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SLM Theory of Change

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SLM Theory of Change
Review of Comparable M&E Frameworks in the EU

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Abbreviations used in this Report

CAP	Common Agricultural Policy
CLMS	Copernicus Land Monitoring Service
CMEF	Common Monitoring and Evaluation Framework for the CAP 2014-20
Copernicus	European earth observation programme
CSP	CAP Strategic Plan
eBMS	European Butterfly Monitoring Scheme
EC	European Commission
EEA	European Environment Agency
ERAMMP	Environment and Rural Affairs Monitoring & Modelling Programme
EU	European Union
FADN	Farm Accountancy Data Network
FSDN	Farm Sustainability Data Network
IEEP	Institute for European Environmental Policy
iMAP	iMAP project - Integrated Modelling platform for Agro-economic and resource Policy
JRC	Joint Research Council
LUCAS	Land use and land cover survey
LULUCF	Land Use, Land Use Change and Forestry
M&E	Monitoring and evaluation
PECBMS	Pan-European Common Bird Monitoring Scheme
PMEF	Performance Monitoring and Evaluation Framework for the CAP 2023-27
SLM	Sustainable Land Management
SWF	Small Woody Features (in Copernicus earth observation portfolio)
ToC	Theory of Change
UKCEH	UK Centre for Ecology & Hydrology
WVM	Woody Vegetation Mask (in Copernicus earth observation portfolio)

Table of Contents

List of Figures

List of Tables

1   Introduction

1.1 Context of this review

This review accompanies the development of a Theory of Change (ToC) for the Welsh Government's Sustainable Land Management (SLM) framework within the context of the Agriculture (Wales) Act 2023[1].

It is intended to provide relevant background information to inform the development of a framework for monitoring and evaluating the effectiveness of the Welsh Government's (WG) policy activities in achieving the SLM objectives[2]. (*Note: monitoring and evaluation of policy activities is quite separate from the 'control and verification' of expenditure of public funding for agriculture undertaken by Rural Payments Wales*).

The intended audience is policy makers and other stakeholders within the Welsh Government and beyond, who are responsible for or involved in monitoring and evaluating the impact of relevant activities on the SLM objectives of the Agriculture (Wales) Act2023, as shown in Figure 1-1 .

Figure 1-1 SLM objectives of the Agriculture (Wales) Act 2023[3]

1.2 Scope of this review

As outlined in the ToC narrative report (ERAMMP Report-108), the implementation of the Agriculture (Wales) Act 2023 will take place not just in the immediate context of the Welsh Government's SLM framework but also the broader UK, EU and international context in which policy in Wales is applied.

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[1] ERAMMP Report-108: SLM ToC Development of a Theory of Change for the Sustainable Land Management Framework: Narrative Report (2025)

[2] Carried out in 2025

[3] Source: Welsh Government 2023

The review covers:

A. Existing and proposed European Union (EU) level monitoring and evaluation (M&E) frameworks/indicators that are considered relevant to the development of a M&E framework for SLM reporting as required by the Agriculture (Wales) Act 2023, This framework, with its indicators and targets, is necessary for assessing progress towards meeting the four SLM objectives set out in the Agriculture (Wales) Act2023.

B. Consideration of the issues arising in the implementation of EU M&E frameworks/indicators. N.B. The information has been gathered from EU level sources (not individual Member States).

C. New and emerging technologies and approaches at EU level of potential relevance to M&E of the four SLM objectives set out in the Agriculture (Wales) Act 2023.

The review concludes with a short summary identifying the implications and lessons relevant to the development of the SLM M&E framework.

EU M&E frameworks and indicators related to agriculture, land management and rural development under the Common Agricultural Policy (CAP) are supported by a wealth of published, detailed information and guidance. Relevant technical details, references and sources of further information are in the Annexes (Sections 9-13) with illustrative examples accompanying the analysis in the text.

EU requirements placed on Member States in this sphere have evolved over time and may change further in the coming years, for example when the next iteration of the CAP comes into force which is currently scheduled for 2028.

EU legislation related to the CAP is reviewed every seven years in successive "programming periods" and legislation specifying M&E rules is part of the common core applying to all Member States. However, individual Member States and regions may have additional systems and indicators of their own in addition to this.

2   Existing EU level M&E frameworks/indicators

Key points:

- The CAP 2023-27 legislation marks a significant change from previous versions of the CAP. This is an **'outcome focused' CAP, with 10 EU objectives covering both CAP Funds**. There is more flexibility for the EU countries in setting out their CAP Strategic Plans, but also greater scrutiny by the European Commission in approving, guiding and monitoring the choices they make.

- In late 2021 the EU adopted the **new CAP Performance Monitoring and Evaluation Framework (PMEF)** for the period 2023-27, applying to the whole CAP (not just rural development programmes as previously) and with a clear link to targets and milestones set in each CSP, and some new indicators.

- The **European Environment Agency (EEA)** maintains a suite of environmental indicators, **with two new indicators added, relevant to management of farmland.**

2.1 The CAP 2023-27

As the CAP has evolved over time, reflecting amongst other things the EU's environmental and climate ambition, the level of ambition and the requirements placed on Member States have also developed.

The ambition of new CAP legislation for 2023-27 is to pave the way for a fairer, greener and more performance-based CAP. This represents a significant change from previous versions of the CAP, with 10 EU objectives covering both CAP Funds (Figure 2-1).

There is greater flexibility for the EU countries to adapt measures to local conditions, but also greater involvement of the European Commission (EC) in approving, guiding and monitoring the choices that Member States make, and in assessing their progress against targets. The key tools for this are the CAP Strategic Plans and an increased focus on the outcomes of Member States' performance and results.

Figure 2-1 CAP specific objectives for 2023-27[4]

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[4] Source: https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27/key-policy-objectives-cap-2023-27_en (accessed 1 Oct 2024)

2.2 CAP Strategic Plans

During 2021-22 each Member State had to prepare a CAP Strategic Plan (CSP) for 2023-27 detailing their chosen intervention strategies and the instruments they proposed to use to achieve the ten CAP key objectives, across the whole CAP (in contrast to the Rural Development Plans of previous periods). These detailed plans specify conditions and allocate financial resources for each intervention, according to the objectives and identified needs, and set targets and milestones against which progress must be made.

Each CSP was assessed and, if necessary, amended before being approved by the European Commission (EC). The EC assessment covered the CSP's contribution to and consistency with EU legislation and commitments, including applicable environmental and climate legislation (and new legislation when this enters into force), and compliance with new monitoring and evaluation requirements for the CAP.

Implementation of the CAP Strategic Plans began on 1 January 2023 and in November 2023 the European Commission published an assessment of CAP Strategic Plans delivery of CAP objectives. It summarises the combined contributions of the 2,500 interventions planned by EU countries[5].

2.3 CAP Performance Monitoring and Evaluation Framework (PMEF)

The CAP's Performance, Monitoring and Evaluation Framework (PMEF) has replaced the Common Monitoring and Evaluation Framework (CMEF) of previous programming periods. This is a significant change - from 2023 onwards, the PMEF covers all CAP objectives and both CAP funds (Pillars), and all interventions within CSPs (in contrast to the CMEF which assessed only the performance of the rural development part of the CAP).

The objectives of the PMEF are to:

a) assess the impact, effectiveness, efficiency, relevance, coherence and Union added value of the CAP;
b) monitor progress made towards achieving the targets of the CAP Strategic Plans;
c) assess the impact, effectiveness, efficiency, relevance and coherence of the interventions of the CAP Strategic Plans; and
d) support a common learning process related to monitoring and evaluation[6].

The PMEF includes a set of three main categories of indicator - output, result and impact/context indicators, as shown in Figure 2-2. Compared to the previous CMEF, there are fewer indicators overall, but there are new indicators on biodiversity, pesticides and animal health. It also requires the collection of other elements of M&E data linked to CAP obligations and interventions.

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[5] For further information see https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans_en (accessed 23 Sep 2024)

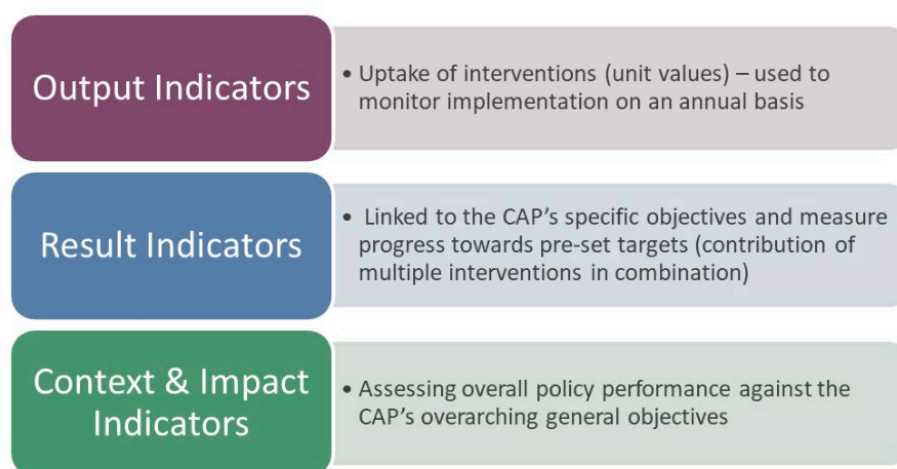[6] Article 129 of the CSP Regulation (Regulation (EU) 2021/2115)

Figure 2-2 PMEF indicators[7]

Output indicators track the different types of intervention in the CSP which have been implemented to date, with one output indicator per intervention type. The unit of measurement varies and may be, for example, the number of farmers, beneficiaries, operations, livestock units or hectares.

Result indicators are intended to establish a link between interventions and the strategic objectives of the CAP and have two functions. Firstly, to set targets and milestones for each indicator over the full period of the CSP and, secondly, to measure progress made towards those targets and annual milestones, using the same indicators. There are 44 result indicators (listed in Annex-1), of which 20 are mandatory for Member States to report on each year. The CSP targets and annual milestones set by Member States for each result indicator are made available via a publicly accessible dataset on the agri-food data portal[8]. Result indicator values are mostly expressed as a percentage or share (e.g. of agricultural area, livestock units or farms under contract), but several different types of intervention may contribute to each result indicator. In the 2023-27 CAP period, there is a far greater emphasis on Member States having to demonstrate which schemes (and the evidence-based practices they support) are expected to contribute to specific result indicators and targets. Although the annual headline figure for each result indicator is a simple aggregate value, there may be ways of using the more detailed information that feeds the indicator as a short-term proxy for the potential impact of some interventions, and thus inform improvements in scheme design or delivery.

Both output and result indicators are reported to the European Commission every year as part of the Member State's CSP Annual Performance Report, which sets out key qualitative and quantitative information on the implementation of the CAP Strategic Plan, including at regional level where relevant[9]. This data is gathered by Member State managing authorities while implementing the CSP.

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[7] Source: Hart, K., (2024) Securing greater environmental and climate performance from EU agricultural funds. Institute for European Environmental Policy, Brussels. https://ieep.eu/publications/securing-greater-environmental-and-climate-performance-from-eu-agricultural-funds/ (Accessed 23 Sep 2024)

[8] European Commission: agri-food data portal CAP 2023 – 27, result indicators dashboard https://agridata.ec.europa.eu/extensions/DashboardCapPlan/result_indicators.html (accessed 3 Oct 2024)

[9] Regulation (EU) 2021/2115 Article 134: and Regulation (EU) 2021/2116 Article 9(3) and Article 10.

Provided the CSP interventions support actions that are proven to be effective in achieving their objectives (and those actions are being targeted and implemented appropriately) being able to follow annual progress through result indicators may help managing authorities to assess whether the CSP is on track. The data about the suite of interventions underlying a result indicator may be useful where impact data is not available, but of course does not substitute for impact evaluation.

Context/impact indicators are essential to evaluate the impact, effectiveness and coherence of Member States' chosen support measures and interventions against the CAP's ten specific objectives. However, not all the PMEF impact indicators are compulsory and there is no obligation on Member States to assess any of the impact indicators until the *ex-post* evaluation of their CSPs, which has a deadline for completion by 31 December 2031 – eight years after CSP implementation began.

In the context of the ToC and the need to develop the SLM monitoring and evaluation framework in Wales, the focus of this section of the report is on the **PMEF impact indicators**, most of which are also context indicators (offering the potential for collecting baseline data at the start of a programming period).

Obtaining evidence of impact on CAP specific objectives also requires clearer and transparent links to be made between the farm practices required or incentivised under the CSP interventions, their predicted or actual uptake and the outcomes anticipated 'on the ground'. This need is also relevant to the SLM monitoring and evaluation framework in Wales, and recent EU advances on classifying farm practices and modelling their impacts are discussed in Section 3 of this report.

2.3.1   PMEF impact indicators

The PMEF list of 29 impact indicators is significantly more than the 16 impact indicators for the CAP 2014[10] and some of those carried over have been subdivided or redefined. New impact indicators for 2023-27 include those related to the agri-food chain, agricultural resilience to climate change, sustainable energy production, pesticide use, animal welfare and microbial resistance, crop diversity, Natura 2000 habitats and species and landscape features on farmland, and young farmers.

Table 2-1 provides a list of the PMEF impact indicators by specific CAP objective and relates these, where possible, to the four SLM objectives being developed for the SLM framework/programme in Wales. It is worth noting that there is no link between the PMEF impact indicators under the EU Special Objective for rural areas (SO8) and the SLM objectives, because the EU indicators are concerned with vibrant rural communities, with no causal link to agriculture.

Most of the data to calculate the values of the current impact indicators are already collected via a range of sources (European statistics, Joint Research Centre, European Environment Agency, etc.) and are also used in the framework of other EU legislation or the Sustainable Development Goals. The data collection frequency is not always annual and there might be an additional two or three years' delay before publication. Annex-2 provides details about each of the PMEF impact

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[10] The list of impact indicators under the Common Monitoring and Evaluation Framework 2014-2020 is available at https://agriculture.ec.europa.eu/document/download/dd735bef-76df-40f7-bafa-353997e585ae_en?filename=impact-indicator-fiches_en.pdf

indicators summarising for each indicator or sub-indicator: the units and frequency of measurement, sample size, data source(s), data issues and limitations, and other comments.

Table 2-1 PMEF impact indicators by EU CAP objective and SLM objective

EU cross-cutting and specific objectives for the CAP	EU CAP Impact indicator Note: indicators in bold are the minimum, compulsory set for Member States to use for CSP evaluation [11]	Related SLM objective[12] See Annex-3 for detailed sub-divisions
XCO - Fostering knowledge and innovation	I.1 Sharing knowledge and innovation: share of CAP budget for knowledge sharing and innovation	all four SLM objectives
SO1 - Ensure a fair income for farmers	**I.2 Reducing income disparities: evolution of agricultural income compared to the general economy**	1a, 1d
	I.3 Reducing farm income variability: evolution of agricultural income	1a, 1d
	I.4 Supporting viable farm income: evolution of agricultural income level by type of farming (compared to the average in agriculture)	1a, 1d
	I.5 Contributing to territorial balance: evolution of agricultural income in areas with natural constraints (compared to the average)	1a, 1b,1d
SO2 - Increase competitiveness	I.6 Increasing farm productivity: total factor productivity in agriculture	no SLM link
	I.7 Harnessing agri-food trade: agri-food imports and exports	no SLM link
SO3 - Improve the position of farmers in the food chain	I.8 Improving farmers' position in the food chain: value added for primary producers in the food chain	1a,1c,1d,1e
SO4 - Climate change action	I.9 Improving the resilience of agriculture to climate change: agricultural sector resilience progress indicator	1d, 2a, 2b, 2d, 2e
	I.10 Contributing to climate change mitigation: greenhouse gas emissions from agriculture	2a, 2e
	I.11 Enhancing carbon sequestration: soil organic carbon in agricultural land	2f, 3a
	I.12 Increasing sustainable energy in agriculture: sustainable production of renewable energy from agriculture and forestry	2d
SO5 – Environmental care	I.13 Reducing soil erosion: percentage of agricultural land in moderate and severe soil erosion	2f
	I.14 Improving air quality: ammonia emissions from agriculture	3b

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[11] Implementing Regulation (EU) 2022/1475 Article 6(5) and ANNEX III

[12] The four SLM objectives in the Agriculture Act (Wales) 2023 are:

　　　1. To produce food and other goods in a sustainable manner.

　　　2. To mitigate and adapt to climate change.

　　　3. To maintain and enhance the resilience of ecosystems and the benefits they provide.

　　　4. To conserve and enhance the countryside and cultural resources and promote public access to and engagement with them, and to sustain the Welsh language and promote and facilitate its use.

