

# Agri-environmental indicator - soil cover

Statistics Explained

Data extracted in June 2020.

Planned update: 2025

**" In 2016, 23 % of arable land in the EU was left as bare soil without any vegetation cover during winter. Soil cover limits the risk of soil erosion, nutrient and pesticide run-off. "**

**" During winter, almost half of the arable land (46 %) was covered by normal winter crops in the EU in 2016; in the warm regions Cyprus and Malta, the majority of arable land is covered during winter. "**

**" The share of permanent grassland, a year-round soil cover, increased strongly in Ireland (11.6 percentage points) and Lithuania (6.7 p.p.) between 2013 and 2016. "**

This article provides a fact sheet of the [European Union \(EU\) agri-environmental indicator soil cover](#) . It consists of an overview of data, complemented by information needed to interpret these data. This article on soil cover in the EU is part of a [set of similar fact sheets](#) , providing a comprehensive picture of the integration of environmental concerns into the [Common Agricultural Policy \(CAP\)](#) . This article reports on [soil cover](#) during winter, i.e. to keep agricultural land with a cover of winter crops, crop residues or catch/cover crops. This is important for preventing nutrient and [pesticide](#) run-off, and soil erosion. Keeping agricultural land covered may improve soil fertility and help mitigate the effects of climate change through the preservation and increased sequestration of soil organic carbon.

