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Scoping document: biodiversity indicators

related to agriculture

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Contents

1   Objectives and structure

Task 1.7.4.A.III of the ETC/BD Action Plan 2015 entails the preparation of a scoping document on biodiversity indicators related to agriculture with the aim of improving the knowledge base to support the assessment and revision of the "European Union Biodiversity Strategy to 2020" and the Common Agricultural Policy (CAP). On one hand, the "EU Biodiversity Strategy to 2020" includes Target 3A which seeks to increase the contribution of agriculture to maintaining and enhancing biodiversity. On the other hand, it is relevant to recall here the environmentally-oriented measures contained in the CAP 2014-2020 programme, the so-called "greening measures" of Pillar 1 (Direct Payments) and some targets of Pillar 2 (Rural Development Policy). A revision of the current CAP Programme is foreseen in 2017. A further description of both policies can be seen in Annex 1.

In short, this document aims at providing the background on environmental and biodiversity indicators related to agriculture as a starting point for following analysis and testing of the relevance and/or feasibility of particular indicators. Although there are several sets of environmental indicators, this document focuses on two frameworks directly related to agriculture, namely the "Common Monitoring and Evaluation Framework" (CMEF) and the agri-environmental indicators (AEIs). An introduction to their main characteristics can be seen in Table 1.1.

This document provides an overview of their history, main purpose, European institutions involved in their development, analytical framework and operational issues. Furthermore, it lists the indicators along with their main characteristics, which are summarized in the text. Particularly, the characteristics that have been collected in the document are, for example, data source/s, data level, status or frequency. A brief overview (supported by a comprehensive table) is also given on the linkages between both sets of indicators, as well as a crosswalk with SEBI indicators relevant for Target 3A of the "EU Biodiversity Strategy to 2020". This document is enriched with the explanations and clarifications given by DG ENV and DG AGRI during an informative meeting in February 2015. As a result, it shows insights into the processing problematic, coverage, comparability and other aspects. This is reflected in the discussion section that focuses on biodiversity-related agricultural indicators and shows a proposal of further work in view of a follow-up of this task. Additionally, the document ends up with a compilation of the major references and a list of relevant webpages that might be useful.

Table 1.1   The current CMEF and AEI indicator frameworks in a nutshell

	COMMON MONITORING AND EVALUATION FRAMEWORK (CMEF)	AGRI-ENVIRONMENTAL INDICATORS (AEIs)
Programmes	2007-2013, 2014-2020	2000-2005 (IRENA operation, only EU-15), 2006-2020
Main purpose	Provide information covering all policy areas to measure the implementation of the CAP	Analyse the relationship between agriculture and the environment and identify trends in this evolving interaction
EU institutions	DG AGRI (coordinator), DG ENV, Eurostat, JRC and EEA	DG AGRI, DG ENV, Eurostat (coordinator), JRC and EEA
Analytical framework	Output, Result, Impact, Context (Socio-economic, Sectorial, Environmental)	DPSIR (Driving forces, Pressures and benefits, State/Impact, Responses)
Implementing Act	Yes	No
Expected frequency	Annual, depending on availability	Annual, depending on availability

2 The Common Monitoring and Evaluation Framework (CMEF)

2.1 History

2.1.1 Previous CAP programme (2007-2013)

The "Common Monitoring and Evaluation Framework" (CMEF) was established by the European Commission and agreed with Member States. A set of guidelines and guidance fiches on the common indicators was put together in a handbook (DG AGRI, 2006).

According to the 2013 report "Rural Development in the EU" (DG AGRI, 2013), the CMEF provided a single framework for monitoring and evaluation of all rural development interventions for the programming period 2007-2013. The CMEF established five types of indicators, following the logic of the intervention process, namely baseline, input, output, result and impact indicators. Baseline indicators were subdivided into objective-related, i.e. directly linked to the wider objectives of the programme, and context-related, which provided information on relevant aspects of the general contextual trends that are likely to have an influence on the performance of the programme.