For the purposes of the ToC these have each been subdivided and referenced a-f, as shown in Annex-3

EU cross-cutting and specific objectives for the CAP	EU CAP Impact indicator Note: indicators in bold are the minimum, compulsory set for Member States to use for CSP evaluation [11]	Related SLM objective[12] See Annex-3 for detailed sub-divisions
	I.15 Improving water quality: gross nutrient balance on agricultural land	3c
	I.16 Reducing nutrient leakage: nitrates in ground water – percentage of ground water stations with nitrates concentration over 50 mg/l under Directive 91/676/EEC	3c
	I.17 Reducing pressure on water resource: Water Exploitation Index Plus (WEI+)	2f, 2e, 3a
SO6 – Preserve landscapes and biodiversity	I.18 Sustainable and reduced use of pesticides: risks, use and impacts of pesticides	3a, 3b, 3c
	I.19 Increasing farmland bird populations: Farmland Bird Index	3a, 3b, 3c
	I.20 Enhancing biodiversity protection: percentage of species and habitats of Community interest related to agriculture with stable or increasing trends, with a breakdown of the percentage for wild pollinators species[13]	3a, 3b, 3c
	I.21 Enhancing provision of ecosystem services: share of agricultural land covered with landscape features	3a, 4b
	I.22 Increasing agrobiodiversity in farming system: crop diversity	3a, 1d
SO7 - Support generational renewal	I.23 Attracting young farmers: evolution of the number of new farm managers and the number of new young farm managers, including a gender breakdown	1b, 1d
SO8 - Vibrant rural areas	I.24 Contributing to jobs in rural areas: evolution of the employment rate in rural areas, including a gender breakdown	no SLM link
	I.25 Contributing to growth in rural areas: evolution of gross domestic product (GDP) per capita in rural areas	no SLM link
	I.26 A fairer CAP: distribution of CAP support among beneficiaries	no SLM link
	I.27 Promoting rural inclusion: evolution of poverty index in rural areas	no SLM link
SO9 - Protect food and health quality	I.28 Limiting antimicrobial use in farmed animals: sales/use of antimicrobials for food-producing animals	1e
	I.29 Responding to consumer demand for quality food: value of production under Union quality schemes and of organic production	1a

Sources: compilation, based on: European Commission Context and Impact indicators 07/03/2024 – Version 9.0 Impact Indicators by objectives as modified by the Presidency. https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef ; Article 6(5) and Annex I to Regulation (EU) 2021/2115; and SLM ToC narrative report – context section v3

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[13] Annex I of Regulation 2021/2115 notes that 'the assessment of the trends for pollinators shall be performed by using relevant Union measures for pollinator indicators, in particular by a pollinator indicator and other measures adopted through the governance framework of the EU Biodiversity Strategy for 2030 (Commission communication of 20 May 2020) on the basis of the EU Pollinators Initiative (Commission communication of 1 June 2018).'

The key legislation underpinning the PMEF is the Commission Implementing Regulation (EU) 2022/1475 of 6 September 2022 laying down detailed rules for implementation of Regulation (EU) 2021/2115 of the European Parliament and of the Council as regards the evaluation of the CAP Strategic Plans and the provision of information for monitoring and evaluation. Further guidance on how to collect and report the different types of data is provided for Member States on the European Commission website[14] and the European Evaluation Helpdesk runs workshops and publishes additional guidance on the PMEF implementation (see section 5.2).

In addition to the PMEF indicators, five other types of data are collected by Member States within the PMEF. These cover:

- CSP interventions and beneficiaries (the data underlying the Annual Performance Report);
- the annual ratio of permanent grassland[15] to the total agricultural area declared by farmers receiving direct payments that year;
- data on interventions in certain sectors (for example, fruit and vegetables, apiculture, wine, hops and olives)[16];
- data on European Innovation Partnership (EIP) operational groups[17]; and
- data on local action groups (LAGs) and their activities for LEADER.

2.4 European Environment Agency (EEA) environmental indicators

EEA environmental indicators are designed to support all phases of environmental policy making, from designing policy frameworks to setting targets, and from policy monitoring and evaluation to communicating with policymakers and the public. The indicators cover a wide range of EU policy sectors, including agriculture and food, biodiversity, climate change, nature protection, soil and water, as well as the UN Sustainable Development Goals. For each indicator, data is provided about the trend (or status) of the phenomenon being investigated over a given period, and specifies whether associated policy objectives are being met and quantitative targets reached. Where these are not being achieved, it discusses the reasons for this.

Four EEA environmental indicators out of a much larger set[18] are reviewed here, chosen for their relevance to SLM objectives in Wales and to recent developments in EU policy . The four are: grassland butterflies, woody landscape features on agricultural land, common birds, and public awareness of biodiversity in Europe. The first two of these are new indicators, not included in the suite of 2014-20 EEA indicators.

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[14] Source: European Commission Common monitoring and evaluation framework: key information on CAP implementation, its results and its impacts. Data for Monitoring and Evaluation (accessed 15 Sept 2024)

[15] Defined by Article 4 (3c) of Commission Delegated Regulation (EU) 2021/2115 as '*land that is used to grow grasses or other herbaceous forage naturally (self-seeded) or through cultivation (sown) and that has not been included in the crop rotation of the holding for five years or more*'. Note that this differs from some biological definitions of 'permanent' grassland, as it can be ploughed up and reseeded at intervals of more than five years.

[16] referred to in Title III, Chapter III, of Regulation (EU) 2021/2115

[17] referred to in Article 127(3) of Regulation (EU) 2021/2115

[18] For an up-to-date list of European Environment Agency indicators see https://www.eea.europa.eu/en/analysis/indicators (accessed 24 Nov 2024)

2.4.1   Grassland butterfly index in Europe[19]

Although the status of grassland butterflies has been the subject of long-term monitoring in Europe, this is a relatively new policy indicator. It is a multi-species index measuring changes in population abundance of 15 grassland butterfly species at EU level, using 1991 as the reference year. The index is presented as a smoothed time series and is calculated with 95% confidence limits. Data is disseminated annually.

Methodology: the data and methodology for this indicator originate from the European Butterfly Monitoring Scheme (eBMS)[20], which is a joint initiative of Butterfly Conservation Europe[21] and the UKCEH, and the SPRING project (Strengthening Pollinator Recovery through INdicators and monitorinG[22]). The indicator is based on the fieldwork of thousands of trained professional and volunteer recorders, counting butterflies under standardised conditions on more than 6,200 transects scattered widely across the EU. Data is disseminated annually.

Policy relevance: this indicator is used for the EU Nature Restoration Regulation, which came into force in 2024 and sets up new monitoring obligations for Member States (described below in section 4.1).

2.4.2   Woody Landscape features on agricultural land in Europe[23]

This new indicator recognises the importance of woody landscape features on farmland, such as tree lines and hedges, which support biodiversity and deliver ecosystem services, providing benefits to agro-ecosystems, the wider environment and to agricultural production.

Methodology: This indicator estimates the share of area covered by woody landscape features on agricultural land in Europe using data from the Copernicus Land Monitoring Services[24]. The indicator is based on two components: the reference area (the agricultural area) and the target class to be analysed (the woody landscape features). The surface covered by landscape features is compared to the surface covered by the agricultural area (per administrative unit). The methodology is described in detail in a report by the European Topic Centre[25]. The results are expressed as a percentage and data is disseminated every three years.

The measurement of the *agricultural area* for this indicator is different from the statistical data of the Utilised Agricultural Area (UAA) that is used in agricultural statistics. The aim here is to provide the best possible spatial approximation of agricultural area, based on earth observation data using Copernicus Land Monitoring products. This definition of agricultural area is higher than UAA by 5-20% in most countries.

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[19] European Environment Agency (2024) Grassland butterfly index in Europe: indicator created 20 December 2023. (Accessed 13 Sept 2024)

[20] https://butterfly-monitoring.net/ (accessed 4 Oct 2024)

[21] https://www.vlinderstichting.nl/butterfly-conservation-europe/ (accessed 4 Oct 2024)

[22] https://www.ufz.de/spring-pollination/ (accessed 4 Oct 2024)

[23] European Environment Agency (2024) Woody Landscape features on agricultural land in Europe: created 09 February 2024. (Accessed 13 Sept 2024)

[24] https://land.copernicus.eu/en/products/high-resolution-layer-small-woody-features (accessed 4 Oct 2024)

[25] https://www.eionet.europa.eu/etcs/etc-di/quantification-of-landscape-features-in-agricultural-areas-using-copernicus-products-an-overview-of-recent-developments (accessed 4 Oct 2024)

The area of *woody landscape features* is assessed via the WOODY Vegetation Mask (WVM), one of the layers of the high-resolution Small Woody Features (SWF) 2018[26] Copernicus portfolio. The WVM depicts all woody features (i.e. trees and scrub) detected from the images of 2-4 m resolution without filtering by vegetation height or by the size or shape of the features. Artefacts including tree rows such as olive tree plantations, vineyards and orchards are removed through manual thematic enhancement. The product allows the user to flexibly apply their own rules to derive any subtype of woody features they specifically require for their topic of interest. The EEA fiche on this indicator discusses accuracies and uncertainties in the methodology and data sets.

Policy relevance: One of the key targets of the EU Biodiversity Strategy for 2030 [27] is at least 10% of agricultural land is composed of high-diversity landscape features. The Habitats and Species Directive[28] specifies that Member States, if they consider it necessary, shall maintain landscape features that are of major importance for wild fauna and flora to improve the connectivity between Natura 2000 sites. The CAP has included policy tools to support the maintenance of landscape features since 1992. The PMEF introduced a new impact indicator, I.21 *'share of agricultural land covered with landscape features'*, which differs from the EEA indicator in that it uses a wider definition of landscape features and a different data set (based on the Land Use/Cover Area frame Survey (LUCAS), which is discussed in section 6.2). The EEA comments that the consistencies and deviations revealed by the comparing these two indicators can help to understand the strengths and limitations of each dataset.

2.4.3   Common bird index in Europe

This is a long-established multi-species index measuring changes in population abundance of all common bird species (n=168), as well as those associated with specific habitats - common farmland bird species (n=39) and common forest bird species (n=34). The index for each group is calculated as an EU aggregate, using 1990 as reference year. Each of the three EU bird indices is presented as a smoothed time series and is calculated with 95% confidence limits. Data is disseminated annually.

Methodology: although the data for this indicator is presented as an EU aggregate, it originates from national monitoring data collected by the Pan-European Common Bird Monitoring Scheme (PECBMS)[29]. Trend information spanning different time periods is derived from annual national breeding bird surveys through common bird monitoring schemes in 26 EU countries. Further details on the methodology[30,OBJ].

Policy relevance: the same indicator features as a PMEF impact indicator (for farmland birds), a Nature Restoration Regulation indicator and as one of the EU agri-environmental indicators (see section 2.5). It is also used in the EU Biodiversity Strategy Dashboard[31] to monitor progress

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[26] https://land.copernicus.eu/en/products/high-resolution-layer-small-woody-features/small-woody-features-2018 (accessed 4 Oct 2024)

[27] https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en (accessed 4 Oct 2024)

[28] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora;

[29] https://pecbms.info/ (accessed 4 Oct 2024)

[30] European Environment Agency https://www.eea.europa.eu/en/analysis/indicators/common-bird-index-in-europe (accessed 13 Sept 2024)

[31] https://dopa.jrc.ec.europa.eu/kcbd/EUBDS2030-dashboard/1.2.1.4.1.1/?version=1 (accessed 4 Oct 2024)

towards the EU biodiversity targets for 2030, and as an EU indicator to monitor progress towards the Sustainable Development Goal 15: life on land.

2.4.4 Public awareness of biodiversity in Europe

The purpose of this indicator[32] is to explore the attitude of the public in relation to issues such as:

- biodiversity and the importance of preserving it;
- the seriousness and impact of biodiversity loss;
- the biggest threats to biodiversity;
- what the EU should do to prevent the loss of biodiversity;
- the role of the Natura 2000 network;
- personal efforts to protect nature and biodiversity, etc.

Methodology: The most recent survey, by Eurobarometer[33], involved 27,643 respondents being interviewed between 4 and 20 December 2018. Interviewees aged 15 years and over were selected from each EU Member State and the UK. This information gives an indication of attitudes towards biodiversity *per se* and attitudes towards actions taken (financial and fiscal, public statements, etc.) by politicians and public bodies for the protection and management of biodiversity. Data is disseminated every 3 years.

Policy relevance: the indicator is relevant for EU biodiversity policy and is based on survey results from all EU Member States and the United Kingdom; the results are easy to understand and widely accepted.

2.4.5 EEA indicators linked to reporting under other EU legislation

Other EEA Indicators are based partly on Member State obligatory reporting under other EU legislation, for example**:**

- *Nitrate in groundwater* using data reported under two different obligations: time series of average concentrations in figure 1 data from WISE SoE - Water quality (WISE-6) reporting obligation (published in Waterbase – Water Quality ICM); and country level assessment in Figure 2 data from the Nitrates Directive reporting obligation**;** and
- *Ecological status of surface waters in Europe* using the WISE Water Framework Directive Database, Directorate-General for Environment (DG ENV).

2.5 EU agri-environmental indicators

A set of 28 indicators was created in 2006 by the European Commission in close collaboration with EU countries, following a Commission communication on agri-environmental indicators[34]. The current suite of 25, shown in Table 2-2, covers indicators for: biodiversity (3 indicators),

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[32] https://www.eea.europa.eu/en/analysis/indicators/public-awareness-of-biodiversity-in-europe (accessed 4 Oct 2024)

[33] https://www.eea.europa.eu/data-and-maps/data/external/special-eurobarometer-481 (accessed 4 Oct 2024)

[34] COM(2006) 508 final COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy

climate (1), agricultural environment (6), energy (2), pesticides (3), air (1), soil (2), water quality (7), water quantity and availability (2). Three of the original indicators, are no longer monitored, but include two which are expected to be monitored in future by Member States as part of the new Nature Restoration Regulation (*landscape diversity*) and the proposed Soil Restoration Law (*soil quality*). The development and upkeep of this group of indicators is a collaborative effort between several directorates of the Commission, including several Directorates General, the EEA and the Joint Research Council (JRC). However, despite efforts since the indicators were created, significant limitations remain in several of them, such as: deficiencies in the data sets, in terms of harmonisation or geographical coverage; data availability; and some indicators that require further conceptual improvement. They are not systematically updated as a set and some topics are covered by newer indicators.

Table 2-2 EU Agri-environmental indicators

AE Indicator	Responsibility
Biodiversity	
Agricultural areas under Natura 2000	EEA
High Nature Value farmland	EEA
Population trends of farmland birds	EEA
Climate	
Greenhouse gas emissions	EEA
Environment - general	
Farmers' training level and use of environmental farm advisory services	DG AGRI
Land use change	EEA
Cropping patterns	Eurostat
Soil cover	Eurostat
Intensification/extensification	DG AGRI
Specialisation	Eurostat
Environment - energy	
Energy use	Eurostat
Production of renewable energy	DG AGRI
Societal demands on food and health – reduce use of pesticides	
Area under organic farming	Eurostat
Consumption of pesticides	Eurostat
Pesticide risk	DG SANTE
Soil erosion, quality and fertility	
Soil erosion	JRC
Tillage practices	Eurostat
Water quality	
Mineral fertiliser consumption	Eurostat
Livestock patterns	Eurostat
Manure storage	Eurostat
Gross nitrogen balance	Eurostat
Risk of pollution by phosphorus	Eurostat
Nitrate pollution	EEA
Pesticide pollution	EEA
Water quantity and availability	
Irrigation	Eurostat
Water abstraction	EEA
Indicators no longer monitored	
Risk of land abandonment	JRC
Soil quality	JRC
Landscape - state and diversity	JRC
Ammonia emissions (air)	EEA

Source: own compilation based on Eurostat Agri- environmental indicators
https://ec.europa.eu/eurostat/web/agriculture/database/agri-environmental-indicators (accessed 19 Sep 2024) and
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicators

2.6 EU Economic and social data sets for the PMEF

The data sources for the PMEF impact indicators linked to the CAP specific objectives on farm incomes and competitiveness are derived mainly from Eurostat and Farm Accountancy Data Network (FADN) data sets. The future expansion of FADN to become the Farm Sustainability Data Network is discussed in section 4.2.

3   New classification and modelling of farm practices

Key points:

- A common classification system of farm practices for environment, climate and animal welfare has been developed by the EU Joint Research Centre (JRC), providing a **new typology of more than 350 farm practices in the EU.** This has enabled **the labelling of planned CAP interventions for 2023-27 across different Member States**, with the findings published by the Commission in a searchable database.
- **The iMAP project by the JRC is developing an integrated modelling platform to provide robust scientific evidence to support the implementation, monitoring and evaluation of the CAP**, in the context of the environment and climate change objectives.

3.1 New EU typology of farm practices in the EU

The current CAP programming period 2023-2027 requires that EU Member States' CAP Strategic Plans (CSP) provide descriptions of their chosen interventions that support farm practices. A common classification system of farm practices has been developed by the EU Joint Research Centre (JRC), providing a new typology of more than 350 farm practices[35], enabling the extraction and aggregation of similar interventions across different Member States and different CAP areas.

The report also touches upon methodological aspects that end users should be aware of to ensure that farm practice labelling is used correctly. For instance, the labelling reflects the planned intervention, and therefore shows the *potential* farm practices to be supported through the intervention, but whether the farm practice is supported depends on the implementation of the intervention.