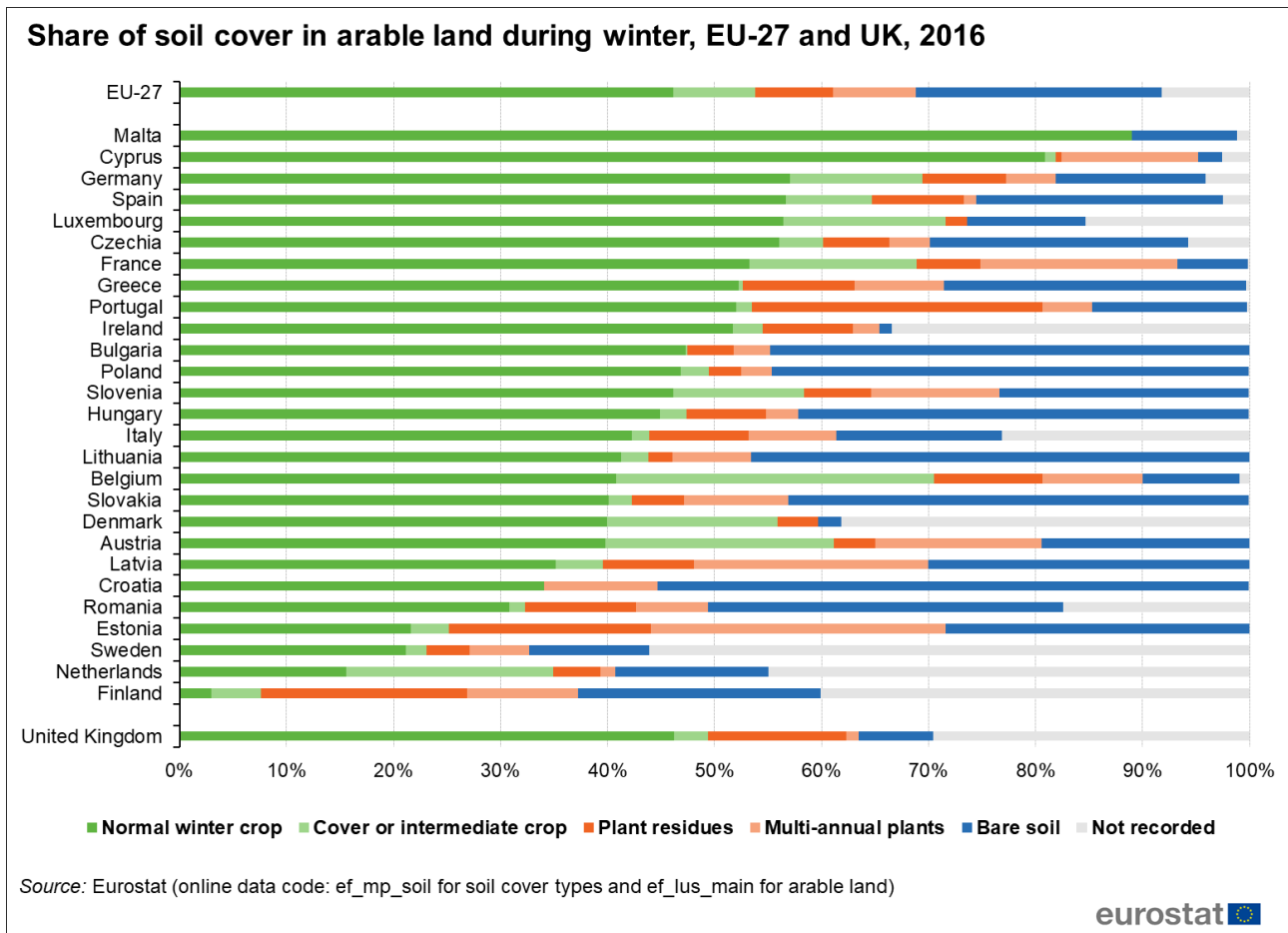
## Analysis at EU and country level

### In 2016, 23 % of arable land in EU-27 was left bare during winter

[Soil cover](#) refers to the vegetation cover of the soil surface (in this context, on [utilised agricultural area](#) ). Different soil cover measures can be used in agriculture to prevent soil degradation. Maintaining a crop cover during winter is one such practice. Normal winter crops, e.g. winter wheat, serve this purpose, as do cover crops that are not planted as [cash crops](#) but to reduce nutrient leakage and soil erosion and to provide other environmental benefits. Farmers can also leave plant residues on the field after harvest. Multi-annual plants, which are sown and then cultivated over several years, like temporary [grassland](#) , contribute to a permanent soil cover, as does [fallow land](#) .

Figure 1 shows the different types of winter cover on arable land for the European Union and the United Kingdom in 2016 as a share of [arable land](#) . In 2016, 23 % of arable land in [EU-27](#) was left as bare soil without any vegetation cover in winter. Almost half of the arable land (46 %) was covered by normal winter crops. Cover or intermediate crops, plant residues and multi-annual plants occupy shares of 8 %, 7 % and 8 % respectively in arable land.

