act	National	EU (Sustainable Use of Pesticides Directive & Plant Protection Products Regulation)	Smart weed control, integrated pest management	This Act implements both the EU Sustainable Use of Pesticide Directives (SUPD) as well as the Plant Protection Products Regulation. The Act aims to ensure that plant protection products are used in such a way that they do not endanger human health,

Policy name	English translation	Scale	EU- or MS based policy	SICS addressed	Description
					animals, or the environment. It regulates a) the introduction of plant protection products on the market, b) the use of plant protection products, c) the confirmation of technical efficiency of equipment used for plant protection products, e) conducting training on plant protection products, f) collecting information on plant protection products poisoning. The Act also mandates Poland to develop a National Action Plan to Reduce the Risk Associated with the Use of Plant Protection Products. The first National Action Plan was published in 2013 and updated in 2018. Whilst the plan identifies the risk of soil (and water) pollution through the use of plant protection products, no specific measures are recommended.
Ustawa o nawozach i nawożeniu	Fertilisers Act	National	EU (Fertilisers Regulation)	Integrated nutrient management	The Act regulates the conditions and procedures for placing fertilisers on the market, covering those products not falling under the EU Fertilisers Regulation. It sets the maximum level of doses of nitrogen fertiliser at 170 kg of nitrogen in a pure ingredient per hectare of agricultural land.
Ustawa o Ochronie Przyrody	Nature Conservation Act	National	MS	Integrated nutrient management, integrated pest control	The Nature Conservation Act is the main legal tool for nature protection in Poland. It aims at conservation, sustainable use and renewal of natural resources. It protects soils from contamination, sealing and other threats as part of the landscape, fauna, and flora conservation measures. The Act includes the [conditional] obligation to conduct soil contamination analysis, "ban of soil contamination and degradation within the limits of the protected areas" "ban of soil degradation in wild fauna or flora refugia" "provision of information on any



Policy name	English translation	Scale	EU- or MS based policy	SICS addressed	Description
					undertaking affecting water-soil balance in the selected nature conservation areas", "management rules of inanimate nature protective of soil profiles" "ban of soil degradation and land use change in national parks and wildlife reserves.

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