Using this new typology, the European Evaluation Helpdesk of the EU CAP Network and the JRC have jointly assigned around 28,000 farm practice labels to the specific schemes planned in Member States under three CAP interventions (eco-schemes, environment-climate commitments and investments) as well as Good Agricultural and Environment Conditions (GAECs) - about 5,000 in total[36]. The labelling of CAP interventions by farm practices is available on the webpage of the Commission's Catalogue of CAP Interventions[37], making it possible to search for interventions that are planned to include these farm practices.

Table 3-1 illustrates the different tiers used in the classification. At the time of writing, the Catalogue reflects the CSP amendments as approved by March 15, 2024; the labelling will be updated on a regular basis to reflect future amendments to the CSPs.

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[35] Angileri, V., Guerrero, I. and Weiss, F., A classification scheme based on farming practices, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/33560, JRC133862.
https://publications.jrc.ec.europa.eu/repository/handle/JRC133862 (accessed 19 Sep 2024)

[36] EUROPEAN COMMISSION – Directorate-General for Agriculture and Rural Development – Unit A.3 (2024): Labelling of interventions in CAP Strategic Plans by farming practices – Purpose and approach https://eu-cap-network.ec.europa.eu/publications/labelling-interventions-cap-strategic-plans-farm-practices_en (accessed 19 Sep 2024)

[37] European Commission Catalogue of CAP interventions
https://agridata.ec.europa.eu/extensions/DashboardCapPlan/catalogue_interventions.html?page=FarmPractices (accessed 19 Sep 2024)

Table 3-1 Example of different tiers used in the EC's new farm practice classification[38]

Section	Farm practices Tier 1	Farm practices Tier 2	Farm practices Tier 3
FX-Fertilisation and soil amendments	F1X-Limitations on the use of fertilisers- this class includes the practices where there are limitations or complete ban in the use of fertilisers (excluding on buffer strips)	F11X- **Ban on the use of fertilisers other than along water courses** - This class includes practices where the use of fertilisers is forbidden other than along water courses. The label should be used only if all fertilizers are forbidden on the whole area under commitment during the whole commitment period or at least for one full season of the main crop. When the ban applies to buffer strips along watercourses, the respective class should be used. Similarly, when the restrictions apply to a limited area of the field such as landscape features, the respective class should be used. When the ban does not cover the whole commitment period or at least one full agronomic year (e.g. ban only limited to cover crops), the practices should be included in the class "Limitations on fertilizer timing". When the application of fertilizers is forbidden but grazing is allowed, the specific Tier 3 classes "ban on mineral fertilizers", "ban on manure application" and "ban on sewage sludge" should be used.	F111- **Ban on organic fertiliser**- the ban refers specifically to organic fertilisers
			F112- **Ban on mineral fertilisers**- the ban refers specifically to mineral fertilisers
			F113- **Ban on manure application**- the ban refers specifically to the application of manure (note: manure deposited by grazing animals may still be allowed; only in the class "ban on organic fertiliser", see above, the deposition of manure from grazing animals is also forbidden)
			F114- **Ban on P fertilisers**- the ban refers specifically to phosphorous fertilisers
			F115- **Ban on sewage sludge**- the ban refers specifically to the use of sewage sludge
			F116- **Ban on slurry**- the ban refers specifically to the use of slurry
		F12X- **Limitation on fertiliser quantity**- This class includes practices where there are limitations on the quantity of fertiliser allowed other than along water courses. The limitations should apply to the whole area under the commitment. Limitations put on limited area of the field such as landscape elements should use the respective class.	F121- **Max mineral fertiliser input**- This class includes practices where a maximum quantity of mineral fertilisers is set
			F122- **Max organic fertiliser input**- This

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[38] Source: EUROPEAN COMMISSION – Directorate-General for Agriculture and Rural Development – Unit A.3 (2024): Labelling of interventions in CAP Strategic Plans by farming practices – Purpose and approach https://eu-cap-network.ec.europa.eu/publications/labelling-interventions-cap-strategic-plans-farm-practices_en (accessed 19 Sep 2024)

Section	Farm practices Tier 1	Farm practices Tier 2	Farm practices Tier 3
			class includes practices where a maximum quantity of organic fertiliser is set
			F123- **Max N surplus**- This class includes practices where a maximum quantity of nitrogen surplus is defined
			F124- **Max N total input** - This class includes practices where a maximum quantity of nitrogen is set
			F125- **Max P total input** - This class includes practices where a maximum quantity of phosphorous is set
		F13- Limitations on fertilizer timing- This class includes practices where there are limitations of periods of time for the application of fertilisers (including limitations only for intermediate crops, catch crop or cover crops) other than along water courses. The limitation should apply to the whole area under the commitment. Limitations put on limited area of the field such as landscape elements or along water courses should use the respective classes	
		F14- B**an and restrictions of fertilisers on limited areas of the field other than along water courses. this class includes the ban and other restrictions** of fertilisers on limited areas of the field such as when the ban is on landscape features. For restrictions along water courses the specific labels should be used.	

3.2 The iMAP project

The iMAP project (Integrated Modelling platform for Agro-economic and resource Policy analysis), commissioned by DG Agriculture and Rural Development and undertaken by the JRC, aims to provide robust scientific evidence to support the implementation, monitoring and evaluation of the CAP, in the context of the environment and climate change objectives[39].

A significant part of the project consists of synthesising large amounts of published scientific evidence on the impacts of farming practices on the environment and the climate. This is presented on the iMAP website as detailed fiches reviewing the evidence base for the environment and climate impacts of each type of farming practice. In addition to these summaries of the scientific evidence, the website provides:

- Case studies showing promising illustrations of selected farming practices at farm and territorial level (taken from the ENRD database, EIP database, or other relevant research projects); and
- Information on farming practices related to animal welfare and antimicrobial use, extracted from the 'Study of the CAP measures and instruments promoting animal welfare and reduction of antimicrobials use[40].

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[39] European Commission, Joint Research Centre, 2023. "iMAP, Integrated Modelling platform for Agro-economic and resource Policy analysis - Tools to assess MS CAP strategic plans on environment and climate performance". https://wikis.ec.europa.eu/display/IMAP/IMAP+Home+page", version October 2023 (accessed 19 Sept 2024)

[40] https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef/sustainability/study-cap-measures-and-instruments-promoting-animal-welfare-and-reduction-antimicrobials-use_en (accessed 4 October 2024)

4   Frameworks & indicators under new and proposed EU legislation

Key points:

- Under the **EU Nature Restoration Regulation (EU) 2024/1991**, which came into force in August 2024, Member States will have to **prepare national nature restoration plans** and **report on progress towards targets set for three agricultural ecosystem indicators.**

- New legislation came into to force in late 2024 **converting the Farm Accountancy Data Network (FADN) into a Farm Sustainability Data Network (FSDN**). Environmental and social data will be added to the existing list of economic data that is collected through surveys of a sample of EU farms, but the additional data will be sourced from other, existing data sets.

- In 2023 the EU published a **detailed proposal fo**r **a new EU Directive on Soil Monitoring and Resilience** to protect and restore soils and ensure that they are used sustainably. **Soil health indicators are defined in considerable detail** and could perhaps become a standardised measure of soil health, depending on the outcome of the legislative process.

This section looks at other EU level M&E frameworks/indicators under legislation that is newly in place or still under development, which could be of interest in relation to the WG SLM Framework.

4.1 EU Nature Restoration Regulation 2024

The EU Nature Restoration Regulation (NRR)[41], which came into force on 18 August 2024, is the first EU-wide, comprehensive law of its kind. It aims to restore ecosystems, habitats and species across the EU's land and sea areas to:
- enable the long-term and sustained recovery of biodiverse and resilient nature;
- contribute to achieving the EU's climate mitigation and climate adaptation objectives; and
- meet international commitments.

After months of deadlock within the EU Council, and two years of negotiations with the EU Parliament, the law passed with a narrow majority, one percent above the required minimum threshold. Negotiations have highlighted ongoing tensions related to environmental policies, particularly concerning agriculture.

National Restoration Plans

EU countries are expected to submit National Restoration Plans to the Commission within two years of the Regulation coming into force (i.e. by mid-2026), showing how they will deliver on the targets. They will also be required to monitor and report on their progress. The European Environment Agency will draw up regular technical reports on progress towards the targets. The

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[41] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1991&qid=1722240349976

European Commission, in turn, will report to the European Parliament and to the Council on the implementation of the Nature Restoration Regulation.

This ambitious regulation has an overarching restoration objective for the long-term recovery of nature in the EU's land and sea areas. There are specific restoration targets for the period 2030 to 2050, some based on existing legislation[42], including the restoration of habitats, species and their habitats protected under the Natura Directives, both inside and outside Natura sites.

Although there are some possible derogations on habitats and species restoration targets, Member States will have to put some restoration measures in place, particularly in Natura 2000 sites. Financing these and other NRR targets remains a significant challenge for Member States. The NNR makes clear that they are expected to use both national and EU funds, although they are not required to reprogramme CAP funds for 2021-27. Given that farmland management practices play such a significant role in making progress towards nature restoration targets, it is possible this may change in future CAP programming periods. In August 2025 the EC is required to submit a report on NNR funding needs and gaps and to propose measures to address these gaps[43]. This timescale allows the proposed measures to be considered during the preparation of the 2028-34 EU Multiannual Financial Framework and the next CAP.

Restoration of agricultural ecosystems – targets and indicators

In addition to the targets for the Natura habitats and species restoration measures (above) there are specific targets and indicators for restoration of biodiversity in agricultural ecosystems, to 2030 and beyond, covering:

- restoration measures aiming to ensure that the common farmland bird index at national level (indexed on 1 September 2025 = 100) increases incrementally from 2030 to 2050;
- measures aiming to restore drained peatlands in agricultural use (of which at least a third must be rewetted) with incremental targets rising to 50 % of such areas by 2050;
- aiming to achieve an increasing trend at national level of at least two out of the three indicators for agricultural ecosystems, by the end of 2030, and then every six years, until satisfactory levels are reached:
  a) grassland butterfly index;
  b) stock of organic carbon in cropland mineral soils;
  c) share of agricultural land with high-diversity landscape features.

These are the only indicators in the NRR and are defined very specifically, as trend-based impact indicators. They are distinct from and independent of the CAP PMEF impact indicators, although the landscape indictor uses a refined version of the PMEF impact indicator for landscape features. Outline details of the methodologies are in Box1, full details can be found in Annex IV of Regulation 2024/1991[44].

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[42] Including: Habitats and Species Directive 92/43/EEC; Directive 2008/56/EC; Birds Directive 2009/147/EC; Energy Efficiency Directive (EU) 2018/2002; Water Framework Directive 2000/60/EC; Renewable Energy Directive (EU) 2018/2001; Floods Directive 2007/60/EC; Directive (EU) 2016/2284

[43] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1991&qid=1722240349976

[44] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1991&qid=1722240349976

Box-1: Agricultural ecosystem indicators in the Nature Restoration Regulation

Source: own compilation based on text of Annex IV of Regulation 2024/1991

Grassland butterfly index: this indicator is expressed as an index of the geometric mean of trends in butterfly species considered to be characteristic of European grasslands and which occur in a large part of Europe. The methodology is that developed and used by Butterfly Conservation Europe (see section 2.4.1 above).

Stock of organic carbon in cropland mineral soils: this indicator describes the stock of organic carbon in cropland mineral soils at a depth of 0 cm to 30 cm, in tonnes of organic carbon/ha. The methodology is as set out in Annex V to Regulation (EU) 2018/1999 in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, and as supported by the Land Use and Coverage Area frame Survey (LUCAS).

Share of agricultural land with high-diversity landscape features: high-diversity landscape features are elements of permanent natural or semi-natural vegetation present in an agricultural context which provide ecosystem services and support for biodiversity such as: buffer strips, hedgerows, individual or groups of trees, tree rows, field margins, patches, ditches, streams, small wetlands, terraces, cairns, stonewalls, small ponds, cultural features and fallow land subject to the following conditions:

- they cannot be under productive agricultural use (including grazing or fodder production), unless such use is necessary for the preservation of biodiversity; and
- they should not receive fertilizer or pesticide treatment, except for low input treatment with solid manure.

Productive trees in sustainable agroforestry systems, in old orchards on permanent grassland and in hedges can also be included, provided they comply with the fertiliser restrictions above and are harvested when this would not compromise high biodiversity levels. The indicator is expressed as % of UAA.

The methodology is as developed under PMEF indicator I.21, Annex I to Regulation (EU) 2021/2115, as based on: the latest updated version of LUCAS, for landscape elements[45]; a Eurostat online publication, for land laying fallow[OBJ]; and, where applicable, for high diversity landscape features not covered by the methodology above, a methodology developed by Member States in accordance with Article 14(7) of the Nature Restoration Regulation. The LUCAS methodology is updated on a regular basis to enhance the reliability of the data used in the EU and, at national level, by Member States when implementing their national restoration plans.

4.2 Farm Accountancy Data Network becomes Farm *Sustainability* Data Network

Regulation (EU) 2023/2674 which came into force in late 2024 converts the *Farm Accountancy Data Network* into a *Farm Sustainability Data Network*. The current FADN is a database of microeconomic and accountancy data collected every year, based on a common methodology,

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[45] Ballin M. et al., Redesign sample for Land Use/Cover Area frame Survey (LUCAS), Eurostat 2018

from a sample of more than 80,000 EU farms, designed to be statistically representative (but which under-represents economically smaller farms). The new FSDN Regulation will provide for the collection of economic, environmental data) and social data, shown in Table 4-1.

Table 4-1 FSDN list of topics on which information must be collected[46]

Economic	Environmental	Social
General information on the holding	Farming practices	Labour
Type of occupation	Soil management	Education
Assets and investments	Nutrient use and management	Gender balance
Quotas and other rights	Carbon farming	Working conditions
Debts and credits	Greenhouse gas emissions and removals	Social inclusion
Value added tax	Air pollution	Social security
Inputs	Water use and management	Infrastructure and essential services
Land use and crops	Plant protection use	Generation renewal
Livestock production	Antimicrobial use	
Animal products and services	Animal welfare	
Market integration	Biodiversity	
Quality products – geographical indications	Organic farming	
Membership in producer organisations	Certification schemes	
Risk management	Energy consumption and energy production	
Innovation and digitalisation	Food loss on primary production level	
Other gainful activities related to the holding	Waste management	
Subsidies		
Indicative share of off-farm income		

The European Commission has the power to amend this list over time to include new topics, via implementing acts. To ease the administrative burden on Member States, relevant data from existing national data collection processes can be used – for example PMEF and IACS data. The use of digital tools will be explored, to try and avoid any duplication in the collection of data. However, although 2025 will be the first reporting year, the availability of data at EU level on the new topics relating to the environment will be available only from 2027.

4.3 Proposed EU Directive on Soil Monitoring and Resilience

On 5 July 2023, the EU published a detailed proposal for a new EU Directive on Soil Monitoring and Resilience to protect and restore soils and ensure that they are used sustainably[47]. Referred to as the Soil Health Law, the proposal provides a clear common definition of soil health, a coherent framework for monitoring, sustainable management and restoration, and indicates the

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[46] *Source: Regulation (EU) 2023/2674 Annex 1*

[47] https://environment.ec.europa.eu/publications/proposal-directive-soil-monitoring-and-resilience_en (accessed 18 Sept 2024)

goals and targets to be achieved by Member States in 2050. The definitions and criteria for soil health indicators are defined in considerable detail and could perhaps become a standardised measure of soil health (although may not survive the legislative process in their present form). See Annex-4 for a full list of the indicators proposed.

It will take considerable time for the draft Directive to pass through the stages of the legislative process, and some elements may be challenged by the European Parliament and the Council (as happened with the Nature Restoration Regulation where negotiations took two years). Unlike the Nature Restoration Regulation this is a Directive, which will have to be transposed by individual Member States – a process taking up to three years. Perhaps a useful analogy is the Water Framework Directive, which also has a suite of indicators.

5   Issues arising in the implementation of EU M&E frameworks/indicators.

Key points:

- Analysis has revealed **several issues with the frequency, availability and ownership of data needed for the PMEF impact and context indicators**
- **The EU Evaluation Helpdesk**, which provides guidance and shares good practice of M&E of the CAP, has issued a **detailed guide to defining factors of success for CSP evaluation** and provided insights on other topics including **designing evaluation plans** and **dealing with the challenges of biodiversity evaluation.**

- **The departure of the UK from the European Union** on 31st January 2020 has had a significant impact on the subsequent collection and dissemination of UK agricultural data by the EU. The divergence of SLM policies among the four UK countries **adds further complexities and barriers to sharing and comparing evaluation methodologies and data.**

5.1 Data issues

Analyses of the PMEF indicators identified a number of issues with data for the impact indicators, which affect not just the evaluation of impact after a period of time but, perhaps more significantly, the measurement of context indicators (normally identical to impact indicators) to set a baseline at the outset of a programme or initiative, against which progress can be measured. These issues include:

- Frequency of data collection;
- Time lag between collection and availability or publication; and
- Different agencies responsible for key data sets at EU and Member State level.

