

Policy analysis:

Promoting SICS adoption in Prague - Ruzyne, Czech Republic

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17	Instituto Politecnico De Coimbra	IPC/ESAC	Spain
18	National Research and Development Institute for Soil Science, Agrochemistry and Environmental Protection	ICPA	Romania
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Contents

- Executive summary 2
- 1 Introduction..... 5
- 2 Analysis of policy shortcomings and opportunities in Prague Ruzyne, CZ..... 9
 - 2.1 Which existing policies and policy instruments shape agricultural practices in Ruzyne, Czech Republic? 10
 - 2.2 To what extent do existing policies facilitate adoption of soil-improving practices in Prague-Ruzyne? 12
 - 2.3 Which factors shape success or failure of policy instruments in Prague-Ruzyne? 14
- 3 Recommendations for actions to promote the uptake of SICS..... 15
- Annex: Overview of key policies in Prague - Ruzyne, CZ..... 17

Tables

- Table 1: SICS addressed by key policies, Prague-Ruzyne (CZ) 2
- Table 2: List of promising general SICS..... 5
- Table 3: Summary of policy approaches 6
- Table 4: Description of the study site..... 9
- Table 5: Overview of experiments carried out in the Czech study site, and the SICS category and cluster under which they are grouped 10
- Table 6: SICS addressed by key policies, Prague-Ruzyne (CZ) 14

Figures

- Figure 1: Research strategy 8



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
znění pozdějších předpisů (Act on Fertilisers Use)											
Zákon 254/2001 Sb., o vodách a o změně některých zákonů (vodní zákon), ve znění pozdějších předpisů (Water Act)											
Předpis č. 262/2012 Sb., Nařízení vlády o stanovení zranitelných oblastí a akčním programu, novelizováno nařízením vlády č. 277/2020 Sb. (Ordinance Concerning the Establishment of Vulnerable Zones and Action Plan)											
Zákon 223/2015 Sb., kterým se mění zákon č. 185/2001 Sb., o odpadech a o změně některých dalších zákonů, ve znění pozdějších předpisů (Waste Act)											

Research and stakeholders 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:

- The Regulatory framework is perceived as complex and excessive by farmers
- Weak/incorrect enforcement of policy measures
- Cost of modern machinery for soil-improving cultivation methods
- Existing non-governmental bodies have the potential of facilitating change

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:

- **Review, if needed adapt and effectively communicate policy requirements:** Highly complex legislation and possibly a lack of policy coherence mean that the existing regulations do not inspire adoption. In addition, compliance with regulation in the study site region is seen as being burdensome rather than rewarding, which is an additional barrier to adoption. Farmers struggle to interpret and comply with rules.
- **Offer regular training and information services to keep farmers informed about new developments and insights:** dissemination of knowledge, awareness raising, and education are important components of policy interventions and they should be used in parallel with economic and legislative instruments. Regular training,

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

- **Engage with farmers and trusted organisations to deliver advice and training:** peer to peer learning and bottom-up initiatives are powerful tools to deliver knowledge to farmers as they play a great degree of trust in their fellow producers. Partnering with farmers willing to pioneer new techniques or trusted organisations, such as the Czech Agrarian Chamber, will ensure that target audiences are reached, and new information is heard.
- **Improve policy monitoring and enforcement:** while it was found that there are a number of policies already in place that – directly and indirectly - regulate and incentivise different SICS, stakeholders report that outcomes on soil health are limited due to weak enforcement mechanisms. It is clear mechanisms for checking compliance with existing regulations need to be strengthened and expanded. Regulatory instruments need to be monitored and effective sanctions put in place for non-compliance in order to be successful in prompting adoption. This needs to include the training of farm inspectors who, like farmers, need to understand the regulatory requirements and their practical implementation.
- **Subsidise transition to sustainable practices:** the uptake of certain SICS, such as reduced tillage, might require upfront investments, such as the purchasing of additional seeds and new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a 'machinery exchange'. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.

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, soil structure (mainly through root systems of legumes growing) 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 and pH value 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
Reduced tillage	Reduces energy cost and may enhance SOM content

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
	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 success 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 using subsidies 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 	<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)

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
		flexibility	<ul style="list-style-type: none"> • 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.

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

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.

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.