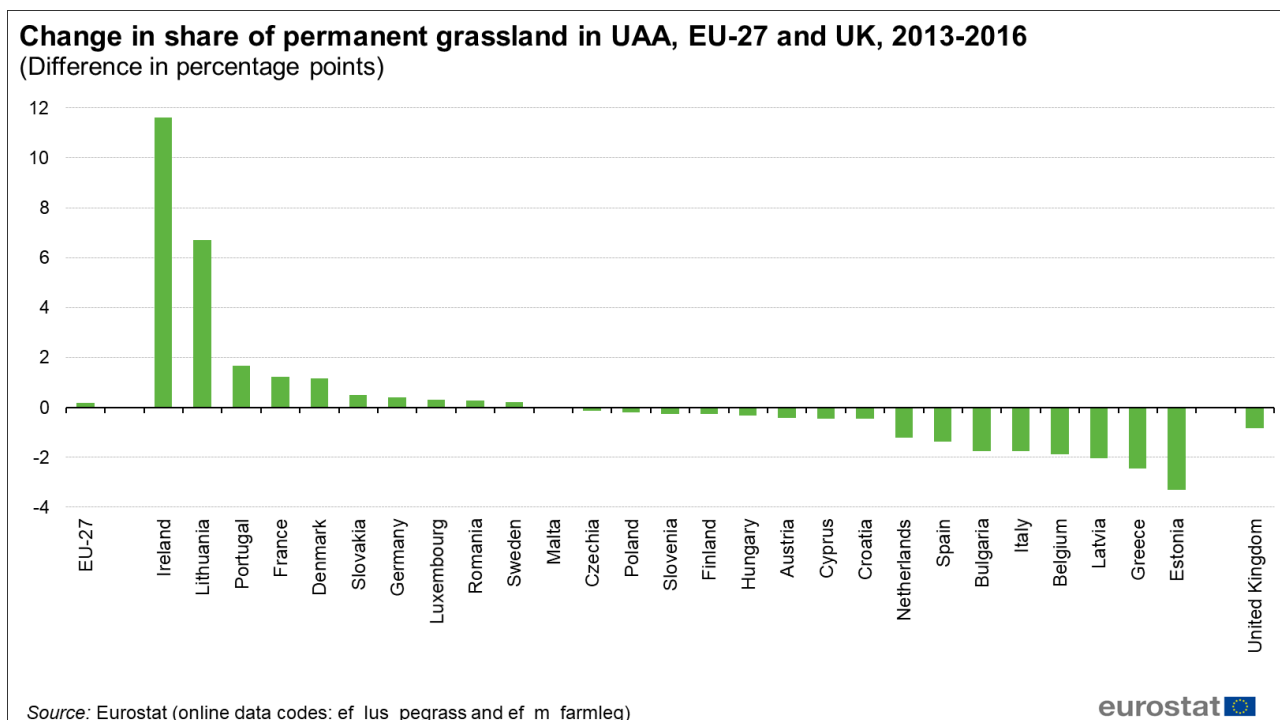
The [soil cover](#) on arable land during winter varies among countries. In Cyprus and Malta, the climate is less harsh during winter and the majority of the arable area is covered by normal winter crops. In Finland, on the other hand, the winters are cold and hardly any of the arable area is covered by normal winter crops. The highest shares of arable land covered with cover or intermediate crops are found in Belgium and Austria, while the highest shares left under plant residues are reported in Estonia, Portugal and Finland. Estonia and Latvia have the highest shares of cover by multi-annual plants. In most of the eastern European countries (Bulgaria, Croatia, Latvia, Lithuania, Hungary, Poland, Romania and Slovakia) more than a third of the arable area was left bare in winter. Soil cover was not reported for all of the [arable area](#) which limits the comparability of the data across countries, for more information see the section methodology under data sources .



**Figure 1: Share of soil cover during winter in arable land, EU-27 and UK, 2016** Source: Eurostat (ef\_mp\_soil) for soil cover and (ef\_lus\_main) for arable land

### The share of permanent grassland in UAA increased strongly in Ireland and Lithuania

Permanent grasslands offer year-round soil cover and therefore reduce the risk of soil erosion. One quarter of the Member States have a share of permanent grassland and meadows in utilised agricultural area (UAA) higher than 40 %, with the highest shares found in Ireland, Slovenia, Portugal, Luxembourg, Austria, Greece and the Netherlands, in descending order (for more information see fact sheet [AEI 10.1 - Cropping patterns](#) ). The share of permanent grassland in UAA remained almost stable in EU-27 between 2013 and 2016 (+0.2 %). In Ireland, however, the share increased by 11.6 percentage points (from 79.0 % to 90.6 %). Also Lithuania, the country with the highest decline in permanent grassland between 2005 and 2010, saw a strong increase in the share of permanent grassland between 2013 and 2016 by 6.7 percentage points. The highest decrease was reported by Estonia with 3.3 percentage points (Figure 2).



**Figure 2: Change in share of permanent grassland in UAA, EU-27 and UK, 2013-2016** Source: Eurostat (ef\_lus\_peggrass) and (ef\_m\_farmleg)