2.1.2 Current CAP programme (2014-2020)

A subset of the CMEF 2007-2013 set of indicators was proposed in 2014 in order to measure the implementation of the CAP 2014-2020. In relation with the previous programme, input indicators have been included under other types and both context-related and objectives-related baseline indicators have been merged into context indicators (see Section 2.2). There are a number of indicators that have not been included in this programme but will be equally calculated to provide additional information in case it is needed.

2.2 Analytical framework

The framework has thus been restructured in four types of indicators (as extracted from DG AGRI website, http://ec.europa.eu/agriculture/cap-indicators/index_en.htm, last accessed 12th March 2015):

- **Output indicators** report on the degree of activity of a policy measure (e.g., the number of projects funded); they are linked to individual policy interventions;

- **Result indicators** measure the direct, immediate effect of the policy measure (e.g., the number of jobs created), in relation to the specific policy objectives;

- **Impact indicators** look at the effect in the longer term (e.g. rural unemployment rate). Overall, impact indicators are linked to the general objectives of the CAP;

- **Context indicators** reflect relevant aspects of the general contextual trends in the economy, environment and society that are likely to have an influence on the implementation, achievements and performance of the CAP. A set of 45 context indicators was selected for the CAP Programme 2014-2020. These indicators are grouped in three sections, namely socio-economic, sectorial and environmental. This scoping document focuses on the environmental context indicators.

Operationally, Member States, with the help of factsheets, regularly update with output and result indicators, which are further used to calculate some of the context indicators. Impact indicators are later extracted from the context indicators.

Theoretically, the frequency of these indicators is annual but this is subject to the availability and peculiarities of some of the indicators. The geographical coverage of the set is the EU-27/28.

It must be noted that the final lists of context, impact, result and output indicators have been included in Implementing Acts.
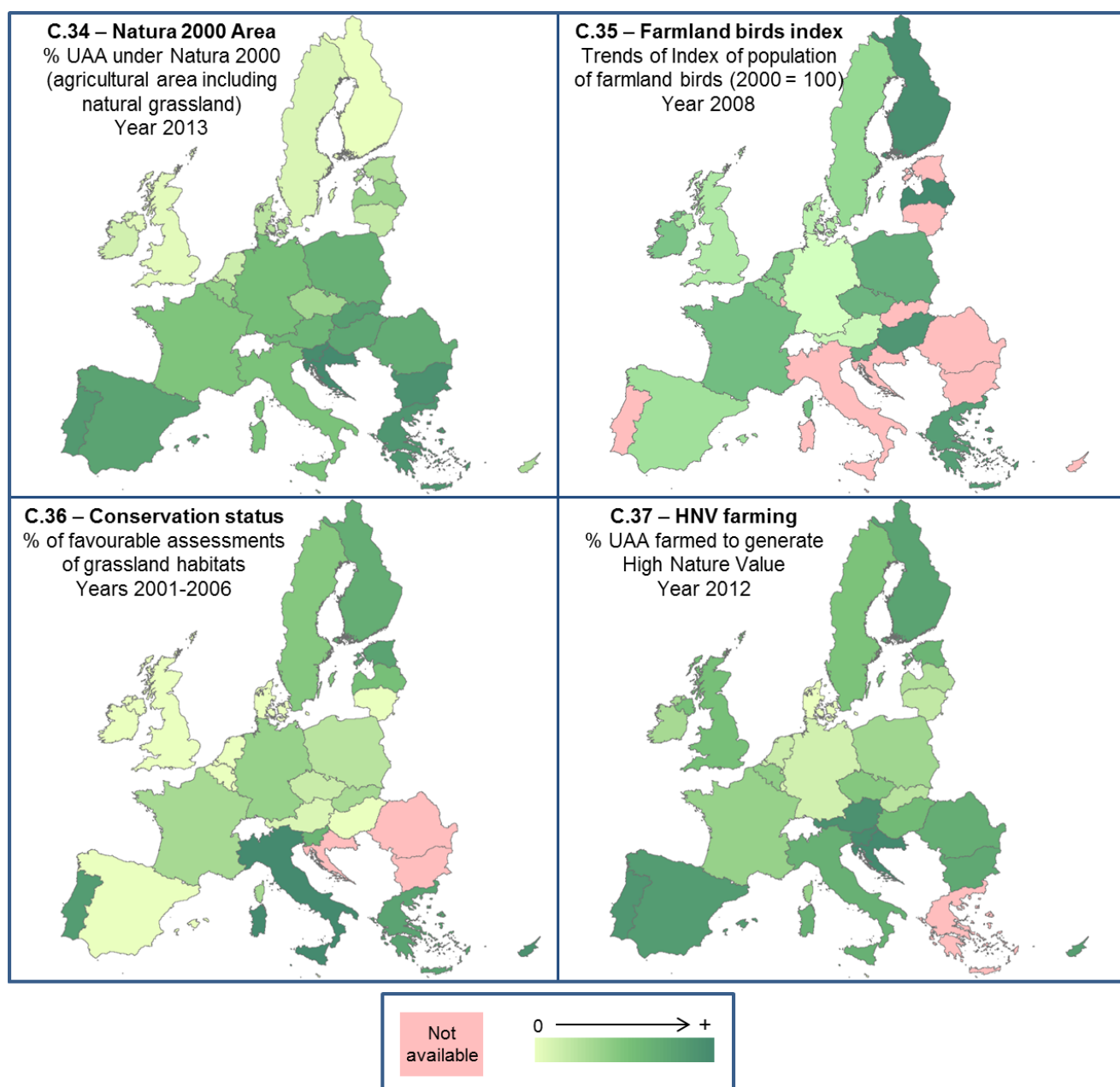
2.3   Main characteristics of the environmental context indicators