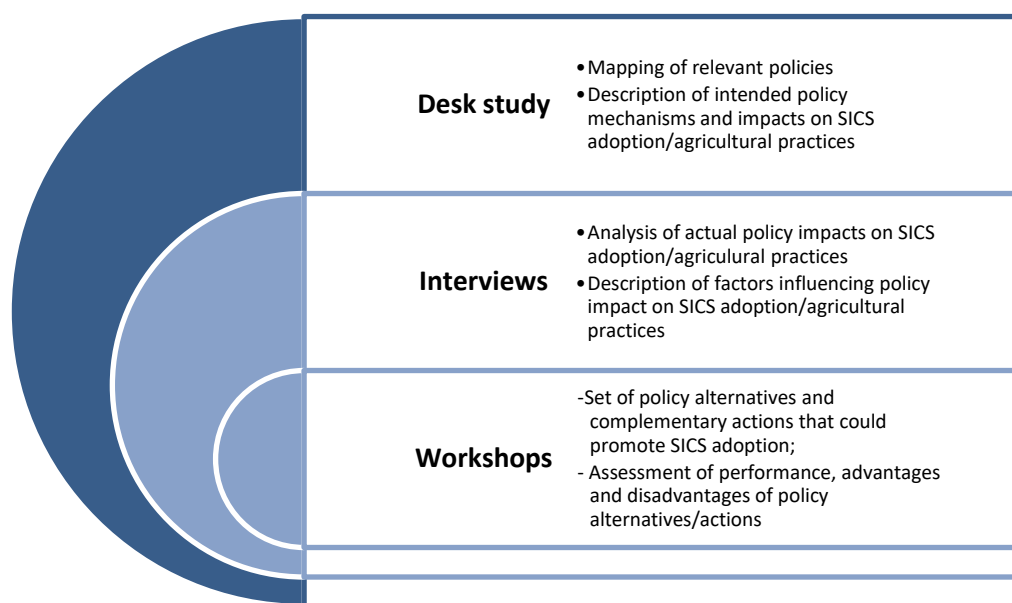


Figure 1: Research strategy

Data collection and analysis involved the following three activities:

- 1. Interviews with selected national and regional policymakers and stakeholders:** based on this analysis, Study Site Researchers then conducted interviews with policy-makers and stakeholders using a semi-structured interview guide. In the Czech Republic, one interview was carried out involving a representative from the Agricultural cooperative farm in the region Ústí nad Labem.
- 2. An adoption workshop with national and regional policymakers and stakeholders:** To develop and assess policy alternatives, the Study Site Research Teams organised a stakeholder workshop in each site, following a common guidance document which detailed the structure and methods for the event. Study site teams mostly invited those stakeholders they were already working with, either within the context of SoilCare or as part of their regular engagement activities. The Czech

workshop brought together 27 stakeholders, which included primarily farmers and farmer organisations, representatives of agricultural companies (agricultural machinery manufacturers and fertilisers companies) as well as researchers.

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 Prague - Ruzyne where the Czech study site is located.⁶ 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 Prague Ruzyne, CZ

This section provides a review and analysis of national instruments relevant for shaping agricultural practices in the region of Prague - Ruzyne where the study site is located. Policies investigated include both policies implementing EU instruments as well as those initiated by national and regional institutions⁷: 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 4: Description of the study site

Site Name	Ruzyne, Prague
Climate	continental
Temperatures	annual average temp. 7.9°C
Soil type	brown soil (Luvisol)
Main soil threats	soil compaction; decrease in SOC and deterioration of soil structure; limited water infiltration; erosion; unexpected weather events (drought, thunderstorms, heavy rains)

⁶ See D7.1 at <https://www.soilcare-project.eu/outputs>

⁷ See the Annex for a more detailed overview of the policies described in this section.

Current practices

Conservation tillage such as reduced or no-tillage. Some soil treatments and crop rotation, minimum pesticide use, tillage trials

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

Table 5: Overview of experiments carried out in the Czech study site, and the SICS category and cluster under which they are grouped

General treatment category	SICS cluster ⁸	Experiments
Reduced tillage, integrated nutrient management	Soil cultivation, Fertilisation/Amendments	Manure; catch crops and growing legumes

2.1 Which existing policies and policy instruments shape agricultural practices in Ruzyně, Czech Republic?

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. 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.

Through conditional payments under cross-compliance farmers are required to adopt various soil protection measures such as crop sequences, nutrient management, crop rotation, landscape management and tillage management.