A report by the EU CAP Network's Evaluation Helpdesk distinguishes between *data gaps* (the absence of data that would allow precise and timely measurement of change) and *attribution gaps* (the absence of data that would allow the application of more robust methods to estimate the net effects of the policy). The timely identification of data and attribution gaps depends on developing an evaluation framework that consists of key elements to be assessed; evaluation questions; factors of success; indicators; data sources; and methods to measure change and attribute it to interventions. The report also notes that environmental data is widely considered to be the most difficult to collect and may require complementary studies to fill data gaps[48].

5.2 Guidance from the EU Evaluation Helpdesk for the CAP

The EU CAP Network's Evaluation Helpdesk for the CAP provides support to monitoring and evaluation activities at the EU and Member State level. It works under the guidance of DG

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[48] EUROPEAN COMMISSION – Directorate-General for Agriculture and Rural Development – Unit A.3 (2023): Addressing data gaps to evaluate CAP Strategic Plans. Report of the Good Practice Workshop 8-9 June 2023. Malmö, Sweden.

Agriculture and Rural Development's policy performance unit and supports national authorities, managing authorities and evaluators. Activities include developing and disseminating evaluation methodologies and tools, gathering and sharing examples of good practice, and capacity building and communication[49]. Good practice workshops enable Member States to share experiences and discuss the challenges and opportunities of monitoring and evaluating their CSPs. Recent outputs include a detailed guide to defining factors of success for the CAP objectives, and several good practice workshops.

5.2.1   Guidance on defining factors of success for the CAP

The Implementing Regulation for the CAP 2021-27[50] requires that when Member States are evaluating their CAP Strategic Plans, they must define evaluation questions and 'factors of success' to assess the evaluation criteria of effectiveness, efficiency, relevance, coherence and EU added value. 'Factors of success' is a new term but not a new concept in CAP evaluation – they were referred to as 'judgment criteria' in 2014-2020 - and are key components of the design of every evaluation. For effectiveness, in most cases, it is the PMEF impact indicators that are most relevant to the factor of success.

In response to a request from Member States, the Evaluation Helpdesk set up a thematic working group on the topic and published a detailed report in late 2023 setting out how to identify and assess factors of success for all CAP objectives[51]. For each factor of success:

- one or more main indicators are proposed (where it was not possible to identify a relevant PMEF indicator, additional indicators are proposed); and
- a detailed fact sheet is provided.

Box2 summarises the method for assessment of the factors of success.

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[49] For more information see https://eu-cap-network.ec.europa.eu/support/evaluation

[50] Article 1 and Annex I of the European Commission Implementing Regulation (EU) 2022/1475

[51] EUROPEAN COMMISSION – Directorate-General for Agriculture and Rural Development – Unit A.3 (2023): Use of Factors of Success in Evaluation. https://eu-cap-network.ec.europa.eu/publications/use-factors-success-evaluation_en   (accessed 5 Oct 2024)

Box-2: Approach to assessment of CAP factors of success[52]

The assessment of the factors of success starts by clarifying its purpose and scope and selecting the main indicator(s) that will be used.

For **effectiveness**, the following steps can be taken:

1. Calculation of the value of the selected indicator(s)
2. Estimation of the net effect.
3. Selection of other indicators that may help set the context or highlight specific aspects.
4. Assessment of the factor of success.

For **efficiency, relevance, coherence and Union added value**, the assessment includes only two steps:

5. Calculation of the value(s) of the main indicator(s).
6. Assessment of the factor of success.

This process is reflected in the factsheets for each factor of success, which contain the following sections:

- The identity of the factor of success, which comprises:
    - the Specific Objective(s);
    - the evaluation criterion;
    - the key evaluation element;
    - a proposed example of an evaluation question;
    - the code and title of the factor of success.
- The rationale for the use of the factor of success.
- An indicative list of types of interventions relevant to the factor of success.
- The main indicator(s) that can be used to assess the factor of success.
- The steps to assess the factor of success, described above.
- Extending the recommended factor of success.

5.2.2 Evaluation good practice – some examples

Recent Evaluation Helpdesk workshops and expert insights on good practice have considered some key issues in planning and designing CSP evaluations that are of wider relevance, summarised below.

Designing good evaluation plans for the new CAP

Evaluation frameworks among EU Member States look very different and may be a source for exchange and mutual inspiration, throughout the implementation of their Evaluation Plans. The relationship between outsourcing evaluations versus building internal evaluation capacity is fundamental, as is the size and type of tenders - comprehensive contracts or thematic evaluations. This will depend on the ability of the national evaluation market to respond adequately to the tenders. The workshop noted that the interlinkage between planned evaluation

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[52] Source: EUROPEAN COMMISSION – Directorate-General for Agriculture and Rural Development – Unit A.3 (2023): Use of Factors of Success in Evaluation https://eu-cap-network.ec.europa.eu/publications/use-factors-success-evaluation_en (accessed 5 Oct 2024)

activities and programme steering is crucial; and also that methodological challenges remain as to how to evaluate the criterion of 'coherence'[53]

Assessing generational renewal in CAP Strategic Plans

Evaluations of generational renewal need to be realistic and multifaceted, expanding beyond the assessment of support for young farmers, as this may not be the key determinant. Other factors also need to be examined, such as access to land and capital, the regulatory framework and the socio-economic reasons for lack of generational renewal, especially in some sectors and for smaller farms. Farm continuity is as important as the farm transfer. Evaluations should assess the extent to which transferred farms are more sustainable and the extent to which policy contributes to improving the performance and development of farms[54].

Insights on biodiversity evaluation

Biodiversity evaluation is one of the more challenging tasks for CSP evaluators. A commentary by an experienced RDP evaluator offers some advice and suggestions for Member State evaluators, including:

- Judgment criteria should be specified (e.g. grasslands are preserved and enhanced) and additional indicators added if necessary (e.g. biological diversity of grasslands).
- If possible, extend the spatial and temporal coverage of the evaluation data to include the whole territory under evaluation, or the previous programming period if necessary.
- Link the evaluation database with IACS/LPIS, and with national and EU environmental databases, but also invest in creating long-term environmental evaluation databases targeting the most prominent biodiversity issues for which ad-hoc data collection is not recommended.
- Consider new evaluation approaches based on artificial intelligence, geospatial analysis or earth observations if they provide better data and support more sophisticated and accurate evaluation methodologies, but also acknowledge their limitations[55].

5.2.3 UK specific issues

The departure of the UK from the European Union on 31 January 2020 has had a significant impact on the subsequent collection and dissemination of UK data by the EU. From the perspective of Wales this will hamper comparison of the choices and performance of indicators of SLM in Wales with those in EU-27 and EFTA countries and more widely. This includes CAP monitoring and evaluation data under the previous CMEF and UK data for Eurostat indicators (although it is the intention to implement a statistical cooperation arrangement, see Annex-5).

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[53]   https://eu-cap-network.ec.europa.eu/publications/good-practice-workshop-report-designing-good-evaluation-plans-new-cap_en (accessed 5 Oct 2024)

[54] EUROPEAN COMMISSION – Directorate-General for Agriculture and Rural Development – Unit A.3 (2024): Assessing generational renewal in CAP Strategic Plans. Report of the Good Practice Workshop 14-15 March 2024. Zagreb, Croatia.

[55] https://eu-cap-network.ec.europa.eu/publications/cap-evaluation-expert-insights-biodiversity_en (accessed 5 Oct 2024)

The post-CAP divergence of agricultural policies among the four UK countries adds further complexities and barriers in sharing and comparing methodologies and data.

Wales and the rest of the UK is obliged to meet the M&E requirements of EU legislation transposed into UK legislation prior to the UK's departure from the EU (including for example the Nitrates Directive, the Water Framework Directive, and the Habitats and Species Directive). However, there is no certainty that SLM relevant M&E requirements in new and forthcoming EU legislation that took effect in the EU after the UK's departure will become a legal requirement in the UK – for example indicators in the Nature Restoration Regulation and the forthcoming Soil Resilience Directive.

6   New and emerging technologies and approaches

> **Key points:**
>
> - Despite increasing emphasis in previous CAP programmes on using remote sensing data for verification and control purposes, **little use has been made of the remote sensing data in EU impact indicators until very recently.**
>
> - Satellite **data from the EU Copernicus Land Monitoring Service**, and satellite plus field survey data from **the EU Land Use and Land Cover Survey** are being **used for the new PMEF/EEA/NNR landscape indicators** and the NNR **soil carbon indicator.**

New and emerging EU technologies and approaches of potential relevance

There has been an increasing emphasis in previous CAP programmes on using remote sensing data for verification and control purposes, for example to define areas not eligible for direct payments (e.g. groups of in-field trees, access tracks, water bodies). However, until the development of some new indicators (such as the PMEF and EEA indicator for landscape features on agricultural land) little use has been made of remote sensing data for impact indicators. This section considers two approaches which are already being incorporated in the methodologies for some of the impact indicators discussed in this report.

6.1 Copernicus Land Monitoring Service (CLMS)

Copernicus is a European Earth observation programme for monitoring the planet and its environment. It has several different programmes, the most relevant of which is the Copernicus Land Monitoring Service (CLMS) and in-situ component, implemented by the European Environment Agency[56].

The CLMS provides geographical information on land cover and land use, ground movement, vegetation, water and surface energy variables to a broad range of users in Europe and across the world in the field of environmental terrestrial applications.

Products include priority area monitoring; mapping land cover and land use; biophysical parameters, image mosaics and in-situ and reference data, for applications such as spatial planning, forest management, agriculture, nature conservation and restoration; ecosystem accounting; and climate change mitigation.

For example, CLMS Land Cover and Land Use Mapping produces land cover classifications at various level of detail, both within a pan-European and global context. At the pan-European level, these are complemented by detailed layers on land cover characteristics, such as imperviousness, forests, grassland, water and wetness and small woody features, geographically covering the EEA38 +UK, with the most recent data for 2018. Satellite Data includes the European Image Mosaic covering the territory of Europe, at various spatial resolutions and update frequencies from 20, 10 and 5 metres (every 3 years) to 2 metres (frequency depends on input data quality and availability).

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[56] For more information see CLMS Portfolio https://land.copernicus.eu/en/products (accessed 22 Sep 2024)

6.1.1   Application of Copernicus in EU indicators

The methodology for the EEA indicator *woody Landscape features on agricultural land in Europe* uses Copernicus data (see section 2.4.2), while the revised LULUCF Regulation identifies the need to improve monitoring and reporting of emissions by Member States, with remote sensing data and Copernicus specifically mentioned[57].

6.2 Land use and land cover survey (LUCAS)

The LUCAS Survey is a Eurostat data collection co-financed by five Directorates General of the European Commission and is part of the Community Statistical Programme. The aim of the LUCAS survey is to gather harmonised information on land cover, land use and environmental parameters. The survey also provides territorial information to analyse the interactions between agriculture, environment and countryside, such as irrigation and land management.

6.2.1   Key features and methodology

LUCAS surveys are carried out every three years, the most recent surveys were in the spring-summer of 2009, 2012, 2015, 2018 and 2022, including a specific topsoil module; in 2022 a landscape feature module was introduced, to assess agricultural landscapes.

The LUCAS survey methodology has three key features that distinguish it from other EU-wide surveys:

- **a clear distinction between *land cover* and *land use*** (unlike for example, CORINE); this is particularly useful when data from these different dimensions needs to be matched, compared and/or combined.
- **a hierarchical classification system**, starting with structured broad-level classes, which allow further systematic subdivision into more detailed sub-classes. At each level the defined classes are mutually exclusive. The land cover hierarchy has 8 categories, 29 classes and 76 subclasses. Land use has 4 main categories, 16 classes and 31 subclasses.
- **it is a two phase, point-based sample survey**:
  - the first phase is a systematic sample with points spaced 2 km apart in the four cardinal directions covering the whole of the EU's territory - around 1.1 million different points. Each point is photo-interpreted and assigned a pre-defined land cover class.
  - the second phase of sample points is **the field sample**, drawn from the stratified first phase sample - 337,845 points in the 2018 survey; field surveyors gathered data on-site at 70% of these points, the rest were photo-interpreted. Box3 summarises the field survey methodology.

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[57] Recital 29 of Regulation (EU) 2023/839

> *Box-3: LUCAS field survey methodology*
>
> LUCAS field surveyors go to the survey points and observe the environmental parameters they find on the ground, documenting the land cover and land use according to the harmonised classifications. The surveyor also records information relating to the percentage of land cover within a specific window of observation, the area size, the width of any specific features, the height of any trees, as well as information on land and water management (for example, grazing or irrigation). Point and landscape photos are taken in the four cardinal directions at each point. Surveyors receive prior training and have a set of supporting documents, instructions on how to carry out the survey, plus a set of quality control procedures. Considerable efforts are made to ensure that all surveyors apply the same methods when collecting data from the sample points.

6.2.2 Application of LUCAS in EU indicators

LUCAS is part of the methodology for four indicators reviewed in this report:

- The methodology for PMEF impact indicator I.21 *Share of landscape features within agricultural area* is based on the LUCAS landscape features module that provides for 2022 the first comprehensive statistical dataset for the share of landscape features in agricultural land covering woody, grassy, wet and stony features. The NNR indicator *share of agricultural land with high-diversity landscape features* adopts the same methodology.
- The PMEF impact indicator I.11 *Soil organic carbon in agricultural land* and the NNR indicator *Stock of organic carbon in cropland mineral soils* both use a methodology combining IPCC and LUCAS data.

7 Implications & lessons to inform the development of the SLM M&E framework

The CAP legislation for 2023-24 marks a significant shift in the focus, balance, delivery, monitoring and evaluation of the CAP. The focus of the new CAP is clearly on the outcomes of all CAP expenditure (not just rural development measures) and the expectation that this will contribute to the 10 defined CAP objectives. Member States have been given more freedom in choosing and designing their support schemes and defining CAP rules but have had to justify their choices to the satisfaction of the European Commission. They also must set targets and annual milestones which will be monitored annually.

The M&E framework has been revised, with the addition of new impact indicators and closer links to Member States' obligations under EU law on, for example, habitats and species and the sustainable use of pesticides. There is a trend to greater granularity in monitoring and evaluation data, aided by using remote sensing and refined land use and land cover data. There have also been efforts to harmonise at least some indicators and methodologies between different EU frameworks - for example between PMEF biodiversity impact indicators and those in the new Nature Restoration Law.

A new typology of farm practices and a modelling platform synthesising large amounts of scientific evidence of the impacts of farming practices on the environment should help to evaluate and compare the environmental effectiveness of CAP interventions.

Challenges remain in moving towards a more outcome-focused approach, including issues with data gaps and timeliness of impact data, and sensitivity of Member States to gather additional data.

8   References

EU legislation

Regulation (EU) 2021/2269 **on integrated farm statistics** and repealing Regulations (EC) No 1166/2008 and (EU) No 1337/2011, and amended by Regulation (EU) 2021/2269. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02018R1091-20211222&qid=1724763725763 (Accessed 27.08.24)

REGULATION (EU) 2019/6 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on **veterinary medicinal products** and repealing Directive 2001/82/EC (Text with EEA relevance). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019R0006-20220128&qid=1724834728682#tocId1251 (Accessed 28.08.24)

Commission Implementing Decision (EU) 2020/1729 of 17 November 2020 on the **monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria** and repealing Implementing Decision 2013/652/EU. https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32020D1729 (Accessed 28.08.24)

Regulation (EC) No 1185/2009 of the European Parliament and of the Council of 25 November 2009 concerning **statistics on pesticides** (Text with EEA relevance) as amended in 2021. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009R1185-20211208 (Accessed 29.08.24)

 Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on **nature restoration** and amending Regulation (EU) 2022/869 (Text with EEA relevance). https://eur-lex.europa.eu/eli/reg/2024/1991 (Accessed 31.08.24)

Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of **greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework,** and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (Text with EEA relevance) Text with EEA relevance) *Consolidated text*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02018R0841-20230511&qid=1725100305888t (Accessed 31.08.24)

Wales/UK legislation and guidance

Agriculture (Wales) Act 2023. https://law.gov.wales/agriculture-wales-act-2023 (Accessed 28.08.24)

Agriculture (Wales) Act 2023 Explanatory notes. https://www.gov.wales/agriculture-wales-act-2023-explanatory-memorandum (Accessed 28.08.24)

Sustainable Farming Scheme: data confirmation general guidance First published: 22 July 2024. https://www.gov.wales/sustainable-farming-scheme-data-confirmation-general-guidance-html (Accessed 30.08.24)

Other

Hart, K. (2024) Securing greater environmental and climate performance from EU agricultural funds. Institute for European Environmental Policy, Brussels. https://ieep.eu/publications/securing-greater-environmental-and-climate-performance-from-eu-agricultural-funds/

Annex-1: PMEF Result Indicators

Details about each of the PMEF impact indicators summarising for each indicator or sub-indicator: the units and frequency of measurement, sample size, data source(s), data issues and limitations, and other comments can be found in: "PMEF – result indicators" (https://agriculture.ec.europa.eu/system/files/2023-09/pmef-result-indicators_en.pdf).

Detailed methodological guidance from Commission can be found in:
European Commission Common monitoring and evaluation framework: key information on CAP implementation, its results and its impacts: "PMEF Cover note on output and result indicators"[58].