A total of 14 context indicators (with codes from C.31 to C.45) have been selected to assess the performance of the CAP regarding environmental issues. Annex 2 shows a list of these indicators along with their main characteristics. The information included has been extracted and synthesized from the report "CAP context indicators 2014-2020" (DG AGRI, 2014):

- **Sub-indicators.** Half of the indicators are subdivided: "Farming intensity", "Natura 2000 area", "Water abstraction in agriculture", "Water quality", "Soil erosion by water", "Production of renewable energy", "Energy use" and "Emissions from agriculture".

- **Data source/s.** There are diverse data sources. In some indicators, such as "HNV farming", the Member States provide their national data after following the methodologies explained in the factsheets. Later on, EU aggregates are calculated from these data by the European institutions. Conversely, other indicators are necessarily produced through modelling by, mainly, the Joint Research Centre.

- **Calculation body.** The indicators are calculated by the all the partners but centralized in DG AGRI.

- **Data level.** All environmental indicators are available at EU and national level but in some cases they have not been calculated at a NUTS regional level due to operational difficulties or the inappropriateness of the methodology to extrapolate results. Among the indicators that provide NUTS regional data are "Land cover", "Farming intensity", "Natura 2000 area", "HNV farming", "Water abstraction in agriculture" and "Soil erosion by water". In the case of "Farming intensity", not all regions across the EU are covered. "Conservation status" can be provided by biogeographic region for each country but not at NUTS 2 or 3 levels. To overcome the fact that some indicators do not have a regional level of detail, a set of proxy indicators has been proposed.

- **Frequency.** Ideally, the updating frequency is annual, as it occurs in some of the indicators. However, others have methodological constraints that cause delays in the delivery. For instance, "Land Cover" depends on Corine Land Cover updates and it will presumably be available in 2015. "Conservation status" is dependant of Member States Article 17 reporting every six years.

- **Units.** The indicators must offer comparable measures and therefore, they are usually presented as percentages. It must be noted that the referential agricultural area is the Utilised Agricultural Area (UAA) that has been defined as "the total area taken up by arable land, permanent pasture and meadow, land used for permanent crops and kitchen gardens".

- **Impact indicators.** Half of the environmental context indicators will be used as a basis for the calculation of the so-called impact indicators.