The following GAECs are relevant for soil protection in the Czech Republic.

- GAEC 4 concerns minimum soil cover;
- GAEC 5 concerns minimum land management;
- GAEC 6 concerns maintenance of soil organic matter;
- GAEC 7 concerns retention of landscape features.

Greening requirements were first introduced in 2015 and apply to direct payments under

⁸ SICS are grouped into four clusters: (1) Soil-improving crops, (2) Fertilisation/amendments, (3) Soil cultivation, and (4) Alleviation of compaction.

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 farmers in the Czech Republic can choose from includes: land lying fallow, terraces, catch crops/green cover, afforested areas and short rotation coppice (SRC).

As part of cross-compliance measures, the **Anti-Water Erosion Measures Guidance** from 2017⁹ addresses the issue of erosion as one of the significant soil threats in the Czech Republic. The guidance addresses GAEC 1 and 2 and contains a number of anti- water and anti- wind erosion measures:

- no-tillage sowing / planting (technology direct seeding in raw land)
- sowing / planting mulch
- sowing / planting in shallow stubble,
- sowing / planting into protecting crop

Water policies

The Water Framework Directive is implemented through the **Water Act** (Zákon 254/2001 Sb., o vodách a o změně některých zákonů), [ve znění pozdějších předpisů](#).

The landowners are obliged to ensure the status of water on their land is not degraded by preventing soil erosion (caused by water) and improving the water retention capacity of the land. In addition, the Water Act prohibits soil contamination when handling hazardous substances and an obligation to ensure these substances do not leak into waste or rain water. The Act also defines vulnerable areas according to the Nitrates Directive (91/676/EEC).

A second relevant EU-level water policy, the Nitrates Directive, is implemented in the Czech Republic primarily through the **Order Concerning the Establishment of Vulnerable Zones and Action Plan**. This Order creates vulnerable zones and the Action Plan applicable to these zones. The Order sets the time periods during which the use of fertilizers containing nitrates on vulnerable zones is not allowed (§ 6). It also sets the maximum usage of nitrates in the soil per year (170 kg N/ha). § 10 prescribes that in order to limit the soil erosion and loss of organic matter, the period of no crops has to be eliminated and requires the farmer to change crops periodically. It also prohibits growing certain crops on the soil that is highly prone to erosion and limits the use of nitrates on these soils (§ 11).

Two types of measures are defined: 1) responsibilities stemming from the Action Plan- only applicable in vulnerable zones and (2) codes of good agricultural practice – in every other area of the Czech Republic.

Another piece of legislation which aims to protect water as well as soil is the **Act on Fertilisers Use** (Předpis č. 156/1998 Sb. , Zákon o hnojivech, pomocných půdních látkách,

⁹ http://eagri.cz/public/web/file/550337/MZE_prirucka_ochrany_proti_erozi_zemedske_pudy_2017.pdf

pomocných rostlinných přípravcích a substrátech a o agrochemickém zkoušení zemědělských půd), [ve znění pozdějších předpisů](#).

Under this Act farmers have to keep a set of rules and conditions for storage and application (limits and periods) of different fertilisers (organic and inorganic). Indirectly farmers are affected by different inspection systems for observing of quality and capacity of storage facilities, administrative activities for data recording (checking system-evidence of fertilisers using). The purpose of the Act is to prevent contamination of the soil through ensuring that the use of fertilisers, some treated sewage sludge and ground sediments is applied in compliance with the limits set out in the legislation. This Act implements the Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture, and Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources. The Central Institute for Supervising and Testing in Agriculture is responsible for regular (in 6 years intervals) testing of agricultural soils in relation to specific parameters of the soil fertility levels stemming from fertilizers, sewage sludge and sediments use.

Waste policies

The Waste Framework Directive was transposed in the Czech Republic by the **Waste Act** (Zákon 223/2015 Sb., kterým se mění zákon č. 185/2001 Sb., o odpadech a o změně některých dalších zákonů, [ve znění pozdějších předpisů](#)).

In relation to soil, this Act deals with the obligations concerning the use of sewage sludge from waste water treatment facilities. The use of treated sewage sludge is permitted only when it does not worsen the quality of soil and quality of underground and ground waters. The Act also spells out certain types of soils where the use of sewage sludge is forbidden e.g. on the agricultural land which is part of the protected area. Ministry of Environment together with the Ministry of Agriculture set, inter alia, legally binding limits for hazardous substances in the soil, sewage sludge and technical conditions for the use of sludge in the soil. This Act is supplemented by the Regulation No. 382/2001 Coll. of the Ministry of Environment which provides details on the application of treated sewage sludge into the soil (technical conditions, threshold values, analysis methods).