## Analysis at regional level

### The share of maize in arable land remained either stable or decreased between 2013 and 2016 in most EU-27 regions

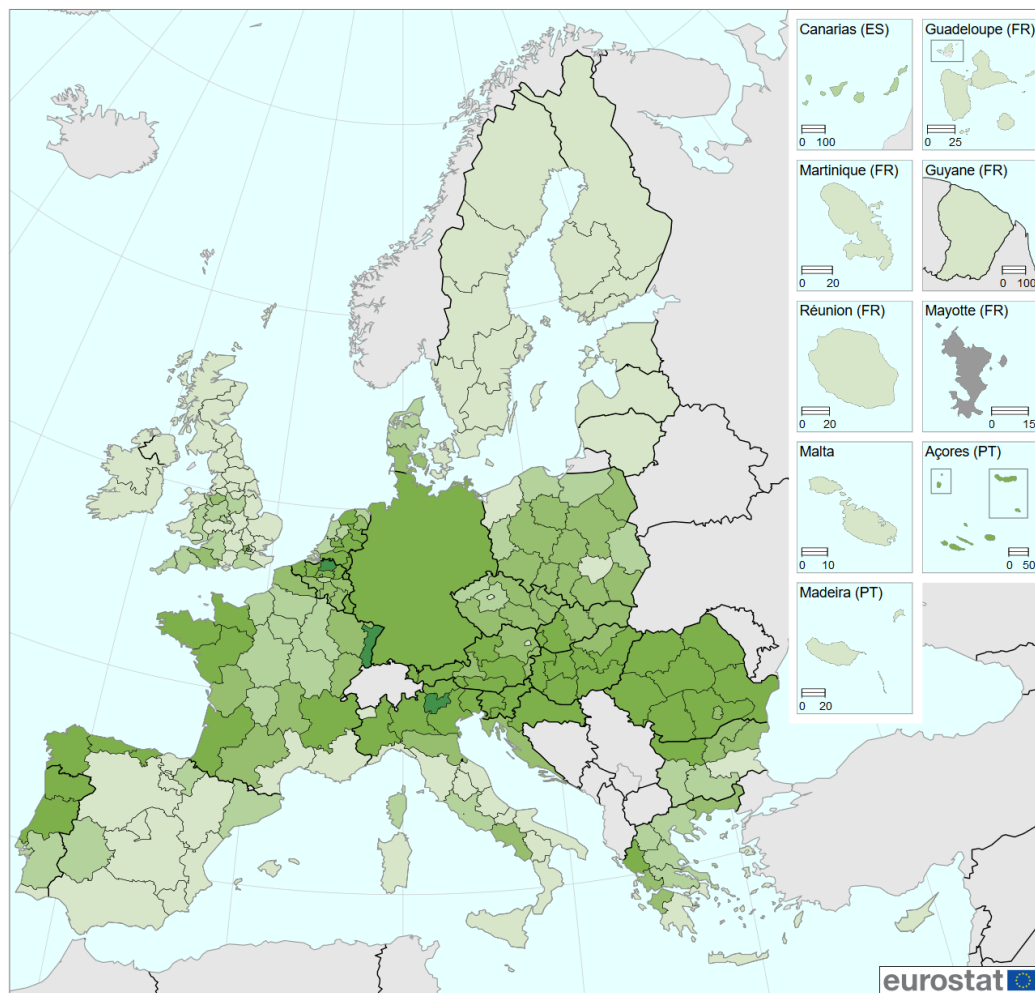
Maize has a short growing period and thus a short soil coverage period. In addition, maize is grown in rows with large distances, resulting in a high risk of surface run-off and soil erosion. After harvest in the autumn, the soil is more or less completely bare until sowing maize again or, more rarely, another crop next spring.

Map 1 shows the share of green and grain maize in total [arable land](#) for EU-27 countries at NUTS 2 level (Germany at NUTS 0<sup>1</sup>) in 2016. The region Provincia Autonoma di Trento in northern Italy had the highest share of maize in arable land (68 %) in 2016, but at the same time a low share of arable land in total land cover. Other regions with high shares of maize (> 50 %) are Alsace in France and Provincie Antwerpen in Belgium. Focusing on regions with large arable land areas (> 500 000 ha), Aquitaine in France and Lombardia in Italy have shares of maize over 40 %. High shares of maize can generally be identified especially in central and eastern Europe, northern parts of Spain and Portugal and the Portuguese Açores. The most northern and southern regions generally have a small share of maize, less than 5 %.

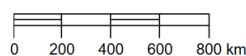
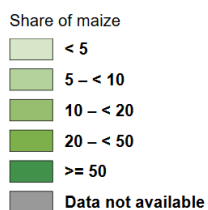
Map 2 compares the change in share of maize between 2013 and 2016. In 108 regions, i.e. more than half of the EU-27 regions, the share of the [arable area](#) covered by green and grain maize remained stable (between -1 and 1 percentage point difference). More regions (74) reported a decrease in the share of maize than an increase; only 16 regions reported an increase by more than 2 percentage points. The largest decline of more than 10 percentage points occurred in the regions Valle d'Aosta, Veneto and Friuli-Venezia Giulia (Italy), the Azorean islands (Portugal) and Ipeiros (Greece). The largest increase of 5 percentage points was in Centru (Romania).