- **Relation to biodiversity.** Although all the environmental indicators can describe important aspects affecting biodiversity, four context indicators can be identified as having a direct relation to biodiversity, namely, "Natura 2000 area" (C.34), "Farmland birds index" (C.35), "Conservation status of agricultural habitats" (C.36) and "HNV farming" (C.37). In the latest update (DG AGRI, 2014), all these indicators have been calculated at EU and national level. However, as can be observed in Map 2.1, the data are not available for all Member States. On the other hand, NUTS regional level is only provided for "Natura 2000 Areas" and biogeographical region level for each Member State is restricted to "Conservation status of agricultural habitats" (C.36). Noteworthy, the latter indicator is only calculated for grasslands because there are no agricultural habitats in Annex 1 of the Habitats Directive. Therefore, the calculation of this

indicator only matches partly the MAES approach for agricultural ecosystems (i.e. croplands and grasslands).

Map 2.1   Geographic representations at national level of the CMEF context indicators related to biodiversity (data from 2014 update)

C.34 – Natura 2000 Area
% UAA under Natura 2000
(agricultural area including
natural grassland)
Year 2013

C.35 – Farmland birds index
Trends of Index of population
of farmland birds (2000 = 100)
Year 2008

C.36 – Conservation status
% of favourable assessments
of grassland habitats
Years 2001-2006

C.37 – HNV farming
% UAA farmed to generate
High Nature Value
Year 2012

Not available   0 ⟶ +

Source: Maps elaborated by the authors on the basis of data from the report "CAP Context Indicators 2014-2020" (DG AGRI, 2014).

3 Agri-environmental indicators (AEIs)

3.1 History

3.1.1 IRENA operation

With the aim at assessing the integration of environmental concerns into the CAP, the European Commission, requested by the European Council, identified a first set of agri-environmental indicators in 2000 (COM(2000) 20 final). The analytical framework was based on the OCDE's DSR (Driving Force-State-Response) and the European Environment Agency DPSIR (Driving forces – Pressures and benefits – State/Impact – Responses) frameworks. This set of 35 indicators was complemented with statistics and other information in a further communication in 2001 (COM(2001) 144 final).

The IRENA (Indicator Reporting on the integration of ENvironmental concerns into Agricultural policy) operation was launched in September 2002 as a partnership between the following European institutions: Directorate-General for Agriculture and Rural Development (DG AGRI), Directorate-General for Environment (DG ENV), Eurostat, Joint Research Centre (JRC) and the European Environment Agency (EEA). The objective of this partnership was to cooperate in the development, compilation of data sets and operationalization of the indicators at the appropriate level. The project was managed and coordinated by the EEA and financed by DG ENV and DG AGRI.

The geographical coverage of the IRENA operation was the EU-15. The main outputs delivered by this operation were 40 indicator fact sheets covering 42 indicators and sub-indicators, and three reports: an environmental assessment on the basis of the indicator results (EEA, 2005), an indicator-based assessment of agricultural policy (EEA, 2006) and an evaluation of the implementation of the IRENA operation. The operation finalised at the end of 2005.

3.1.2 Current scheme

In 2006, the Commission adopted the current list of 28 agri-environmental indicators in a Communication (COM(2006) 508 final). The geographical coverage of this set is the EU-27/28. The maintenance and development of these indicators has been agreed by the same five partner institutions through a Memorandum of Understanding. In practical terms, the data are collected from different sources but centralized in Eurostat.
The agri-environmental indicators have not been included in an Implementation Act.

3.2 Analytical framework

The set of 28 agri-environmental indicators is structured in four domains (and 13 subdomains) according to the DPSIR (Driving forces – Pressures and benefits – State/Impact – Responses) analytical framework.
An overview of the indicators classified in four groups ("Farm Management Practices", "Agricultural Production Systems", "Pressures and Risks to the Environment" and "State of natural resources") can be seen in Eurostat website (http://ec.europa.eu/eurostat/web/agri-environmental-indicators/overview, last accessed 12th March 2015).

3.3 Main characteristics

Annex 3 shows the set of 28 agri-environmental indicators (AEIs) classified in the respective domains and subdomains. A synthesis of their main characteristics is also presented.