This Annex is sourced from: Source: European Commission: Common Monitoring and Evaluation Framework: European Commission Common monitoring and evaluation framework: key information on CAP implementation, its results and its impacts PMEF – result indicators[59].

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[58] https://agriculture.ec.europa.eu/document/download/8566e25f-ed50-4e81-9c20-5ff27df42567_en?filename=pmef-cover-note-indicators_en.pdf (assessed 15 Sept 2024)
[59] https://agriculture.ec.europa.eu/system/files/2023-09/pmef-result-indicators_en.pdf (accessed 15 Sept 2024)

Result indicators
02/07/2024 – Version 19.0

Code	Result indicators (only based on interventions supported by the CAP)	
R.1[PR]	Enhancing performance through knowledge and innovation	Number of persons benefitting from advice, training, knowledge exchange or participating in European Innovation Partnership (EIP) operational groups supported by the CAP in order to enhance sustainable economic, social, environmental, climate and resource efficiency performance
R.2	Linking advice and knowledge systems	Number of advisors receiving support to be integrated within the Agricultural Knowledge and Innovation Systems (AKIS)
R.3	Digitalising agriculture	Share of farms benefitting from support for digital farming technology through CAP
R.4	Linking income support to standards and good practices	Share of utilised agricultural area (UAA) covered by income support and subject to conditionality
R.5	Risk Management	Share of farms with supported CAP risk management tools
R.6[PR]	Redistribution to smaller farms	Percentage of additional direct payments per hectare for eligible farms below average farm size (compared to average)
R.7[PR]	Enhancing support for farms in areas with specific needs	Percentage additional support per hectare in areas with higher needs (compared to average)
R.8	Targeting farms in specific sectors	Share of farms benefitting from coupled income support for improving competitiveness, sustainability or quality
R.9[PR]	Farm modernisation	Share of farms receiving investment support to restructure and modernise, including to improve resource efficiency
R.10[PR]	Better supply chain organisation	Share of farms participating in producer groups, producer organisations, local markets, short supply chain circuits and quality schemes supported by the CAP
R.11	Concentration of supply	Share of value of marketed production by producer organisations or producers' groups with operational programmes in certain sectors
R.12	Adaptation to climate change	Share of utilised agricultural area (UAA) under supported commitments to improve climate adaptation
R.13[PR]	Reducing emissions in the livestock sector	Share of livestock units (LU) under supported commitments to reduce emission of greenhouse gases and/or ammonia, including manure management
R.14[PR]	Carbon storage in soils and biomass	Share of utilised agricultural area (UAA) under supported commitments to reduce emissions or to maintain or enhance carbon storage (including permanent grassland, permanent crops with permanent green cover, agricultural land in wetland and peatland)

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1

Result indicators
02/07/2024 – Version 19.0

R.15	Renewable energy from agriculture, forestry and from other renewable sources	Supported investments in renewable energy production capacity, including bio-based (in MW)
R.16	Investments related to climate	Share of farms benefitting from CAP investment support contributing to climate change mitigation and adaptation, and to the production of renewable energy or biomaterials
R.17[PR]	Afforested land	Area supported for afforestation, agroforestry and restoration, including breakdowns
R.18	Investment support to the forest sector	Total investment to improve the performance of the forestry sector
R.19[PR]	Improving and protecting soils	Share of utilised agricultural area (UAA) under supported commitments beneficial for soil management to improve soil quality and biota (such as reducing tillage, soil cover with crops, crop rotation included with leguminous crops)
R.20[PR]	Improving air quality	Share of utilised agricultural area (UAA) under supported commitments to reduce ammonia emission
R.21[PR]	Protecting water quality	Share of utilised agricultural area (UAA) under supported commitments for the quality of water bodies
R.22[PR]	Sustainable nutrient management	Share of utilised agricultural area (UAA) under supported commitments related to improved nutrient management
R.23[PR]	Sustainable water use	Share of utilised agricultural area (UAA) under supported commitments to improve water balance
R.24[PR]	Sustainable and reduced use of pesticides	Share of utilised agricultural area (UAA) under supported specific commitments which lead to a sustainable use of pesticides in order to reduce risks and impacts of pesticides such as pesticides leakage
R.25	Environmental performance in the livestock sector	Share of livestock units (LU) under supported commitments to improve environmental sustainability
R.26	Investments related to natural resources	Share of farms benefitting from CAP productive and non-productive investment support related to care for the natural resources
R.27	Environmental or climate-related performance through investment in rural areas	Number of operations contributing to environmental sustainability and the achievement of climate mitigation and adaptation goals in rural areas
R.28	Environmental or climate-related performance through knowledge and innovation	Number of persons benefitting from advice, training, knowledge exchange, or participating in European Innovation Partnership (EIP) operational groups supported by the CAP related to environmental or climate-related performance
R.29[PR]	Development of organic agriculture	Share of utilised agricultural area (UAA) supported by the CAP for organic farming, with a split between maintenance and conversion

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2

	Result indicators 02/07/2024 – Version 19.0	
R.30^{PR}	Supporting sustainable forest management	Share of forest land under commitments to support forest protection and management of ecosystem services
R.31^{PR}	Preserving habitats and species	Share of utilised agricultural area (UAA) under supported commitments supporting biodiversity conservation or restoration including high-nature-value farming practices
R.32	Investments related to biodiversity	Share of farms benefitting from CAP investment support contributing to biodiversity
R.33	Improving Natura 2000 management	Share of total Natura 2000 area under supported commitments
R.34^{PR}	Preserving landscape features	Share of utilised agriculture area (UAA) under supported commitments for managing landscape features, including hedgerows and trees
R.35	Preserving beehives	Share of beehives supported by the CAP
R.36^{PR}	Generational renewal	Number of young farmers benefitting from setting up with support from the CAP, including a gender breakdown
R.37	Growth and jobs in rural areas	New jobs supported in CAP projects
R.38	LEADER coverage	Share of rural population covered by local development strategies
R.39	Developing the rural economy	Number of rural businesses, including bio-economy businesses, developed with CAP support
R.40	Smart transition of the rural economy	Number of supported smart-village strategies
R.41^{PR}	Connecting rural Europe	Share of rural population benefitting from improved access to services and infrastructure through CAP support
R.42	Promoting social inclusion	Number of persons covered by supported social inclusion projects
R.43^{PR}	Limiting antimicrobial use	Share of livestock units (LU) concerned by supported actions to limit the use of antimicrobials (prevention/reduction)
R.44^{PR}	Improving animal welfare	Share of livestock units (LU) covered by supported actions to improve animal welfare

^{PR} Indicators subjected to Performance Review

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3

Annex-2: CAP PMEF Impact Indicators – Analysis

Purpose: To gather data to support the review of comparable M&E frameworks and indicators in the EU that are relevant to monitoring activities related to the SLM outcomes.

Scope: CAP 2023-27 PMEF impact indicators.

Structure and content of the data spreadsheet: The data summary here covers the following key features of each indicator (where one indicator is sub-divided into several parts each part is treated as a separate indicator):

Indicator name and number	as in published source
Specific EU objective of indicator	as in published source
EU short definition	as in published source, if provided
Geographical scope	e.g. EU wide, Europe including EU, etc
Unit(s)	of published data e.g. no. of hectares, %,
Frequency/timeliness	of data collection/publication, in years
Sample size	of data used to compile the indicator e.g. individual farms, regional or national data (e.g. NUTS)
Data source(s) and ownership	of data used to compile the indicator values
Data issues and limitations	as noted in the data source or from EU guidance and other published evaluation/commentary
Other comments	Implications / lessons to inform the development of the SLM M&E framework

Source: Own compilation based on European Commission Context and Impact indicators 07/03/2024 – Version 9.0[60]

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[60] https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef_en#towardsthepmef (accessed 29 Aug 2024)

Indicator PMEF I.1 Sharing knowledge and innovation: share of CAP budget for knowledge sharing and innovation					
Geographic scope: Member States (NUTS 0) **Unit(s):** % annual financial transactions accounted for by expenditure on a range of interventions 'see "EU definition' for more detail **Frequency/timeliness in years:** 1/1 **Sample size:** expenditure accounted for under specific interventions					
Specific EU objective of indicator	**EU short definition**		**Data source(s) (and ownership)**	**Data issues and limitations**	**Other comments**
Modernising agriculture and rural areas by fostering and sharing knowledge, innovation and digitalisation in agriculture and rural areas and by encouraging their uptake by farmers, through improved access to research, innovation, knowledge exchange and training	Share of CAP budget for knowledge sharing and innovation The main purpose of this index is to measure efforts to foster innovation and knowledge sharing, as required under the cross-cutting CAP objective on modernisation and covers a broad range of interventions covering knowledge exchange/sharing; knowledge creation through interactive innovation projects, including those by EIP Operational Groups; and multi-actor research and experimental production by Producer Organisations in specific sectors, including fruit and vegetables, hops, wine and apiculture. Expenditure accounted for: • interventions under Article 78 (knowledge exchange and dissemination of information), e.g. use of advice by farmers; training of advisors; cross- visits for advisors; knowledge exchange activities between advisors, CAP networks and research working together; setting up and implementing of EIP OG innovative projects etc.) • innovative projects of EIP operational groups (interventions funded under Article 77 according to specific requirements detailed in Art 127) • support to training and advice under Art 47(1)(b) and (c), Art 55(1)(a) and Art 58(1)(f) as well as to research, innovation and experimental production (Art 47(1)(a), Art 58(1)(e), Art 55(1)(e))		DG AGRI (Annual Performance Reports)		This impact indicator measuring expenditure is complement ed by result indicators R1 and R2, which measure number of beneficiaries

PMEF I.2	Reducing income disparities; evolution of agricultural income compared to the general economy			
Geographical scope: Member State				
Unit(s): All three specific indicators are expressed in EUR/AWU.				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To support viable farm income and resilience of the agricultural sector across the Union in order to enhance long-term food security and agricultural diversity as well as ensuring the economic sustainability of agricultural production in the Union	Comparison of agricultural income with non-agricultural labour cost. This indicator compares labour costs in industry, construction and services with 3 specific indicators for agricultural income: 1. Agricultural entrepreneurial income plus compensation of employees per annual work unit. 2. Farm net income plus wages and social security charges by total AWU. 3. Farm net income minus opportunity costs for own production factors (land and capital) by total family work units. **NOTE: See indicator fiche for detailed explanation of the calculations involved**	Databases of Eurostat and the EU Farm Accountancy Data Network (FADN)	The FADN sample is different from the total agricultural sector since small farms are excluded.	Definition also used for context indicator C.26

PMEF I.3 Reducing farm income variability: evolution of agricultural income				
Geographical scope: Member State (NUTS 0). Regional (NUTS 1 and 2) where data are available **Unit(s):** 1: EUR (in real terms)/AWU 2: Index 2010 =100 3: % **Frequency/timeliness in years:** 1/1 **Sample size:** Member State				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To support viable farm income and resilience of the agricultural sector across the Union in order to enhance long-term food security and agricultural diversity as well as ensuring the economic sustainability of agricultural production in the Union	**Agricultural factor income** measures the remuneration of all factors of production (land, capital, labour) regardless of whether they are owned or borrowed/rented and represents all the value generated by a unit engaged in an agricultural production activity. The indicator consists of 3 specific indicators: 1. Agricultural factor income per annual work unit (AWU). It measures the income generated by a farm (as defined above) per annual working unit, where an AWU in agriculture corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis. For this indicator, total (paid and unpaid) AWU are used. 2. The index of agricultural factor income per AWU is already available in Eurostat's Economic Accounts for Agriculture as specific indicator 1. This index is a measure of relative labour productivity and is particularly suited for showing developments over time. 3. Indicator I.3 is the % variation of the Index compared to the last 3- year average. NOTE: See indicator fiche for detailed explanation of the calculations involved	Eurostat	Agricultural factor income is best suited for evaluating the impact of changes in the level of public support (i.e. direct payments) on the capacity of farmers to reimburse capital, pay for wages and rented land as well as to reward their own production factors. In this context one should note that the remuneration of own and external production factors is often unequal at farm level. The Eurostat Economic Accounts for Agriculture (EAA) provide timely data, however to assess income development and variability by region or farm type, Member States might complement the analysis using FADN data. This indicator is also used for the EU reporting on UN Sustainable Development Goals.	Definition also used for context indicator C.25.

PMEF I.4	Supporting viable farm income: evolution of agricultural income level by type of farming (compared to the average in agriculture)			
Geographical scope: National and by FADN division (similar to NUTS 2) **Unit(s):** Euro per AWU **Frequency/timeliness in years:** 1/2 to 3 **Sample size:** FADN sample survey of farms				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To support viable farm income and resilience of the agricultural sector across the Union in order to enhance long-term food security and agricultural diversity as well as ensuring the economic sustainability of agricultural production in the Union	Evolution of agricultural income level by type of farming (compared to the average in agriculture) Farm net value added (FNVA) is the portion of agricultural output value that can be used to remunerate the fixed factors of production (labour, land and capital), whether they are external or family-owned factors. As a result, agricultural holdings can be compared regardless of the family/non- family nature of the factors of production used. (See Indicator fiche for calculation methodology) The value is calculated per annual work unit (AWU) in order to take into account the differences in the scale of farms and to obtain a better measure of the productivity of the agricultural workforce. The indicator consists of 5 specific indicators:1. Farm net value added by type of farming2. Farm net value added by region3. Farm net value added by economic farm size4. Farm net value added by physical farm size5. Farm net value added in areas facing natural and other specific constraints **Methodology same as PMEF indicator 1.5 NOTE: See indicator fiche for detailed explanation of the calculations involved**	SE425 in the FADN public database	The FADN sample is different from the total agricultural sector since small farms are excluded.	Definition also used for context indicator C.27

PMEF I.5　　Contributing to territorial balance: evolution of agricultural income in areas with natural constraints (compared to the average)				
Geographical scope: ANC/LFA areas other than mountain, mountain ANC/LFA areas and "not in ANC/LFA areas **Unit(s):** Euro per AWU **Frequency/timeliness in years:** 1/2 to 3 **Sample size:** FADN sample survey of farms				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To support viable farm income and resilience of the agricultural sector across the Union in order to enhance long-term food security and agricultural diversity as well as ensuring the economic sustainability of agricultural production in the Union	Evolution of agricultural income in areas with natural constraints (compared to the average) **Methodology same as PMEF indicator 1.4**	SE425 in the FADN public database	The FADN sample is different from the total agricultural sector since small farms are excluded.	Definition also used for context indicator C.27

PMEF I.6   Increasing farm productivity: total factor productivity in agriculture
Geographical scope: EU, National (NUTS 0)
Unit(s): Index (3-year moving average)
Frequency/timeliness in years: 1/1
Sample size: Member State

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To enhance market orientation and increase farm competitiveness both in the short and long term, including greater focus on research, technology and digitalisation	Total factor productivity in agricultureTotal factor productivity (TFP) compares total outputs relative to the total inputs used in production of the output; an increase in TFP reflects a gain in output quantity, which is not originating in from an increase of input use. As a result, TFP reveals the joint effects of many factors including new technologies, efficiency gains, economies of scale, managerial skill, and changes in the organisation of production.	Eurostat (Economic Accounts for Agriculture, Farm Structure Survey, Agricultural Production Data - Crop Products)Farm Accountancy Data Network (FADN)	The climatic conditions affecting crop yields have strong impact on the indicator, therefore a 3-year moving average is calculated to smooth the weather effect; also, the level of detailed information required to compile the indices does not allow for calculating long time series. There are breaks in time series and data is missing for some years, especially in the Agricultural Production Data. The methodology to value the fixed capital consumption seems to vary over time. The TFP indicator is very sensitive to any variation in labour input. The calculation of regional values is not possible due to the lack of data at such detailed geographical level.The FADN sample is different from the total agricultural sector since small farms are excluded.	Definition also used for context indicator C.29

PMEF I.7　　　Harnessing agri-food trade: agri-food imports and exports

Geographical scope: EU, National (NUTS 0)
Unit(s): EUR billion
Frequency/timeliness in years: 1/Year N is available in March N+1
Sample size: Member State (NUTS 0)

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To enhance market orientation and increase farm competitiveness both in the short and long term, including greater focus on research, technology and digitalisation	This indicator consists of 4 specific indicators covering the EU trade agri-food (intra-, extraEU; total, exports, imports, and trade balance); as well as 7 sub-indicators providing more in-depth information (total and separate values for commodities, other primary products, processed, food preparations, beverages, non-edible products)	Indicator is calculated by DG AGRI yearly on the basis of EUROSTAT Comext data, using the definition of agricultural products developed internally by DG AGRI unit A.1 and used in DG AGRI publications on agri-food trade (cf. https://ec.europa.eu/agriculture/trade-analysis/statistics_en).		Definition also used for context indicator C.31

PMEF I.8　　Improving farmers' position in the food chain: value added for primary producers in the food chain
Geographical scope: National
Unit(s): EUR million and %
Frequency/timeliness in years: 1/1
Sample size: National