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

The main soil threats in region where the study site is located include:

- soil compaction;
- decrease in SOM and deterioration of soil structure; and small input of SOM into the soil;
- erosion.

SICS that are being tested within the context of the SoilCare project include application of manure; use of catch crops and growing of legumes and are thought to alleviate the soil threats identified above. In addition, several long-term experiments (LTE) with various tillage methods (conventional, reduced and no tillage), as well as different fertiliser applications and organic farming methods are being carried out in the study site. Convenient crop rotation systems are also used, which include the use of legumes and other soil improving crops. By-products (post-harvest residues) are left on the fields to recover nutrients and organic matter. The methods trialed through the SoilCare and LTE therefore present 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 address the SICS tested in the Czech study site region.

Crop rotation/cover crops/residue management/reduced tillage

In the Czech Republic, crop rotation is encouraged in water (and soil) protection policies such as the Water Act, and Order Concerning the Establishment of Vulnerable Zones and Action Plan as well as CAP, both GAEC cross-compliance standards and measures related to greening payments. The use of cover crops, mulching and reduced tillage is addressed to a slightly smaller extent in the CAP in both cross-compliance measures and greening payments requirements.

Integrated nutrient management

Well managed nutrient input is essential to address and prevent the loss of soil organic matter which is an issue in the study site. Nutrient management is regulated and incentivised by several policies, policies such as the CAP (GAEC 6), the Water Act and Action Plan related to the use of nitrates (ban on certain use of nitrates fertilisers), the Fertilisers Act (restriction on certain use of fertilisers) as well as the Waste Act concerned, inter alia, with the application of sewage sludge in the agricultural land.

The table below provides an overview of policies promoting the full range of SICS covered by the SoilCare project (shaded in light green) and the SICS (including the LTE) tested at the study site (shaded in dark green). The analysis shows that all of the identified policies regulate and incentivise the SICS trialed to some degree. The use of crop rotation, green manure, and reduced tillage practices are incentivised through CAP GAEC Cross-compliance Standards, greening payments and are further specified by the national Anti-Water Erosion Measures Guidance. CAP cross-compliance establishes nutrient management requirements for farmers receiving direct payments. In addition, water policies place limitations on fertiliser use in certain areas.

Table 6: SICS addressed by key policies, Prague-Ruzyne (CZ)

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
CAP GAEC Cross-compliance Standards											
CAP Greening payments requirements 1st Pillar , EFAs											
Cross-compliance, PŘÍRUČKA OCHRANY PROTI VODNÍ EROZI (<i>Anti-Water Erosion Measures Guidance</i>)											
Předpis č. 156/1998 Sb. , Zákon o hnojivech, pomocných půdních látkách, pomocných rostlinných přípravcích a substrátech a o agrochemickém zkoušení zemědělských půd (zákon o hnojivech), ve znění pozdějších předpisů (<i>Act on Fertilisers Use</i>),											
Zákon 254/2001 Sb., o vodách a o změně některých zákonů (vodní zákon), ve znění pozdějších předpisů (<i>Water Act</i>),											
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Zákon 223/2015 Sb., kterým se mění zákon č. 185/2001 Sb., o odpadech a o změně některých dalších zákonů, ve znění pozdějších předpisů (<i>Waste Act</i>),											

2.3 Which factors shape success or failure of policy instruments in Prague-Ruzyne?

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

- **The Regulatory framework is perceived as complex and excessive by farmers:** stakeholders emphasised that SICS were regulated by multiple laws, including the Water Act. Rules were perceived as quite complex and difficult to understand for many farmers. It was pointed out that it was unclear to farmers how to interpret some of the rules and the conditions they are supposed to meet.
- **Weak/incorrect enforcement of policy measures:** as pointed out above, a complex regulatory framework stemming from e.g. the Nitrates Directive, the Act on plant

protection and pesticides use, and Water Act hampers compliance and thus limits the achievement of the positive impacts intended by the various policy instruments. Weak enforcement of these policies limits their impacts on the ground. In this context, it was mentioned that sometimes individual inspectors lack understanding of the funding requirements, e.g. in the case of the CAP, and stakeholders report that this has led to an unjustified reduction of subsidies in some cases.