- **Main/Supporting indicators.** The majority of "main indicators" are complemented by 1 to 4 "supporting indicators" that can be used as proxies when the calculation is not feasible for the time being.

- **Data source/s.** The database is updated with Member State deliveries that are collected in form of surveys (e.g. Farm Structure Survey - FSS) or questionnaires. The indicators are later calculated or aggregated by the partners. Some of the indicators are the product of modelling exercises or research projects carried out by the JRC or the EEA.

- **Status.** The table, which is constantly updated, shows the different level of development of the indicators. Several of them are under preparation due to diverse causes such as unclear definition of concepts and/or methodology, lack of harmonised data, weak modelling approaches or need of substantial improvements.

- **Units.** The referential agricultural area is also the Utilised Agricultural Area (UAA).

- **Relation to biodiversity.** An illustrative list of agri-environmental indicators that can be used to measure biodiversity-related aspects is the following: "Agricultural areas under Natura 2000" (AEI 2), "Genetic diversity" (AEI 22), "High Nature Value farmland" (AEI 23), "Population trends of farmland birds" (AEI 25) and "Landscape - state and diversity" (AEI 28).

4 Linkages between CMEF environmental context indicators and AEIs

A crosswalk between the existing environmental indicators related to agriculture is presented in Annex 4. In order to provide a quick guide, the table not only shows the linkages between the current CMEF environmental context indicators and the agri-environmental indicators but also their relations to previous CMEF baseline context-related and objective-related indicators and to IRENA indicators. In case there is a direct relation between a CMEF and an AEI indicator, it is calculated by the same organism and then transferred to both frameworks.

5 EU indicators relevant for Target 3A of the "EU Biodiversity Strategy to 2020"

In order to stress the link with biodiversity of certain AEIs and CMEF context indicators, Table 5.1 shows those EU indicators that will be used to measure progress against Target 3A of the "EU Biodiversity Strategy to 2020" according to BISE website simplified overview (http://biodiversity.europa.eu/policy/eu-biodiversity-indicators-and-related-eu-targets-simplified-overview, last accessed 12th March 2015). Thus, the agriculture-related SEBI Streamlining European Biodiversity Indicators have also been included, as well at their linkages with the aforementioned frameworks. However, it must be noted that the linkages between the SEBI and AEI/CMEF indicators are not straightforward in all the cases, i.e. the focus or the calculation may not be completely the same.

Table 5.1   EU Indicators relevant for Target 3A of the "EU Biodiversity Strategy to 2020"

SEBI CODE	SEBI TITLE	AEI CODE	AEI TITLE	CMEF CONTEXT ENVIRONMENT CODE	CMEF CONTEXT TITLE
SEBI 001	Abundance and distribution of selected species: Common farmland birds and grassland butterflies	**AEI 25**	Population trends of farmland birds	**C.35**	Farmland birds index (FBI)
SEBI 003	Conservation status of species of European interest related to agro-ecosystems and grassland	**None**	None	**None**	None
SEBI 005	Conservation status of habitats of European interest related to agro-ecosystems and grassland	**None**	None	**C.36**	Conservation status of agricultural habitats
SEBI 019	Agriculture: Nitrogen Balance	**AEI 15**	Gross nitrogen balance	**C.40**	Water quality
SEBI 020	Agriculture: area under management practices supporting biodiversity	**AEI 23**	High Nature Value farmland	**C.37**	HNV farming
SEBI 020	Agriculture: area under management practices supporting biodiversity	**AEI 4**	Area under organic farming	**None**	None
None	None	**AEI 1**	Agri-environmental commitments	**None**	None
None	None	**AEI 2**	Agricultural areas under Natura 2000	**C.34**	Natura 2000 area
None	None	**AEI 18**	Ammonia emissions	**None**	None
None	None	**AEI 27.1**	Water quality - Nitrate pollution	**C.40**	Water quality
None	None	**AEI 28**	Landscape - state and diversity	**None**	None

Note: Sorted by SEBI code in first place and then by AEI code.