<sup>1</sup>Germany is only available on NUTS 0 level for the moment, but will be updated on NUTS 2 level when data becomes available.

**Share of (green and grain) maize in arable land by NUTS 2 regions, EU-27 and UK, 2016**  
 (% of total arable land)



Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat  
 Cartography: Eurostat – IMAGE, 07/2020

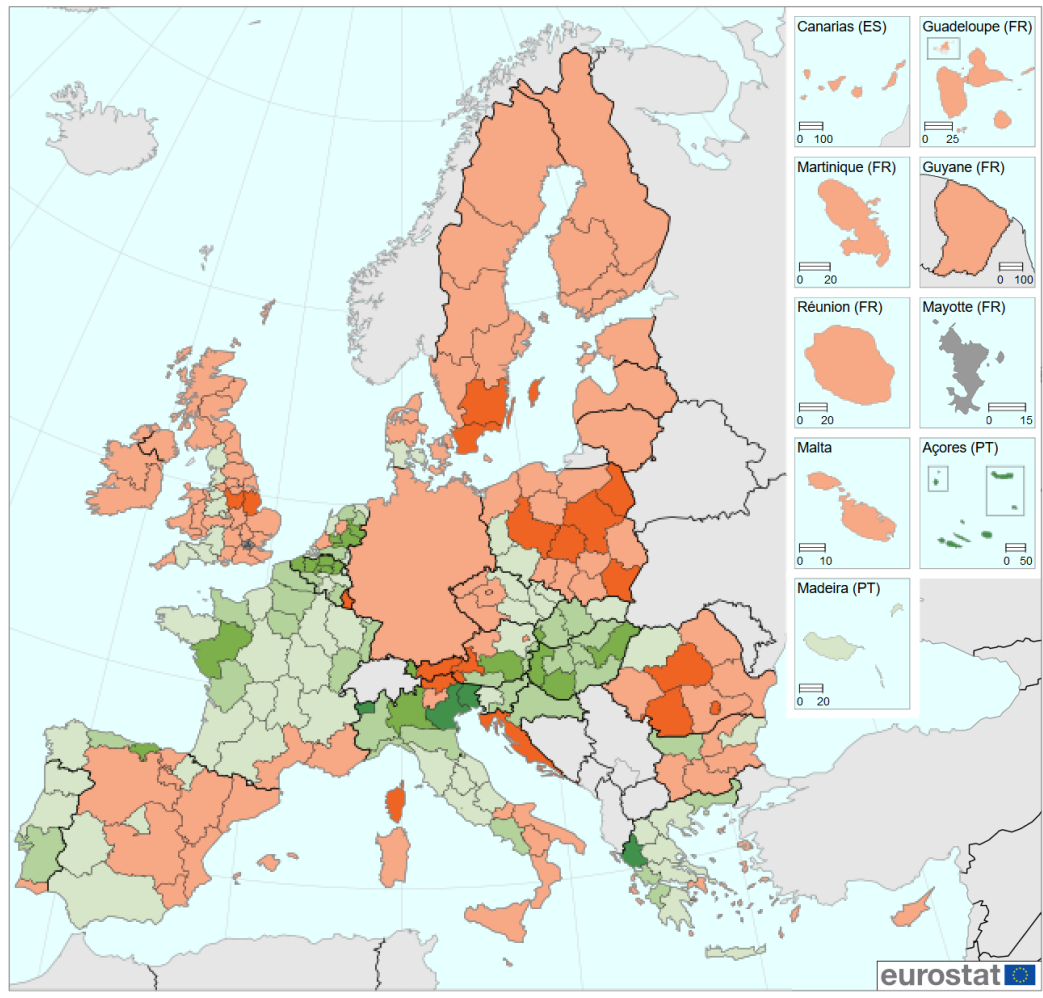


Note: NUTS regions are based on classification of 2013. Germany is only available on NUTS 0 level for the moment, but will be updated on NUTS 2 level soon.