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
Improve the farmers' position in the value chain	Gross Value Added (GVA) of primary producers, total and share of the primary production on the total value added generated by different participants of the food chain (primary production, food manufacturing, food distribution and food service activities. GVA is defined as the value of output less the value of intermediate consumption. Output is valued at basic prices, GVA is valued at basic prices and intermediate consumption is valued at purchasers' prices.	Eurostat – National and Regional Economic Accounts, Economic accounts for agriculture and Structural Business Statistics	For the primary producers the whole food manufacturing is covered as well as the food distribution of three products (food, beverages, tobacco). However, the share is still an over-estimate, as the value-added of the primary production includes also other products (e.g. textiles and bio-industries outlets, which have been excluded, when possible, in the rest of the food chain added value).	Definition also used for context indicator C.11

PMEF I.9	Improving the resilience of agriculture to climate change: agricultural sector resilience progress indicator			
Geographical scope: National **Unit(s):** The synthetic value of the indicator is given by the cumulative score of components scaled to range between 0 and 100%. **Frequency/timeliness in years:** Beginning, mid and end of programming period / corresponding to CAP PMEF, JRC and Eurostat data. **Sample size:** As for individual selected impact indicators				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To contribute to climate change mitigation and adaptation, including by reducing greenhouse gas emissions and enhancing carbon sequestration, as well as to promote sustainable energy	The resilience of agriculture to climate change refers to the capability to maintain functions and services of the sector in the context of increasing extreme events under climate change. Resilience can be strengthened through short-term adjustment of existing practices and management, and long-term transformational change, in response to the duration and the intensity of climate disturbances. Several factors affect the sector's resilience to climate change, including socio-economic, innovation, governance and biophysical factors.This is a composite indicator synthesising status and progress of different components that impact or depend on resilience. The initial components are financial and biophysical (references in brackets correspond PMEF context indicators or to other existing sources of information)• Agricultural factor income stability (from C.25 data)• Crop production stability – annual cereals production resilience (from Eurostat)• Water exploitation index plus (WEI+) regionally and monthly for the agricultural sector (from C.38 data, supplemented with model results)• Soil organic carbon in agricultural land (from C.40 data), including regional change of modelled carbon stocks.Each component can have a value of 0 (less resilient without progress), 0.5 (less resilient, but significant progress), or 1 (reached and maintain a good resilience). The composite indicator can have a maximum value of 100%, indicating a good status of all	CAP CMEF and PMEF, JRC, Eurostat and EEA data	This indicator provides a basic framework open to further development and selection of components. The intial set is based on those for which a trend assessment or comparison with a reference period can be carried out. More will be included later.It is important to recognise that a comprehensive assessment of the resilience would imply describing dimensions such as: socio-economic; governance; social and innovation; and bio-physical. For some components, data are not readily available or data collection will only start with the new programming period. Those will include, for example: implementation of (agro-management) adaptation measures to climate change; investments related to care for the environment or climate; risk assessment methods, including climate services, training, related to environmental/climate	Assesment of indicators uses data from three PMEF context indicators. Definition also used for context indicator C.45.

evaluated components. Progress is assessed compared to baseline reference levels, i.e. the previous programming period, or a climate-relevant longer period depending on data availability. Threshold values and related methodology are defined by JRC, component by component.

performance. It is also possible that the overall system resilience will depend on the 'weakest' factor, and careful analysis of the contributing factors and importance in the local context remains imperative. Systematic analysis of relationships between driving factors that enhance or weaken aspects of resilience may help refining the indicator in the local context. Several model-based indicators can be further improved using detailed information on e.g. agro-management and other practices.

PMEF I.10	Contributing to climate change mitigation: greenhouse gas emissions from agriculture
Geographical scope: National **Unit(s):** 1, 3, 4: tonnes (megatonnes) of CO2 equivalents per year for the absolute value and % for the change compared to baseline2, 5: %6: tonnes of CO2 equivalents/ha7: tonnes of CO2 equivalents/LU **Frequency/timeliness in years:** 1/2 **Sample size:** National	

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To contribute to climate change mitigation and adaptation, including by reducing greenhouse gas emissions and enhancing carbon sequestration, as well as to promote sustainable energy	This indicator is composed of seven specific indicators:1. GHG emissions from agricultureAggregated annual emissions of methane and nitrous oxide from agriculture reported by Member States under the IPCC 'Agriculture' sector (Sector 3 Agriculture non-CO2) in the national GHG inventories to the UNFCCC.2. Share of GHG emissions from agriculture in total GHG emissions3. GHG emissions and removals from LULUCFAggregated annual emissions and removals reported by Member States under the IPCC LULUCF sector in the national GHG inventories to the UNFCCC. The relevant LULUCF categories are those related to cropland and grassland management, as defined in the Implementing Act accompanying the Governance Regulation (2018/1999). 4. GHG emissions from agriculture including cropland and grasslandSum of GHG emissions from agriculture and GHG emissions and removals from LULUCF for cropland and grassland5. Share of GHG emissions from agriculture including cropland and grassland in total GHG emissions6. GHG emissions from livestock: sum of enteric fermentation and manure management/hectares of Utilised Agricultural Area (UAA)7. GHG emissions from ruminants: enteric fermentation per livestock unit (LSU) of ruminants Methodology: Member States calculate emissions and removals using standard methodologies (2006 guidelines of the Intergovernmental Panel on Climate Change – IPCC, and its 2019 refinement) according to a common reporting framework agreed under the UNFCCC.	The indicator is based on the annual national inventory submissions to the EU and subsequently the UNFCCC. The inventory is compiled by each Member State, and then collated and quality-assured by the European Environment Agency (EEA) and the European Topic Centre for Air Pollution and Climate Change Mitigation (ETC/ACM)NOTE: See indicator fiche for details	This indicator does not include emissions of CO2 from the energy use of agricultural machinery, buildings and farm operations, which are included in the 'energy' inventory under UNFCCC, or emissions from production of inputs, such as inorganic fertilisers.Data are recalculated annually for the whole time series due to update in coefficients or upgrading of Tiers. Therefore it is important to ensure an update of the whole time series each year this indicator is reported on.Definition also used for context indicator C.44.	Also excludes farm woodland which is included in in LULUCF. Definition refers to Member State obligations, and definitions, in other EU legislation including: Effort Sharing Regulation (2018/842), Governance Regulation (2018/1999) and its Implementing Act, LULUCF Regulation (2018/841), and Monitoring Mechanism Regulation (2018/1999)

PMEF I.11   Enhancing carbon sequestration: soil organic carbon in agricultural land

Geographical scope: EU plus UK

Unit(s): 1: megatonnes (Mt) of C;2: g of C / kg3: %

Frequency/timeliness in years: Data-model framework is updated according to LUCAS frequency. 2018 data was published in 2022.

Sample size: The final outputs are maps of SOC stock and changes in time at 100 m resolution, that can be aggregated at any administrative level.

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To contribute to climate change mitigation and adaptation, including by reducing greenhouse gas emissions and enhancing carbon sequestration, as well as to promote sustainable energy	The indicator estimates the total organic carbon content in soils on agricultural land using 3 specific indicators:1. estimate of the total organic carbon content in soils on agricultural land of EU Member States (with a breakdown by arable land, grassland and permanent crops)2. the mean organic carbon content in agricultural land3. estimate of soil organic carbon (SOC) changes over timeThe methodology is based on the integration of ground data, from the LUCAS soil survey, with an advanced modelling framework coupling process-based and machine learning models. The model will also include scenarios on actual implementation of practices which are relevant for SOC accumulation. The final outputs are maps of SOC stock and changes in time at 100 m resolution, that can be aggregated at any administrative level.**NOTE: See indicator fiche for detailed explanation of the calculations involved**	European Soil Data Centre (ESDAC) - https://esdac.jrc.ec.europa.eu/	As the indicator is an estimate of the topsoil only, the total SOC in agricultural soils is underestimated. Nevertheless, it can give a good indication on the change. The indicator is downscaled at 100 m resolution and uncertainty of the estimation provided.	This method is complementary to national scale or local maps that are often based on more detailed information, and sometimes spatialised. Member States have used LUCAS, combined with national data, to enhance estimates within Member State inventories.Definition also used for context indicator C.40

PMEF I.12	Increasing sustainable energy in agriculture: sustainable production of renewable energy from agriculture and forestry			
Geographical scope: EU, National (NUTS 0)				
Unit(s): 1 – 3: ktoe 4: %				
Frequency/timeliness in years: 1/2				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To contribute to climate change mitigation and adaptation, including by reducing greenhouse gas emissions and enhancing carbon sequestration, as well as to promote sustainable energy	A composite indicator of renewable energy from agriculture and forestry, consisting of 4 specific indicators: 1. Production of renewable energy from agricultural biomass 2. Production of renewable energy from forestry biomass 3. Production of renewable energy from agriculture and forestry 4. Share of the combined production of renewable energy from agricultural and forestry biomass over the total primary energy production of renewable energy. **NOTE: See indicator fiche for detailed explanation of the calculations involved**	Eurostat Energy Statistics. Member State reporting under the Governance of the Energy Union (Regulation 2018/1999) and/or the Renewable Energy Directive (2009/28/EC and EU/2023/2413)	Category "energy from agricultural biogas", predominantly covers agricultural biogas, but also contains some biogas from municipal solid waste etc.	The indicator has some similarities with the Agri-environmental indicator 24 (renewable energy production) Definition also used for context indicator C.42

PMEF I.13		Reducing soil erosion: percentage of agricultural land in moderate and severe soil erosion		
Geographical scope: National (NUTS 0), Regional (NUTS 2-3) level (based on 100m cell – model output).				
Unit(s): 1: t/ha/year 2: %				
Frequency/timeliness in years: Every 3-4 years depending on the data input availability / 3 years delay between sampling (or surveying) and publication				
Sample size: Based on 100m cell – model output				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To foster sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency	Percentage of agricultural land in moderate and severe soil erosion.Consists of 2 specific indicators:1. estimated rate of soil loss by water erosion2. percentage of agricultural land at risk of moderate and severe soil erosionThese indicators assess potential soil loss by water erosion processes (rain splash, sheetwash and rills); and identify the agricultural areas susceptible to a rate of soil erosion considered unsustainable, within the following thresholds: (moderate >5 t/ha/year, severe >10 t/ha/year). They have been produced by the Joint Research Center of the European Commission (JRC-Ispra), on the basis of an empirical computer model.NOTE: See indicator fiche for detailed explanation of the methodology	Sources:• Joint Research Centre (JRC) – European Soil Data Centre (ESDAC);• Input data sources used for the model: LUCAS Topsoil 2009, European Soil Database, Corine Land Cover 2006/2012, Rainfall Erosivity Database in Europe (REDES), Copernicus Remote Sensing, Eurostat Statistics, Digital Elevation Model (DEM), Good Agricultural Environmental Conditions (GAEC), Lucas Earth Observations 2009/2012/2015, Farm Field Survey (FSS) statistical data 2010/2016 (source: Eurostat).• Potential sources available at national level (studies, surveys, reports) can be explored and used.Location of data:Joint Research Centre (JRC)• European Soil Data Centre (ESDAC) https://esdac.jrc.ec.europa.eu/Eurostat• [aei_pr_soiler] (full data set)• [sdg_15_50] (indicator table)National studies, surveys, reports	Soil erosion rates may change due to change in land cover or soil management practices (e.g. soil cover, reduced tillage, contour farming, terraces, grass margins). To evaluate significant changes in soil erosion over time it should be noted that an analysis over a time period of at least 10-15 years would be necessary. The time interval for which data are available is limited and therefore any conclusion must be drawn with caution.The soil erosion map provides the most updated and harmonised picture of water erosion in EU based on the best available input factors. The soil erodibility is estimated for the 20 000 field sampling points included in the LUCAS survey; the land cover data are taken by CORINE LC (subject to QA) and Farm Structure Survey (source: Eurostat). The proposed map is not intended to substitute any national or local erosion map which is based on more detailed spatial data.	The following indicators are based on the JRC data/indicator:Eurostat agri-environmental indicator (AEI) 21 – Soil erosion. https://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_soil_erosion**An SDG indicator on severe soil loss** https://ec.europa.eu/eurostat/statistics-explained/index.php?title=SDG_15_-_Life_on_land_(statistical_annex)#Estimated_soil_erosion_by_water**Definition also used for context indicator C.41

PMEF I.14   Improving air quality: ammonia emissions from agriculture

Geographical scope: EU, National (NUTS 0)
Unit(s): 1. Kilotonnes of NH3 per year 2. %
Frequency/timeliness in years: 1/1
Sample size: Member State

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To foster sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency	Ammonia emissions from agriculture.This indicator measures total annual ammonia emissions (NH3) from agriculture, considering: manure management for 12 types of livestock; and application to soil of inorganic N- fertilisers (including urea), animal manure applied to soil, and urine and dung deposited by grazing animals as well as application of fertilisers and manure to soils.There are 2 specific indicators:1. Total ammonia emissions2. Change in ammonia emissions compared to 2005	Source: The Member States report their total national emissions of NH3 every year to the European Commission. Data are recalculated annually for the whole time series due to update in coefficients or upgrading of Tiers.Data location: Annual data on ammonia emissions from agriculture is available at the EEA's website. The information, broken down by Member State and sub-category, is also provided through the web-based tool "Air pollutant emissions data viewer (NEC Directive)" https://www.eea.europa.eu/data-and-maps/dashboards/necd-directive-data-viewer-1 or Eurostat's table on ammonia emission [Tai07]	Data are able to show emission trends over time and compare trends among Member States; and also to show differences in the subcategories, such as identifying main sources within the agricultural sector within a country, but these can be strongly dependent on the Tier used. Evaluation of impacts of air pollution by NH3 emissions, requires spatial information in conjunction with models. Science based gridded emission inventories, and gridded inventories from some MS are available. Satellite observations of NH3 provide new opportunities to derive spatial information. The use by MS of Tier 1 approaches may prevent tracking progress and policy effectiveness when using MS inventory information. Improvements such as on manure spreading methods or in productivity of milk, should be detected. Along with inventory MS submit an Informative Inventory Report (IIR). To link NH3 emission improvement to CAP, detailed information on which measures have been implemented, implementation rate (no. of livestock or m2 of UAA affected) are necessary, as well as improvement in emission factors.	**This indicator is also used for the EU reporting on UN Sustainable Development Goals.**Definition also used for context indicator C.47

PMEF I.15.1	Improving water quality: gross nutrient balance on agricultural land (nitrogen)

Geographical scope: National (NUTS 0), covering <20 countries of the EU
Unit(s): kg N/ ha/ year
Frequency/timeliness in years: 1/2

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To foster sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency	Impact indicator 1.15.1 for water quality1. Gross nutrient balance – nitrogen A lack of nitrogen may cause degradation in soil fertility and erosion, while an excess may cause surface and groundwater (including drinking water) pollution and eutrophication.Nitrogen balances are monitored for the purposes of the Water Framework Directive and for the Nitrates Directive. The following Eurostat indicator already exists: Agri-environmental indicator 15 Gross Nitrogen Balance: Potential surplus of nitrogen on agricultural land, http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-nvironmental_indicator-gross_nitrogen_balance	Source: Eurostat, based on data reported by the countries (currently only available for those countries that report) new Stats REG Location: Eurostat: Gross nutrient balance [aei_pr_gnb]https://ec.europa.eu/eurostat/cache/metadata/en/aei_pr_gnb_esms.htmhttps://ec.europa.eu/eurostat/cache/metadata/en/t2020_rn310_esmsip2.htm	Some countries prefer to use the fertilised areas, i.e. they have removed rough grazings from the agricultural area.Data at national level and annual national balances can mask important regional or monthly variations. The indicator is only a snapshot at a point in time. It does not consider the past-cumulated surplus. i.e, the risk to water quality degradation does not come from the actual surplus, but also from past surpluses. The indicator is a robust measure for nutrient leaching risk, directly linked⬚.The indicator is captive of the methodologies used to calculate coefficients and the availabilities of national coefficients, plus the recalculation of coefficients when national practices change. With no work on the coefficients, the only changes recorded are related to changes in ⬚.The⬚.In the future, it could be considered how to make data available at regional (NUTS 2) level, using JRC modelling data, or with MS data when they have them available. Details on accuracy can be found in the metadata of the source datasets. There is high uncertainty in some coefficients used.	The indicator is part of the Resource Efficiency Scoreboard, the agri-environmental indicators, and the SDG indicators. Definition also used for context indicator C.39

PMEF I.15.2	Improving water quality: gross nutrient balance on agricultural land (phosphorus)			
Geographical scope: National (NUTS 0), covering <20 countries of the EU **Unit(s):** kg P/ ha/ year **Frequency/timeliness in years:** 1/2				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To foster sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency	Gross Phosphorus Balance (GNB-P): Potential surplus of phosphorus on agricultural land (Gross Phosphorus Surplus). It represents the total potential threat of phosphorus surplus in agricultural soils to the environment. When P is applied in excess, it can cause surface and groundwater (including drinking water) pollution and eutrophication. In contrast to nitrogen, phosphorus can be loaded into agricultural soils. In several places in the EU, soil is lacking phosphorus and a surplus (loading) can improve soil fertility in the longer run.	Eurostat, based on data reported by the countries (only available for those countries that report). Gross nutrient balance (aei_pr_gnb) https://ec.europa.eu/eurostat/cache/metadata/en/t2020_rn310_esmsip2.htm	The indicator is only a snapshot at a point in time, it does not consider the past-cumulated surplus. The risk to water quality degradation comes from the actual surplus, and also from past surpluses. This is particularly true for phosphorus saturated soils, where P leaching occurs even in negative surplus areas.	