Source: Table elaborated by the authors on the basis of data from BISE webpage http://biodiversity.europa.eu/policy/eu-biodiversity-indicators-and-related-eu-targets-simplified-overview (last accessed 12th March 2015) and the report "Streamlining European biodiversity indicators 2020: Building a future on lessons learnt from the SEBI 2010 process" (EEA, 2012).

6   Discussion on biodiversity indicators related to agriculture

Environmental indicators are constantly being revised in order to enhance their conceptual and methodological consistency and their operability. This scoping document provides a snapshot of the current frameworks and indicator status, which is a necessary starting point for the improvement of the knowledge base. However, several indicators would benefit of methodological improvements and the next phase of this exercise may be to identify gaps and needs to propose methodological recommendations for selected biodiversity-focused indicators that could be applied during prospective calculations by the EEA and/or the ETC/BD.

As a result of this study and only focusing on the indicators that are directly related to biodiversity, the following points can be emphasized:

- The indicator **"Agricultural areas under Natura 2000"** (AEI 2) (**"Natura 2000 area"**, C.34) is in practice calculated by clipping Natura 2000 polygons with Corine Land Cover

agricultural classes (Class 2 of level 1). In this regard, a study has been carried out to test the improvement of the UAA estimation by combining Corine Land Cover and EUNIS habitat maps. The resulting document, titled "Update of agri-environmental indicator 02: Agricultural areas under Natura 2000" (ETC/BD, 2014a), shows that, although the estimation of the UAA is better with this approach, it does not change significantly AEI 2 calculation results.

- The **"Genetic diversity"** indicator (AEI 22) is yet to be properly defined and data availability and methodological difficulties have been found. As mentioned during the Mid-term Review discussions, the development of this indicator should follow the outcomes of the Commission on Genetic Resources for Food and Agriculture (CGRFA, http://www.fao.org/nr/cgrfa/en/).

- The **"HNV farming"** indicator, existing in both frameworks (AEI 23 and C.37), depends on data from the Member States and updates on the distribution of birds and butterflies. In order to test the use of the Grassland High Resolution Layer (HRL) for a better discrimination between management intensities in grasslands, an analysis titled "Improvement of HNV farmland through the Grassland HRL (GEOLAND Data layer) – Austrian case study" (ETC/BD, 2014b) was performed. Its results showed the limited suitability of the current Grassland HRL to improve HNV farmland delimitation.

- The **"Farmland birds index"** (C.35), which is linked to the "Population trends in farmland birds" (AEI 25), relies on data from 27 Member States with monitoring periods up to 2013. The last update of the EU aggregate has been produced by the "Pan-European Common Bird Monitoring Scheme" in 2015 (http://www.ebcc.info/trends2015.html).

- The **"Landscape - state and diversity"** indicator (AEI 28) is calculated by the Joint Research Centre by modelling the degree of naturalness.

- As explained above, the indicator **"Conservation status of agricultural habitats"** (C.36) is only calculated for grasslands since there are no "Cropland habitats" in the Habitats Directive. As a result, the indicator only matches partly the MAES approach for agriculture ecosystems. Furthermore, given the different methodologies used in the reporting, there are comparability issues between reporting periods. Moreover, it is not feasible to extract data at a NUTS regional level given the current methodology and the scarcity of sample points (their number and distribution are uneven among countries). These weaknesses may be analysed in deep and the possibility of providing NUTS regional data should be explored. Therefore, as a follow-up of this scoping document, the indicator "Conservation status of agricultural habitats" is proposed for further assessment in order to achieve methodological improvements.