- **Cost of modern machinery for soil-improving cultivation methods** : stakeholders identified the costs of purchasing new equipment and technology as financial factors impeding the wider uptake of certain SICS, such as reduced tillage tested in the study site.
- **Existing non-governmental bodies have the potential of facilitating change**: there are already a number of non-governmental bodies, such as the Czech Agrarian Chamber, dedicated to the issue of agricultural policy and farming, which could support the transition to more sustainable agricultural practices, e.g. through educational offers to farmers.

3 Recommendations for actions to promote the uptake of SICS

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 Prague-Ruzyne in the Czech Republic. SICS that are being tested at the study site - manure; catch crops and growing legumes - are thought to be suitable to address the main soil threats of soil erosion, soil compaction and loss of SOM.

The analysis shows that the existing policy framework promotes all these relevant SICS to some extent but also identifies some barriers to achieving higher adoption rates. Firstly, all identified relevant measures take the form of a ban/restriction-type of legislation or are linked with financial reward for undertaking the soil-promoting activity (e.g. CAP). There are no other measures, legislative or policy, which would encourage positive change in farmers' behavior through educational activities, trainings and learning about benefits of certain 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:

- **Review, if needed adapt and effectively communicate policy requirements**: Highly complex legislation and possibly a lack of policy coherence mean that the existing regulations do not inspire adoption. In addition, compliance with regulation in the study site region is seen as being burdensome rather than rewarding, which is an additional barrier to adoption. Farmers struggle to interpret and comply with rules.
- **Offer regular training and information services to keep farmers informed about new developments and insights**: dissemination of knowledge, awareness raising,

and education are important components of policy interventions and they should be used in parallel with economic and legislative instruments. Regular training, informative sessions on latest innovations are preferred to one off training sessions which have limited impact.

- **Engage with farmers and trusted organisations to deliver advise and training:** peer to peer learning and bottom-up initiatives are powerful tools to deliver knowledge to farmers as they play a great degree of trust in their fellow producers. Partnering with farmers willing to pioneer new techniques or trusted organisations, such as the Czech Agrarian Chamber, will ensure that target audiences are reached, and new information is heard.
- **Improve policy monitoring and enforcement:** while it was found that there are a number of policies already in place that – directly and indirectly - regulate and incentivise different SICS, stakeholders report that outcomes on soil health are limited due to weak enforcement mechanisms. It is clear mechanisms for checking compliance with existing regulations need to be strengthened and expanded. Regulatory instruments need to be monitored and effective sanctions put in place for non-compliance in order to be successful in prompting adoption. This needs to include the training of farm inspectors who, like farmers, need to understand the regulatory requirements and their practical implementation.
- **Subsidise transition to sustainable practices:** the uptake of certain SICS, such as reduced tillage, might require upfront investments, such as the purchasing of additional seeds and new machinery. Grants should be made available to farmers buying new equipment to implement these practices or groups of farmers intending to set up a 'machinery exchange'. Such an exchange could also be set up and managed by the regional/local farm advisory services or municipalities.