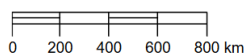
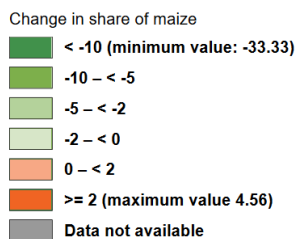
Source: Eurostat (online data code: ef\_lus\_allcrops)

**Map 1: Share of (green and grain) maize in arable land by NUTS 2 regions, EU-27 and UK, 2016 (% of total arable land)** Source: Eurostat (ef\_lus\_allcrops)

**Change in share of (green and grain) maize in arable land by NUTS 2 regions, EU-27 and UK, 2013-2016**  
(Difference in percentage points)



Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat  
Cartography: Eurostat – IMAGE, 07/2020



Note: NUTS regions are based on classification of 2013. Germany is only available on NUTS 0 level for the moment, but will be updated on NUTS 2 level soon.

Source: Eurostat (online data code: ef\_lus\_allcrops)

**Map 2: Change in share of (green and grain) maize in arable land by NUTS 2 regions, EU-27 and UK, 2013-2016 (Difference in percentage points) Source: Eurostat (ef\_lus\_allcrops)**

## Source data for tables, graphs and maps

- [Soil cover statistics 2016](#)

## Data sources

### Indicator definition

[Soil cover](#) , i.e. when soil is covered by crops, including catch/cover crops, is important for preventing nutrient and [pesticide](#) run-off. In addition, soil cover may improve soil fertility and reduce the risk of soil erosion.

### Main indicator

- Share of the year when the [arable area](#) is covered by plants or plant residues.

### Supporting indicators

- Share of arable area covered by the following soil cover types:
  - winter crops, such as winter [cereals](#) , winter rape, or grass.
  - cover or intermediate crops, such as lucerne, clover, legumes or grass. These are not planted for the purpose of harvest or grazing, but provide benefits such as reduced nutrient leakage and soil erosion.
  - plant residues, e.g. stubbles that are left on the field after the harvest.
  - multi-annual plants, such as temporary grassland or hops, cultivated during several years, or [fallow land](#) .
  - bare soil.
- Share of [utilised agricultural area \(UAA\)](#) covered by [Permanent grassland](#) .
- Share of arable area covered with (green and grain) maize.

### Links with other indicators

This indicator has links to a number of other [AEI indicators](#) (especially [soil erosion](#) that describe developments in some of the main contributory factors.

### Data used

All data (data on soil cover types, [permanent grassland](#) , maize, [arable area](#) and utilised agricultural area) are available from the [Farm Structure Surveys \(FSS\)](#) . Countries did not report soil cover for areas under glass or protective cover.

Data sources in Eurobase:

- [ef\\_mp\\_soil](#) for soil cover types,
- [ef\\_lus\\_peggrass](#) for [permanent grassland](#) ,
- [ef\\_lus\\_allcrops](#) for green and grain maize,
- [ef\\_lus\\_main](#) for [arable land](#) ,
- [ef\\_m\\_farmleg](#) for [utilised agricultural area \(UAA\)](#) .

The legal basis for the FSS from 2010 onwards is [Regulation \(EC\) No 1166/2008](#) of 19 November 2008 on farm structure surveys and the survey on agricultural production methods, which repealed Council Regulation (EEC) No 571/1988. The FSS are conducted consistently throughout the EU with a common methodology at a regular base and provide therefore comparable and representative statistics across countries and time, at regional levels (down to [NUTS 3 level](#)). Every 3 or 4 years the FSS is carried out as a sample survey, and once in the ten years as a census. The basic unit underlying the FSS is the agricultural holding. The FSS covers all agricultural holdings with [UAA](#) of at least one hectare (ha) and also those holdings with UAA of less than 1 ha where their market production exceeds certain natural thresholds. Although the thresholds for defining an agricultural holding can be different between countries (as high as five hectares of UAA in some cases), it has been ensured that the survey covers 98

% of the UAA and the livestock of each country. For more information see the metadata file [ef\\_esms](#) .