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Relevant webpages (last accessed 12th March 2015)

- **DG AGRI**

The Common Agricultural Policy after 2013: http://ec.europa.eu/agriculture/cap-post-2013/

Rural development statistics (2007-2013): http://ec.europa.eu/agriculture/statistics/rural-development/index_en.htm

CAP CMEF Context indicators (2014-2020): http://ec.europa.eu/agriculture/cap-indicators/index_en.htm

- **DG ENV**

EU Biodiversity Strategy to 2020 – towards implementation: http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm

- **Eurostat**

Agri-environmental indicators: http://ec.europa.eu/eurostat/web/agri-environmental-indicators/overview

Statistics explained, Agri-environmental indicators : http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicators

- **EEA**

IRENA operation: http://www.eea.europa.eu/projects/irena

- **BISE**

EU biodiversity indicators and related EU Biodiversity Strategy to 2020 targets (simplified overview). BISE webpage: http://biodiversity.europa.eu/policy/eu-biodiversity-indicators-and-related-eu-targets-simplified-overview

Annex 1 Policy context

Box A1.1   European Union Biodiversity Strategy to 2020, Target 3: Increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity

3a) Agriculture: By 2020, maximise areas under agriculture across grasslands, arable land and permanent crops that are covered by biodiversity related measures under the CAP so as to ensure the conservation of biodiversity and to bring about a measurable improvement (*) in the conservation status of species and habitats that depend on or are affected by agriculture and in the provision of ecosystem services as compared to the EU2010 Baseline, thus contributing to enhance sustainable management. (*) For both targets, improvement is to be measured against the quantified enhancement targets for the conservation status of species and habitats of EU interest in Target 1 and the restoration of degraded ecosystems under target.

Action 8: Enhance direct payments for environmental public goods in the EU Common Agricultural Policy
8a) The Commission will propose that CAP direct payments will reward the delivery of environmental public goods that go beyond cross-compliance (e.g. permanent pasture, green cover, crop rotation, ecological set-aside, Natura 2000).
8b) The Commission will propose to improve and simplify GAEC (Good Agricultural and Environmental Conditions) cross-compliance standards and consider including the Water Framework Directive within the scope of cross-compliance once the Directive has been implemented and the operational obligations for farmers have been identified in order to improve the state of aquatic ecosystems in rural areas.
Action 9: Better target Rural Development to biodiversity conservation
9a) The Commission and Member States will integrate quantified biodiversity targets into Rural Development strategies and programmes, tailoring action to regional and local needs.
9b) The Commission and Member States will establish mechanisms to facilitate collaboration among farmers and foresters to achieve continuity of landscape features, protection of genetic resources and other cooperation mechanisms to protect biodiversity.
Action 10: Conserve Europe's agricultural genetic diversity
10) The Commission and Member States will encourage the uptake of agri-environmental measures to support genetic diversity in agriculture and explore the scope for developing a strategy for the conservation of genetic diversity.

Source: "The EU Biodiversity Strategy to 2020" brochure (DG ENV, 2011).

Box A1.2   The Common Agricultural Policy (CAP) environmental measures (Programme 2014-2020)

Between 2014 and 2020, over EUR 100 billion will be invested to help protect the environment:

Pillar 1 (Direct Payments): 30% of direct payments will be linked to three environmentally friendly farming practices, the so-called "greening measures": crop diversification, maintaining permanent grassland and conserving 5% (and later 7%) of arable lands as ecological focus areas (features such as fallow land, buffer strips, hedges, trees, ponds, forestry and nitrogen-fixing crops).

Pillar 2 (Rural Development Policy): At least 30% of the rural development programmes budget will have to be allocated to agri-environmental measures, support for organic farming or projects associated with environmentally friendly investment or innovation measures.

Source: "The common agricultural policy (CAP) and agriculture in Europe – Frequently asked questions" press release MEMO (European Commission, 2013).

Annex 2 CMEF environmental context indicators (December 2014)