PMEF I.16	Reducing nutrient leakage: nitrates in ground water – percentage of ground water stations with nitrates concentration over 50 mg/l under Directive 91/676/EEC			
Geographical scope: National (NUTS 0) and river basin level **Unit(s):** % of groundwater stations above the concentration threshold (50 mg NO3/l). The 4 yearly Commission reports on implementation of Nitrates Directive includes the % age of stations with average values ≥ 25, 40 or 50 mg/l during current and previous reporting period for each Member State. **Frequency/timeliness in years:** Nitrates Directive 4/4-6 EEA 1/1.5 **Sample size:** Number of national groundwater monitoring stations				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To foster sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency	Nitrates in groundwater shows the potential impact of agriculture on groundwater quality due to pollution by nitrates. It consists of an index measuring the % of groundwater monitoring sites with nitrate (NO3) over 50 mg/l for groundwater. This is linked to the requirement in the Nitrates Directive (91/676/EEC) for Member States to identify groundwaters that contain more than 50 mg/l nitrate, and complements the PMEF indicator I.15 **Other, related EU indicators already exist**, but there might be some differences with I.16: - Eurostat Agri-environmental indicator 27.1 Water quality – nitrates in freshwater: nitrate pollution of water.https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Agri-environmental_indicator_-_nitrate_pollution_of_water - CSI 020 Nutrients in freshwater European Environment Agency indicator Concentrations of nitrate in rivers and groundwater.https://www.eea.europa.eu/data-and-maps/indicators/nutrients-in-freshwater/nutrients-in-freshwater-assessment-published-9	Source: Nitrates Directive reporting (DG Env): national and river basin level.EEA Nutrients in freshwater: voluntarily reported annually by EEA Member Countries via the WISE/SOE (State of Environment) data flowLocation: EEA website, based on data reported to EIONET: Waterbase_rivers, Waterbase_groundwaters, CSI020 , http://www.eea.europa.eu/data-and-maps/indicators/nutrients-in-freshwaterReferences:- European Environment Agency (EEA): WISE-SoE Water Information System for Europe – State of Environment- Council Directive 91/676/EEC concerning the protection of waters against pollution by nitrates from agricultural sources.	Groundwater only, not rivers.National aggregation masks variation at individual groundwater monitoring stations; Calculation of %age above the limit not meaningful if location and sampling frequency not spatially representative, or changes year to year. DG Env and EEA working with Member States on streamlining reporting on water quality including coordination of WISE-SOE and Nitrate Directive reporting.Eurostat indicator (AEI 27.1) is available, but has not been updated since 2009, needing checking on the sources of information (unofficial MS's reporting) used for its estimation. The current AEI 27.1 is built as follows: for groundwater, groundwater monitoring station data are used for the current situation and groundwater bodies for the time series and trend analysis. However, the density and the stability of the monitoring station networks varies among Member States.	Complements I.15There are similar (but not identical) indicators by Eurostat and EEADefinition also used for context indicator C.39. **This indicator has common ground with the one used for EU reporting on UN SDG**

PMEF I.17	Reducing pressure on water resource: Water Exploitation Index Plus (WEI+)

Geographical scope: National (NUTS 0) and potentially River Basin District or sub-unit level.

Unit(s): % of water use over the renewable water resources available.

Frequency/timeliness in years: Annually (some monthly) depends on data sources and if voluntary. No info on timeliness

Sample size: WEI+ available at River Basin and sub-basin level.

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To foster sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency	Water use in agriculture is assessed with the WATER EXPLOITATION INDEX PLUS (WEI+), which is expressed as a percentage of water use over the renewable water resources available. For an PMEF impact indicator two specific indicators could be derived from the WEI+:- relative pressure of agriculture compared to other economic sectors, at national level and on an annual basis.- change over time in the volume of water used by agriculture, at national level and on an annual basis.More details on the calculation and units of measurement are being developed.	Source: - WISE SoE 3- Eurostat and OECD joint Questionnaire on Inland Waters - National Statistical Offices ad-hoc basis, not part of formal EEA data collection - E-OBS gridded dataset (on hydro-climatic variables)- 'Return': The average water return rate, which is implemented in the WEI+, reflects differences in irrigation technology and efficiency improvements.Location: • WISE SoE 3: https://rod.eionet.europa.eu/obligations/184 • Eurostat [sdg_06_60]• Eurostat and OECD Joint questionnairehttps://ec.europa.eu/eurostat/documents/1798247/6664269/Data+Collection+Manual+for+the+OECD_Eurostat+Joint+Questionnaire+on+Inland+Waters+%28version+3.0%2C+2014%29.pdf/f5f60d49-e88c-4e3c-bc23-c1ec26a01b2a- National Statistical Offices: on MS nat. stat. offices website- E-OBS gridded dataset:https://www.ecad.eu/download/ensembles/download.phphttps://www.knmi.nl/over-het-knmi/about	**The WEI+indicator is now available**. For development of specific PMEF I.17 indicators need to explore options to present the WEI+ information of the - at MS level on annual resolution, or- at finer spatial and temporal scales i.e. RBD or SU level on seasonal resolution. Both options come with pros and cons, notably on the interpretation of the results.Significant caveats about spatial and temporal gaps in data e.g. for WISE SoE 3, since 2010, reporting rate of Member States on abstraction for irrigation has been dramatically decreasing. See indicator fiche for more examples	Definition also used for context indicator C.38

PMEF I.18　　Sustainable and reduced use of pesticides: risks, use and impacts of pesticides

Geographical scope: 1. EU level but Eurostat plans to publish comparable data for each Member State in Quarter 4 2024 - Quarter 1 2025 on the same dataset, and to update this data annually in future. 2. EU and MS level. 3. Member States must submit 5-yearly reports to Eurostat detailing hazardous pesticides used on specified agricultural crops.
Unit(s): 1: kg. 2: Index based on weighted annual quantities of active substances in PPP placed on the market. 3: kg used (on hectares of specified crops)
Frequency/timeliness in years: 1/2
Sample size: EU, National (NUTS 0)

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To contribute to halting and reversing biodiversity loss, enhance ecosystem services and preserve habitats and landscapes	Comprises 3 specific indicators: **1. Sales of pesticides** Covers fungicides and bactericides, herbicides, haulm destructors and moss killers, insecticides and acaricides, molluscicides, plant growth regulators, and other plant protection products (PPP). **2. Harmonised Risk Indicator 1** NOTE: see indicator fiche for explanation of methodology **3. Sales of more hazardous pesticides** Active substances as defined in Regulation (EC) No 1107/2009 (as amended in 2021).	Eurostat Location of the data 1. Eurostat – Statistics on the placing on the market (sales) of pesticides table [aei_fm_salpest09] 2. The HRI 1 indicator at EU level published https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/harmonised-risk-indicators_en. The indicator at MS level is published by each MS https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/harmonised-risk-indicators/trends-harmonised-risk-indicators-member-states_en. 3. Eurostat – Not published yet	Indicator 1 covers both agricultural and non-agricultural sales	Indicator 2 is also used for the EU reporting on UN Sustainable Development Goals, and methodology of indicators 2 and 3 are used for measuring progress towards EU Farm to Fork targets of 50% reduction of risk and use of pesticides; and 50% reduction of the more hazardous pesticides. For both indicators, the baseline is the average of the reference period 2015-2017. Definition also used for context indicator C.49

PMEF I.19　　Increasing farmland bird populations: Farmland Bird Index

Unit(s): Index (time series)
Frequency/timeliness in years: Annual
Sample size: EU, National

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To contribute to halting and reversing biodiversity loss, enhance ecosystem services and preserve habitats and landscapes	Farmland Bird Index	EBCC/RSPB/BirdLife/Statistics Netherlands: the European Bird Census Council(EBCC) and its Pan-European Common Bird Monitoring Scheme (PECBMS),https://pecbms.info/		Definition also used for context indicator C.36

PMEF I.20	Enhancing biodiversity protection: percentage of species and habitats of Community interest related to agriculture with stable or increasing trends, with a breakdown of the percentage for wild pollinators species				
Unit(s): Percentage of assessments with a stable or improving conservation status trend. **Frequency/timeliness in years:** Every 6 years/Producing the indicator is estimated to take 6-12 months from reporting time. **Sample size**: EU, national					
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**	
To contribute to halting and reversing biodiversity loss, enhance ecosystem services and preserve habitats and landscapes	Percentage of species and habitats of Community interest related to agriculture with stable or increasing trends, with breakdown of the percentage for wild pollinators species		Annex I of Regulation 2021/2115 notes that 'the assessment of the trends for pollinators shall be performed by using relevant Union measures for pollinator indicators, in particular by a pollinator indicator and other measures adopted through the governance framework of the EU Biodiversity Strategy for 2030 (Commission communication of 20 May 2020) on the basis of the EU Pollinators Initiative (Commission communication of 1 June 2018).'	Definition also used for context indicator C.37	

PMEF I.21   Enhancing provision of ecosystem services: share of agricultural land covered with landscape features

Geographical scope: EU, National (NUTS 1), Regional (NUTS 2 and 3), based on detailed maps / samples covering the full EU.

Unit(s): 1: %. 2: Still to be defined

Frequency/timeliness in years: To be defined

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To contribute to halting and reversing biodiversity loss, enhance ecosystem services and preserve habitats and landscapes	This indicator consists of 2 specific indicators: 1. The share of agricultural land covered with landscape features (I.21), and 2. An elaborated index of landscape elements structure (under development).	• Copernicus Land Monitoring Service high resolution layers (https://land.copernicus.eu/pan-european/high-resolution-layers) • LUCAS (https://ec.europa.eu/eurostat/statistics-explained/index.php/LUCAS_-_Land_use_and_land_cover_survey)		Definition also used for context indicator C.21

PMEF I.22   Increasing agro-biodiversity in farming system: crop diversity

Geographical scope: National (NUTS 0)
Unit(s): Number, %
Frequency/timeliness in years: 3-4/2-3 (Farm Structure Survey)
Sample size: National (NUTS 0)

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To contribute to halting and reversing biodiversity loss, enhance ecosystem services and preserve habitats and landscapes	This indicator of **crop diversity** comprises two sub-indicators: 1. Crop diversity on farm (number of farms by number of crops and size) Number and % of farms by number of crops (1, 2, 3, and >3) and by size of arable land (arable land < 10ha; 10ha< arable land < 30 ha; 30 ha < 100 ha; arable land>100 ha), at NUTS 2 level. 2. Crop diversity in a region Average number of crops grown on a holding at NUTS 2 level as one, and broken down by arable land size classes (arable land < 10ha; 10ha< arable land < 30 ha; arable land > 30 ha).	Eurostat – Integrated Farm Statistics (IFS) as of survey year 2020. 1: special request to Eurostat for extraction from Eurofarm Database 2: from sub-indicator 1		Definition also used for context indicator C.22

PMEF I.23	Attracting young farmers: evolution of the number of new farm managers and the number of new young farm managers, including a gender breakdown

Geographical scope: EU, national (NUTS 0) and regional (NUTS 1 and 2)
Unit(s): Number of new farm managers by gender; number of new young farm managers by gender.
Frequency/timeliness in years: IFS: full census every 10 years, intermediate surveys twice in-between. Timeliness 2 years
Sample size: Farm-business, according to IFS sample

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To attract and sustain young farmers and other new farmers and facilitate business development in rural areas	The indicator shows the number of new farm managers including new young farm managers. The definition of 'new farmer' will be that proposed by Eurostat.	Source: Eurostat Integrated Farm statistics (IFS)The Integrated Farm Statistics Regulation (EU) 1091/2018 will provide data for• number of new entrant (including young) farmers in the previous 3 years• year in which the manager of the agricultural holding took up this role• year of birth of the manager of the agricultural holding	First data on new farm managers was available in 2022 (for reference year 2020)	Lead time of several years between surveys then 2 year delay in publication. Definition also used for context indicator C.16

PMEF I.24	Contributing to jobs in rural areas: evolution of the employment rate in rural areas, including a gender breakdown			
Geographical scope: Eurostat Labour Force Survey (LFS data) are collected on a continuous basis. Data by degree of urbanisation are disseminated by Eurostat annually **Unit(s):** % **Frequency/timeliness in years:** Continuous/4 months **Sample size:** LFS data are collected at LAU level (LAU2), with a sample defined to be significant at NUTS 2 level and at national level				
Specific EU objective of indicator	**EU short definition**	**Data source(s) (and ownership?)**	**Data issues and limitations**	**Other comments**
To promote employment, growth, gender equality, including the participation of women in farming, social inclusion and local development in rural areas, including the circular bio-economy and sustainable forestry	This indicator of employment rate in rural areas measures employed persons as a share of the total population of the same age group in rural areas. Data is gathered for each of two age groups. 'Employed persons' comprises: all persons aged 15-64 (or 20-64) years and who, during the reference week, worked at least one hour for pay or profit, or were temporarily absent from such work; employees, self-employed and unpaid family workers. 'Population' comprises persons aged 15-64 (or 20-64) years and over living in private households. There are 3 specific indicators: 1. total employment rate and by age groups 2. total employment rate by sex and by age groups 3. total employment rate by age groups in rural areas Methodology: Based on the Labour Force Survey (LFS), the total employment rate of each country can be disaggregated by degree of urbanisation, classifying the territory (Local Administrative Units (LAU)) into rural areas, towns and suburbs and cities. The rural employment rate of each Member State could then be compared with the employment rates in the other two types of areas or for the whole country; rates could also be calculated for men and women and even for other age groups.	Source Eurostat – Labour Force Survey	Although the use of the degree of urbanisation has been selected as the most appropriate for this indicator of "rural employment rate", the urban/rural typology is the one to be used when the information is available at NUTS level 3 (for example, for the indicator "Rural GDP per capita")	Definition also used for context indicator C.06

PMEF I.25	Contributing to growth in rural areas: evolution of gross domestic product (GDP) per capita in rural areas

Geographical scope: EU, National (NUTS 0), Regional (NUTS 1, 2 and 3) by type of region (predominantly rural, intermediate and predominantly Urban)
Unit(s): Index of GDP in PPS per inhabitant
Frequency/timeliness in years: 1/1 (national) 3 (regional)
Sample size: EU, National (NUTS 0), Regional (NUTS 1, 2 and 3) by type of region (predominantly rural, intermediate and predominantly Urban)

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To promote employment, growth, gender equality, including the participation of women in farming, social inclusion and local development in rural areas, including the circular bio-economy and sustainable forestry	Gross Domestic Product (GDP) per capita in rural regions, in Purchasing Power Standard (PPS) [*see indicator fiche for definition of PPS*]The index of GDP per capita in Purchasing Power Standards (PPS) is expressed in relation to the European Union average set to equal 100.Two specific indicators are calculated:1. Index of GDP expressed in PPS per inhabitant at national level2. Index of GDP expressed in PPS per inhabitant in percentage of the EU average for rural areas.	Source:Eurostat – National and Regional Economic AccountsEurostat — Rural development statisticsLocation:National data: table [nama_10_gdp], [nama_10_pc]Regional data: table [nama_10r_3popgdp], [nama_10r_3gdp]National data, by typology: table Gross domestic product (GDP) at current market prices by other typologies [urt_10r_3gdp]Most recent urban-rural typology: https://ec.europa.eu/eurostat/web/rural-development/methodology	As an average, this indicator does not measure the distribution of income within a given geographical area. Furthermore, non-monetary exchanges(production for self-consumption; public goods and externalities; barter;unpaid family labour) are not taken into account but can be substantial in somesectors (especially in agriculture) and regions.	Definition also used for context indicator C.09

PMEF I.26   A fairer CAP: distribution of CAP support

Geographical scope: National (NUTS 0)
Unit(s): 1: %. 2: EUR/beneficiary
Frequency/timeliness in years: 1/1 to 2
Sample size: All beneficiaries of the identified interventions (see definition)

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To promote employment, growth, gender equality, including the participation of women in farming, social inclusion and local development in rural areas, including the circular bio-economy and sustainable forestry	The main purpose of this indicator is to check the fairness of CAP support distribution. It measures in particular the impact of the redistributive payment to small and medium size farms, capping, degressivity, etc. There are two specific indicators: 1. Share of support received by 20% of the largest beneficiaries of the CAP; 2. Interquartile range of CAP support by beneficiary. CAP support included: all direct payments, payment for natural or other area-specific constraints and payment for area specific disadvantages – Natura 2000 and Water framework directive. Distribution analysis based on the ranked level of income support per beneficiary	Member States' operations database	For the calculation, individual data (at anonymised beneficiary level) is necessary. A unique identifier of beneficiaries is required.	Direct payments, ANC and N2K/WFD included, but not environmental land management payments or their accompanying investment.