## Indicator methodology

Ideally the soil cover indicator provides an estimate of the number of days in a year when agricultural land is covered by plants or plant residues. The greater the cumulative soil cover, the less surface run-off is generated, and thus the erosion of soil and the transport of soil, nutrients, pesticides and faecal microbes to waterways are reduced. The degree of soil cover provided by each crop depends on its growth period, its leaf area and how quickly cover is established after seeding. The equal distribution of crops or residues is the determining factor to measure the erosion risk. Summarising the impact of any crop, management system or protective cover depends on how much protection is available at a given period during the year, relative to the amount of erosive rainfall that falls during that period. The report from the research project Diredate [1] (a project on identifying data needs to establish AEI ) pointed out that seeding and harvest dates and number of days from sowing until crop is established is very dependent on local soil management and climatic conditions. However, using the precise number of days of soil cover will in general not improve the indicator very significantly.

To evaluate the risk of nutrient leaching and soil erosion in combination with soil cover detailed geo-referenced data on soil quality and management are needed. Earth-Observation data also offer a great potential to assess areas with bare soil.

Soil cover was not reported for all of the arable area. For example, for areas under glass or protective cover, it was not necessary to report soil cover. Countries however included and excluded different areas of [land use](#) for which soil cover needed to be reported. Also non-response and other issues may limit the comparability of the data across countries.

## Context

### Introduction

Soil cover, i.e. periods of the year when soil is covered by crops, including catch/cover crops, is important for preventing nutrient and [pesticide](#) run-off. In addition, soil cover may improve soil fertility and reduce the risk of [soil erosion](#) .

- **Cover crops** are crops grown mainly to reduce soil erosion by covering the ground with living vegetation and living roots that hold the soil.
- **Green manure crops** are crops grown to help maintain soil organic matter and fertility.
- **Catch crops** are crops grown to retrieve remaining nutrients in the soil following a [cash crop](#) , preventing nutrient loss over the winter. Statutory catch crops, i.e. under sown grass or crucifers sown just before or after harvest and ploughed before sowing the next crop, are included in the legislation in some countries to reduce nitrate leaching during autumn and winter.

The monitoring of soil cover:

- gives valuable information about trends towards good farming practices,
- contributes information about likely soil fertility and organic carbon sequestration,
- provides significant information about the risks of nitrate leaching and run-off,
- provides significant information about erodibility of soils,
- could be improved by information about intercropping and tillage systems.

### Policy relevance and context

In 2019, the European Commission adopted its communication on [The European Green Deal](#) . It announced a [Zero pollution action plan for water, air and soil](#) and a targeted [research mission on soil](#) under the under the Horizon Europe programme. In February 2020, the [Commission announced](#) that 24 European countries joined a European Joint Programme on Soil which will be closely aligned with future work under this mission.

The [Farm to Fork](#) and [Biodiversity strategy 2030](#) develop further on policy actions planned to support soil health and the sustainability of soil and the use of agricultural soils. Among other actions, the Commission will update its [Soil Thematic Strategy](#) in 2021.

According to the [Lucas Survey](#) of 2015, 41 % of the EU's total area is used by agriculture. This fact alone highlights the importance of cultivation methods for the protection of the soil resource. Sustainable soil management is an important policy target, because soil is essentially a non-renewable resource with potentially rapid degradation rates and extremely slow formation and regeneration processes. Furthermore, soil available for food production per person is limited. Soil degradation processes such as erosion, decline in [soil organic matter](#) , [soil contamination](#) , [soil sealing](#) , [soil compaction](#) , decline in [soil biodiversity](#) and [salinisation](#) can cause soil to lose its capacity to carry out its main functions. Such degradation processes can result from inappropriate farming practices e.g. low soil cover over winter, unbalanced fertilisation, use of heavy machinery, or overgrazing. Soil degradation may also result from [abandonment](#) of certain farming practices, for example traditional [crop rotation](#) systems or fertilising with leguminous crops, practices which contribute to the maintenance and restoration of soil organic matter content. In most Member States codes of good agricultural practice aim to improve soil management by farmers.