Annex: Overview of key policies in Prague - Ruzyne, CZ

Policy name	English translation	Scale	Initiated by EU or MS level	Impact on SICS	Description of policy
CAP GAEC Cross-compliance Standards	n/a	National	EU	Integrated nutrient management, crop rotation, integrated landscape management, reduced tillage	Under the cross-compliance standards farmers have to keep a set of rules and conditions for their farming (crop rotations, nutrient management, pest management, livestock management, etc.). Indirectly farmers (and their farming) are affected by different monitoring and inspection systems.
CAP Greening payments requirements 1st Pillar , EFAs	n/a	National	EU	Integrated landscape management crop rotation, green manure, cover crops, and catch crops	Greening requirements are set out in Regulation (EU) 1306/2013 (Chapter 4), and the associated delegated acts, implementing regulations and Commission guidance to Member States. Ecological Focus Areas (EFAs)- fallow, terraces, catch crops/green cover, afforested areas and short rotation coppice (SRC).
Cross-compliance, PŘÍRUČKA OCHRANY PROTI VODNÍ EROZI	Anti-Water Erosion Guidance	National	EU	Crop rotation, reduced tillage, smart residue management, green manures, cover crops, and catch crops,	The guidance (January 2014) specifies the requirements for GAEC 1 and 2 as follows: <ul style="list-style-type: none"> - no-tillage sowing / planting (technology direct seeding in raw land) - sowing / planting mulch - sowing / planting in shallow stubble, - sowing / planting into protecting crop - Dimpling plus more specific ones in the document
Předpis č. 156/1998 Sb. , Zákon o hnojivech, pomocných půdních látkách, pomocných rostlinných přípravcích a substrátech a o agrochemickém zkoušení zemědělských půd, ve znění pozdějších	Act on Fertilisers Use	National	EU	Integrated nutrient management	Under this Act, farmers have to respect a set of rules and conditions for storage and application (limits and periods) of different fertilisers (organic and inorganic). Indirectly farmers (and their farming) are affected by different inspection systems for observing of quality and capacity of storage facilities, administrative activities for data recording (checking system-evidence of fertilisers using). The purpose of the Act is to prevent contamination of the soil through ensuring that the use of fertilizers, some treated sewage sludge and ground sediments is applied in compliance with the limits set out in the relevant legislation. This Act implements the COMMISSION REGULATION (EU) 2016/1618 related to fertilizers, Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture, and Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources. The Central Institute for Supervising and Testing in Agriculture is responsible for regular (in 6 years intervals) testing of agricultural soils in

předpisů (zákon o hnojivech)					relation to specific parameters of the soil fertility levels stemming from fertilizers, sewage sludge and sediments use.
Zákon 254/2001 Sb., o vodách a o změně některých zákonů, ve znění pozdějších předpisů (vodní zákon)	Water Act	National	EU	Crop rotation, integrated nutrient management	In Part V the Act deals with the protection of water status and water sources. The landowners are obliged to ensure the status of the water on their land is not degraded by preventing soil erosion (caused by water) and improving the water retention capacity of the land. The Act, in accordance with soil protection, also defines vulnerable areas according to the Nitrates Directive (91/676/EEC). In implementing this Directive, Government adopts an Action Programme for these types of territories which include the use and storing of fertilizers, changing of crops and anti-erosion measures. In addition, the Water Act prohibits soil contamination when handling hazardous substances and an obligation to ensure these substances do not leak into waste or rain water. In accordance with the implementation of the Nitrates Directive, two types of measures are defined: 1) responsibilities in the Action Programme - only in vulnerable zones (eg. use of fertilizers, manure storage, changing of crops and anti-erosion measures- § 33), 2) codes of good agricultural practice - over the total area of the MS.
Předpis č. 262/2012 Sb., Nařízení vlády o stanovení zranitelných oblastí a akčním program, novelizováno nařízením vlády č. 277/2020 Sb.	Order Concerning the Establishment of Vulnerable Zones and Action Plan	National	EU	Integrated nutrient management, crop rotation, integrated landscape management	This Order transposes the Nitrates Directive and creates vulnerable zones and the Action Plan applicable to these zones. The Order sets the time periods during which the use of fertilizers containing nitrates on vulnerable zones is not allowed (§ 6). It also sets the maximum usage of nitrates in the soil per year (170 kg N/ha). § 10 prescribes that in order to limit the soil erosion and loss of organic matter, the period of no crops has to be eliminated and requires the farmer to change crops periodically. It also prohibits growing certain crops on the soil that is highly prone to erosion and limits the use of nitrates on these soils (§ 11).
Zákon 223/2015 Sb., kterým se mění zákon č. 185/2001 Sb., o odpadech a o změně některých dalších zákonů, ve znění pozdějších předpisů	Waste Act	National	EU	Integrated nutrient management	In relation to soil, §33 deals with the obligations concerning the use of sewage sludge from waste water treatment facilities. It states that a person is only allowed to use treated sewage sludge which does not worsen the quality of soil and quality of underground and ground waters. The Act also spells out certain types of soils where the use of sewage sludge is forbidden e.g. on the agricultural land which is part of the protected area . Ministry of Environment together with the Ministry of Agriculture set, inter alia, legally binding limits for hazardous substances in the soil, sewage sludge and technical conditions for the use of sludge in the soil. This Act is supplemented by the Regulation No. 382/2001 Coll. of the Ministry of Environment which provides details on the application of treated sewage sludge into the soil (technical conditions, threshold values, analysis methods).