PMEF I.27   Promoting rural inclusion: evolution of poverty index in rural areas

Geographical scope: EU, National (NUTS 0), Regional (NUTS 1 and 2) by degree of urbanisation (rural areas, towns and suburbs, cities)

Unit(s): % of total population

Frequency/timeliness in years: 1/2

Sample size: EU, National (NUTS 0), Regional (NUTS 1 and 2) by degree of urbanisation (rural areas, towns and suburbs, cities)

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To promote employment, growth, gender equality, including the participation of women in farming, social inclusion and local development in rural areas, including the circular bio-economy and sustainable forestry	The indicator is defined as the share of population at risk of poverty or social exclusion in rural areas, as defined in the classification of the degree of urbanisation (DEGURBA). The at-risk-of-poverty rate is the share of people with an equivalised disposable income (after social transfer) below the at-risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income after social transfers (http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:At-risk-of-poverty_rate).Three specific indicators, expressed as share of total population:1. total poverty rate2. poverty rate by type of area3. poverty rate by sex (at national level only)	Source:Eurostat – Survey on income and living conditions (SILC)Eurostat – Degree of urbanisationLocation:National data: table People at risk of poverty or social exclusion by age and sex [ilc_peps01]National data: by degree of urbanisation: table [ilc_peps13]Regional data: table [ilc_peps11]	Regional data not available for some Member States	This indicator is also used for the EU reporting on UN Sustainable Development Goals. Definition also used for context indicator C.10

PMEF I.28   Limiting antimicrobial use in farmed animals: sales/use of antimicrobials for food-producing animals

Geographical scope: EU, National (NUTS 0), European Economic Area (EEA)
Unit(s): mg/Population Correction Unit
Frequency/timeliness in years: 1/2
Sample size: National

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To improve the response of Union agriculture to societal demands on food and health, including high quality, safe and nutritious food produced in a sustainable way, to reduce food waste, as well as improve animal welfare and to combat antimicrobial resistances	This indicator refers to the sale and use of antimicrobials in food producing animals. Specifically, to the total annual quantity of antimicrobial active substances from veterinary medicinal products sold (product package level) in relation to the total estimated weight of each particular livestock species at the time of treatment. It is an annual figure per country (disaggregated by type of active substance and mode of delivery), expressed as: • mg of active ingredient per Population Correction Unit (PCU) in kg. PCU is a theoretical unit of measurement developed by the European Medicines Agency (EMA) in 2009. It represents the standardised average weight in kilograms (kg) of all animals at time of treatment X the number of animals, based on national statistics.	Location: - European One Health Action Plan against Antimicrobial Resistance (2017) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0339 - ESVAC interactive database https://esvacbi.ema.europa.eu/analytics/saw.dll?PortalPages - ESVAC Annual Reports http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/document_listing/document_listing_000302.jsp#annual	Under Regulation (EU) 2019/6 on veterinary medicinal products is to be applied, which came into force in January 2022, all MS are obliged to collect data on sales and use of antimicrobials in animals, to enable in particular the direct or indirect evaluation of their use in food-producing animals at farm level, with reporting to the Commission starting in January 2024 (see Article 57 of Regulation (EU) 2019/6 and Commission Implementing Decision (EU) 2020/1729	Although PCU is an estimation it does enable year-on-year comparisons to be made and trends to be seen. Latest data on EMA website is for 2022, but EMA notes that for the UK, as from 1.1.2021, EU Law applies only to the territory of Northern Ireland (NI) to the extent foreseen in the Protocol on Ireland/NI (https://esvacbi.ema.europa.eu/analytics/saw.dll?PortalPages (accessed 28.08.24) Definition also used for context indicator C.48

PMEF I.29   Responding to consumer demand for quality food: value of production under Union quality schemes and of organic production

Geographical scope: Data are available at the producer's level. Their availability depends on the readiness of producer to provide them. There is no systematic data collection established EU wide but some Member States have national data collections. The indicator will be established at EU level, based on an estimation provided by a study.

Unit(s): 1 – 3: sales in EUR and %

Frequency/timeliness in years: 4 /2

Sample size: See study (in 'data sources and ownership')

Specific EU objective of indicator	EU short definition	Data source(s) (and ownership?)	Data issues and limitations	Other comments
To improve the response of Union agriculture to societal demands on food and health, including high quality, safe and nutritious food produced in a sustainable way, to reduce food waste, as well as improve animal welfare and to combat antimicrobial resistances	It consists of 3 specific indicators:1. total value of production under EU quality schemes and organics as well as the share of the total agricultural and food production value2. value of production by EU quality schemes – PDO, PGI and TSGand share of total agricultural and food production value3. value of certified organic production and share of total agriculturaland food production value	Given the lack of a clear definition of quality, the EU PDO/PGI schemes were taken as a proxy for quality production as well as the certified organic production. The indicator could be biased in case some producers (notably the larger ones) do not provide data. So far this is the only method to obtain data. The latest study, finalised in 2019, is available here. EC Context and Impact indicators 07/03/2024 – Version 9.0 https://agriculture.ec.europa.eu/document/download/b7b8a856-e6d5-48fc-abc2-acdbda887e34_en?filename=pmef-context-impact-indicators_en.pdf	Member States are reluctant to ensure a systematic data collection of the value of production under EU quality schemes and certified organic.	Two issues: proxy data using PDO/PGI schemes and organic certification is not a guarantee of quality; other producers could be selling quality produce. Definition also used for context indicator C.35

Annex-3: SLM Objectives

Note: Subject to approval by Welsh Government

The table that follows breaks down the 4 SLM objectives into more detailed objectives.

All sub-objectives are sourced from the list of purposes for which Welsh Ministers have powers to provide support under Section 8 of the Agriculture (Wales) Act 2023 (AA) or its accompanying Explanatory Memorandum (EM). These are referenced in the table.

Each sub-objective is listed under the main objective to which it most directly relates (as set out either in the Agriculture Act or the Explanatory Memorandum). However, many sub-objectives will contribute to more than one main objective.

NB: The purposes for which Ministers have power the support can be amended by adding or removing a purpose to the list or amending the description of a purpose (Section 8 (4)). This list is correct at the time of drafting (August 2024).

Objective - Food	Objective - Climate	Objective - Ecosystems	Objective - Cultural
1. To produce food and other goods in a sustainable manner	**2. To mitigate and adapt to climate change**	**3. To maintain and enhance the resilience of ecosystems and the benefits they provide**	**4. To conserve and enhance the countryside and cultural resources and promote public access to and engagement with them, and to sustain the Welsh language and promote and facilitate its use**
1a To encourage the production of food in an environmentally sustainable manner *Source: AA (S8 (2)(a)* *To enable farmers to stay on the land and produce food and other goods in a way that is environmentally, economically and socially sustainable* *Source: EM (Section 3.42)*	*2a To reduce emissions of GHGs* *Source: AA (S8 (2)(e)*	*3a To maintain and enhance the resilience of ecosystems* *Source: AA (S8 (2)(g)* *To maintain and enhance the resilience of ecosystems and the benefits they provide, including to improve environmental protection, reverse biodiversity loss and protect natural habitats.* *Relevant factors: scale, condition, connectivity, diversity, adaptability.* 　　• *Benefits include: clean air, clean water, enhanced carbon storage* *Source: EM (Section 3.57)*	*4a To sustain the Welsh language and promote and facilitate its use* *Source: AA (S8 (2)(d)*
1b To help rural communities to thrive *Source: AA (S8 (2)(b)*	*2b To maximise carbon sequestration and storage* *Source: AA (S8 (2)(f)*	*3b To improve air quality* *Source: AA (S8 (2)(i)*	*4b To conserve and enhance landscapes and the historic environment* *Source: AA (S8 (2)(h)*

Objective - Food	Objective - Climate	Objective - Ecosystems	Objective - Cultural
To support the cohesion and resilience that the continuity of Welsh farms provide to their communities *Source: EM (Section 3.43)*			*To conserve and enhance cultural resources, including cultural heritage and the historic environment* *Source: EM (Section 3.63)* *To preserve the cultural heritage in the traditions and way of working that farmers embody* *Source: EM (Section 3.43)*
1c To strengthen links between agricultural businesses and their communities *Source: AA (S8 (2)(b)*	*2c To mitigate flood and drought risks* *Source: AA (S8 (2)(l)* *To adapt to the effects of the climate emergency through actions which lessen the impacts on people, land and infrastructure* *Source: EM (Section 3.48)*	*3c To improve water quality* *Source: AA (S8 (2)(j)*	*4c To maintain and enhance public access to and engagement with the countryside and the historic environment* *Source: AA (S8 (2)(k)*
1d To improve the resilience of agricultural businesses *Source: AA (S8 (2)(c)* *To contribute to a prosperous and resilient agricultural sector and local communities* *Source: EM (Section 3.45)*	*2d To encourage agricultural businesses to manage energy effectively (including by adopting energy efficiency and energy saving practices and generating renewable energy on their land)* *Source: AA (S8 (2)(o)*		
1e To achieve and promote high standards of animal welfare *Source: AA (S8 (2)(m)*	*2e To maximise resource efficiency* *Source: AA (S8 (2)(n)* *To help mitigate climate change by increasing resource efficiency and lowering transport emissions* *Source: EM (Section 3.49)*		
	2f To improve soil health *Source: EM (Section 3.49)*		

Annex-4: Proposed EU Directive on Soil Monitoring and Resilience – Indicators

In July 2023, the EU published a detailed proposal for a new EU Directive on Soil Monitoring and Resilience[61]. The Soil Health Law proposal provides a common definition of soil health, a framework for monitoring, sustainable management and restoration, and indicates the goals and targets to be achieved by Member States in 2050. The definitions and criteria for soil health indicators are defined in detail.

The pages below [with a green border] is a reproduction of Proposed EU Directive on Soil Monitoring and Resilience (extract from Annex I) "List of proposed soil descriptors and criteria for healthy soil condition, land take and soil sealing indicators".

Annex II to the Proposed Regulation (not reproduced here) details the methodologies for these indicators. It is sourced from European Commission COM(2023) 416 (final) Brussels 5.7.2023 ANNEXES to the proposal for a Directive of the European Parliament and of the Council on Soil Monitoring and Resilience (Soil Monitoring Law) https://environment.ec.europa.eu/publications/proposal-directive-soil-monitoring-and-resilience_en (accessed 18 Sept 2024)

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[61] https://environment.ec.europa.eu/publications/proposal-directive-soil-monitoring-and-resilience_en (accessed 18 Sept 2024)

ANNEX I

SOIL DESCRIPTORS, CRITERIA FOR HEALTHY SOIL CONDITION, AND LAND TAKE AND SOIL SEALING INDICATORS

For the purposes of this Annex, the following definitions shall apply

(1)   'reverse land take' means the conversion of artificial land into natural or semi-natural land;

(2)   'net land take' means the result of land take minus reverse land take.

Aspect of soil degradation	Soil descriptor	Criteria for healthy soil condition	Land areas that shall be excluded from achieving the related criterion
Part A: soil descriptors with criteria for healthy soil condition established at Union level			
Salinization	Electrical Conductivity (deci-Siemens per meter)	< 4 dS m^{-1} when using saturated soil paste extract (eEC) measurement method, or equivalent criterion if using another measurement method	Naturally saline land areas; Land areas directly affected by sea level rise
Soil erosion	Soil erosion rate (tonnes per hectare per year)	≤ 2 t ha^{-1} y^{-1}	Badlands and other unmanaged natural land areas, except if they represent a significant disaster risk
Loss of soil organic carbon	Soil Organic Carbon (SOC) concentration (g per kg)	- For organic soils: respect targets set for such soils at national level in accordance with Article 4.1, 4.2, 9.4 of Regulation (EU) .../...[+]	No exclusion
		- For mineral soils: SOC/Clay ratio $> 1/13$; Member States may apply a corrective factor where specific soil types or climatic conditions justify it, taking into account the actual SOC content in permanent grasslands.	Non- managed soils in natural land areas

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[+]   OP : please insert in the text the number of Regulation on nature restoration contained in document COM(2022) 304

EN   1   **EN**

Subsoil compaction	Bulk density in subsoil (upper part of B or E horizon[1]); Member States may replace this descriptor with an equivalent parameter (g per cm^3)	Soil texture[2]	range	Non-managed soils in natural land areas
		sand, loamy sand, sandy loam, loam	<1.80	
		Sandy clay loam, loam, clay loam, silt, silt loam	<1.75	
		silt loam, silty clay loam	<1.65	
		Sandy clay, silty clay, clay loam with 35–45% clay	<1.58	
		Clay	<1.47	
		In case a Member State replaces the soil descriptor "bulk density in subsoil" with an equivalent parameter, it shall adopt a criterion for healthy soil condition for the chosen soil descriptor that is equivalent to the criterion set for "bulk density in subsoil".		

Part B: soil descriptors with criteria for healthy soil condition established at Member States level				
Excess nutrient content in soil	Extractable phosphorus (mg per kg)	< "maximum value"; The "maximum value" shall be laid down by the Member State within the range 30–50 mg kg^{-1}		No exclusion

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[1] As defined in the FAO Guidelines for Soil Description, Chapter 5 (https://www.fao.org/3/a0541e/a0541e.pdf)

[2] As defined in Arshad, M.A., B. Lowery, and B. Grossman. 1996. Physical tests for monitoring soil quality. p.123- 142. In: J.W. Doran and A.J. Jones (eds.) Methods for assessing soil quality. Soil Sci. Soc. Am. Spec. Publ. 49. SSSA, Madison, WI.

EN　　　2　　　**EN**

Soil contamination	– concentration of heavy metals in soil: As, Sb, Cd, Co, Cr (total), Cr (VI), Cu, Hg, Pb, Ni, Tl, V, Zn (µg per kg) – concentration of a selection of organic contaminants established by Member States and taking into account existing concentration limits e.g. for water quality and air emissions in Union legislation	Reasonable assurance, obtained from soil point sampling, identification and investigation of contaminated sites and any other relevant information, that no unacceptable risk for human health and the environment from soil contamination exists. Habitats with naturally high concentration of heavy metals that are included in Annex I of Council Directive 92/43/EEC[3] shall remain protected.	No exclusion
Reduction of soil capacity to retain water	Soil water holding capacity of the soil sample (% of volume of water / volume of saturated soil)	The estimated value for the total water holding capacity of a soil district by river basin or subbasin is above the minimal threshold. The minimal threshold shall be set (in tonnes) by the Member State at soil district and river basin or subbasin level at such a value that the impacts of floodings following intense rain events or of periods of low soil moisture due to drought events are mitigated.	No exclusion

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[3]　Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7).

EN　　　3　　　**EN**

Part C: soil descriptors without criteria	
Aspect of soil degradation	**Soil descriptor**
Excess nutrient content in soil	Nitrogen in soil (mg g^{-1})
Acidification	Soil acidity (pH)
Topsoil compaction	Bulk density in topsoil (A-horizon[4]) (g cm^{-3})
Loss of soil biodiversity	Soil basal respiration ((mm^3 O$_2$ g^{-1} hr^{-1}) in dry soil Member States may also select other optional soil descriptors for biodiversity such as: - metabarcoding of bacteria, fungi, protists and animals; - abundance and diversity of nematodes; - microbial biomass; - abundance and diversity of earthworms (in cropland); - invasive alien species and plant pests

Part D: land take and soil sealing indicators	
Aspect of soil degradation	**Land take and soil sealing indicators**
Land take and soil sealing	Total artificial land (km² and % of Member State surface) Land take, Reverse land take Net land take (average per year–– in km² and % of Member State surface) Soil sealing (total km² and % of Member State surface) Member States may also measure other related optional indicators such as: - land fragmentation - land recycling rate - land taken for commercial activities, logistic hubs, renewable energies, surfaces such as airports, roads, mines - consequences of land take such as quantification of loss of ecosystem services, change in floods intensity

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[4]   As defined in the FAO Guidelines for Soil Description, Chapter 5 (https://www.fao.org/3/a0541e/a0541e.pdf)

EN   4   **EN**

Annex-5: UK Data in Eurostat

The departure of the UK from the European Union on 31st January 2020 has had a significant impact on the dissemination of statistics by Eurostat and in particular on the database.

During the transition period until the end of 2020, the UK continued to send data to Eurostat. This data has been loaded in the database and made available to users. In geographical lists, the UK is placed after those third countries with which the EU already has established very close relationships in the field of statistics, EEA/EFTA and Switzerland[62].

A new Trade and Cooperation Agreement between the European Union and the United Kingdom has been concluded and applies on a provisional basis as from 1 January 2021. It includes a provision on statistical cooperation that foresees the establishment of a specific arrangement (see Article UNPRO.5.2 on Statistical cooperation[63]).

Until this arrangement on statistical cooperation is established, addressing in particular the scope and means of data transmission, there are changes for the dissemination of UK data by Eurostat, apart from cases foreseen in the Protocol on Ireland/Northern Ireland.

This means that until agreement on statistical cooperation is established, Eurostat is no longer disseminating new data for the UK, neither through its database nor in other dissemination products[64].

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[62] Source: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/wdn-20200201-1 (accessed 29.08.24)

[63] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22020A1231(01)#page=389

[64] https://ec.europa.eu/eurostat/web/main/help/faq#brexit (accessed 31.08.24)

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