The following policies do not specifically require data on soil cover, but relate to this indicator:

- The [Nitrates Directive](#) aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices (including closed periods of fertilisers application, crop rotations, soil winter cover, and catch crops, in order to limit leaching during the wet seasons).
- [Framework Directive for the Sustainable Use of Pesticides](#) : [Directive 2009/128](#) encourages a rational and precise pesticide use, as well as appropriate crop and soil management practices .
- The [Common Agricultural Policy](#) (CAP) contributes to preventing and mitigating soil degradation processes. In particular, [agri-environment measures](#) offer opportunities for:
  - favouring the build-up of soil organic matter;
  - the enhancement of soil biodiversity;
  - the reduction of soil erosion, contamination and compaction.

In addition, the provisions of [cross-compliance](#) , notably with respect to the obligation to keeping agricultural land in good agricultural and environmental condition, can play an important role for soil protection.

- [United Nations Framework Convention on Climate Change \(UNFCCC\)](#) : Conservation tillage can have beneficial impacts on combating global warming as it can reduce soil carbon losses.

### **Agri-environmental context**

Soil is a hugely important non-renewable resource, vital for human and economic health, as well as the production of food. Farmers play a vital role in preserving agricultural soils and can influence its properties through their agricultural practices. Processes like desertification, erosion, the decline in organic matter in soil, soil contamination (e.g. by heavy metals), soil compaction and salinity can reduce the ecological state and, thereby, the productive capacity of soil. There is therefore a close link between soil sustainability, our food production and the livelihood of farmers.

Serious soil degradation, which threatens the productivity of the different soils, is widespread in Europe. The soil cover of arable lands with plants and crop residues provides many environmental benefits as it protects soils from erosion risk, reduce run-off of nutrients and pesticides and thus their pressure on water, and contribute to maintenance of biodiversity. The efficiency of different soil cover types in terms of preventing nutrient and pesticide run-off etc. may differ as well as their suitability for various farming practices. Many alternative farming systems, such as low-impact farming and permaculture farming aims to integrate agriculture and natural ecosystems.

There are farming practices that boost sustainability, such as precision agriculture, agro-ecology (including [organic farming](#) ), carbon farming and agro-forestry. The Common Agricultural Policy supports agri-environmental-climate measures through [Rural Development Programmes](#) and [greening](#) . In the future, support for 'eco-schemes' will also continue.



## Other articles

- [Agri-environmental indicators - fact sheets](#)

## Database

- [Agriculture \(agr\)](#) , see:
- Farm structure (ef)
  - Main farm indicators by NUTS 2 regions (ef\_mainfarm)
    - Farm indicators by agricultural area, type of farm, standard output, legal form and NUTS 2 regions ( [ef\\_m\\_farmleg](#) )
    - Farm land use by NUTS 2 regions (ef\_landuse)
  - Main farm land use by NUTS 2 regions ( [ef\\_lus\\_main](#) )
    - Crops by classes of UAA in number of farms and hectare by NUTS 2 regions ( [ef\\_lus\\_allcrops](#) )
    - Permanent grassland by NUTS 2 regions ( [ef\\_lus\\_peggrass](#) )
  - Management and practices (ef\_mp)
  - Soil cover by NUTS2 regions ( [ef\\_mp\\_soil](#) )

## Dedicated section

- [Agri-Environmental Indicators](#)
- [Agriculture - Overview](#)

## Publications

- [Agriculture, forestry and fishery statistics](#) - 2018 edition
- [Agriculture, forestry and fishery statistics](#) - 2019 edition

## Methodology

- Farm structure survey metadata: [ef\\_esms](#)

## Legislation

- [Commission Communication COM\(2006\)508 final](#) - Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy
- [Commission Staff working document](#) accompanying COM(2006)508 final

## External links

- [European Commission](#)
- [DG Agriculture and Rural Development](#)
  - [Agriculture and soil protection](#)
    - [Common Agricultural Policy \(CAP\)](#)
  - [DG Environment](#)
  - [Soil](#)
  - [DG Joint Research Centre](#)
  - [European Soil Data Centre \(ESDAC\)](#)
- [Commission Communication COM\(2006\)508 final](#) - Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy
- [Agri-Environmental Indicators](#) , see:

Legislation: [Commission Staff working document accompanying COM\(2006\)508 final](#)