CODE	CMEF CONTEXT ENVIRONMENT	SUB-INDICATORS	DATA SOURCE	CALCULATION	DATA LEVEL	YEAR	FREQUENCY	PREVIOUS CMEF CODE	IMPACT INDICATORS
C.31	Land cover	None	CLC2006	DG ENV	National, NUTS 1 and 2	2006	Depending on CLC updates	C7	None
C.32	Less favoured areas	None	DG AGRI - MS specific communications or CAP-IDM	DG AGRI	National	2005 (2007 for BG, 2008 for RO)	Depending on MS reporting within the RD programmes	C8	None
C.33	Farming intensity	(1) Farm input intensity; (2) Areas of intensive grazing	(1) DG AGRI - Farm Accountancy Data Network - FADN; (2) Eurostat - Farm Structure Survey - FSS	(1) DG AGRI; (2) Eurostat	National, NUTS 1 and 2	(1) 2012; (2) 2010	-	C9	None
C.34	Natura 2000 area	(1) % Territory under Natura 2000; (2) % UAA under Natura 2000; (3) % forest area under Natura 2000	(1) DG ENV - Natura 2000 Barometer; (2) and (3) EEA, Natura 2000 spatial dataset (End 2013) + CLC2006	(1) DG ENV, DG AGRI - E3 ; (2) and (3) DG AGRI - E3	National, NUTS 1 and 2	2013	Depending on Natura 2000 sites evolution and CLC updates	C10	None
C.35	Farmland birds index (FBI)	None	Eurostat - Environment statistics (data from 27 MS, monitoring period 1980-2013) and OECD	National data are calculated by MS and EU aggregates are calculated by the Pan-European Common Bird Monitoring Scheme	National	Updated EU aggregate in 2015	Depending on MS information	O17	8
C.36	Conservation status of agricultural habitats (grassland)	None	DG ENV	DG ENV	National, Biogeographical regions for each MS	2001-2006	Reporting periods every 6 years. An indicator will be provided in 2015	None	None
C.37	HNV farming	None	EEA and JRC	Data were provided by MS following JRC methodology	National, NUTS 1 and 2	2012	-	O18	9
C.38	Protected forest	None	Forestry statistics and "State of Europe's Forests 2011 Report" (Forest Europe/UNECE/FAO)	-	National	2010	Every 5 years	C11	None
C.39	Water abstraction in agriculture	(1) Total water abstraction in agriculture; (2) Share of irrigation in total water abstraction	Eurostat, from (1) FSS - Survey on Agriculture Production Methods (SAPM) and (2) Environment statistics - Joint OECD/Eurostat Questionnaire, Section Inland Water	Eurostat	National, NUTS 1 and 2	2010	-	None	10
C.40	Water quality	(1) Gross Nutrient Balance; (2) Nitrates in freshwater	(1) Eurostat - Agri-Environmental Indicators; (2) EEA (EIONET-WATER)	(1) Eurostat; (2) EEA	National	(1) 2005-2008 and 2009-2012; (2) 2012	-	C14, O20, 021	11
C.41	Soil organic matter in arable land	None	JRC based on LUCAS Land use survey	JRC	National	2009	-	None	12
C.42	Soil erosion by water	(1) Soil erosion by water; (2) Agricultural areas at risk of soil erosion by water	JRC (RUSLE Model)	JRC	National and NUTS 1, 2 and 3	(1) 2006; (2) 2006-2007	-	O22	13
C.43	Production of renewable energy from agriculture and forestry	(1) Production of renewable energy from agriculture; (2) Production from forestry	(1) DG AGRI estimates on data from EurObservER, EEB and ePURE; (2) Eurostat - Energy statistics	(1) DG AGRI; (2) Eurostat	National	2012	-	O24	None
C.44	Energy use in agriculture, forestry and food industry	(1) Direct use of energy in agriculture and foresty; (2) Use in food production	Eurostat - Energy statistics, from the joint IEA/OECD-Eurostat-UNECE questionaires	Eurostat	National	2012	-	None	None
C.45	Emissions from agriculture	(1) GHG emissions from agriculture; (2) Ammonia emissions from agriculture	(1) EEA; (2) DG AGRI	-	National	2012	Annual	O26	7

Source: Table elaborated by the authors on the basis of data from the report "CAP Context Indicators 2014-2020" (DG AGRI, 2014).

Annex 3 Agri-environmental indicators (12th March 2015)

DOMAIN	SUB-DOMAIN	CODE	AEI TITLE	MAIN/SUPPORTING INDICATORS	DATA SOURCE	STATUS
Responses	Public policy	AEI 1	Agri-environmental commitments	MAIN: Share of area under agri-environmental commitments in total UAA	DG AGRI: CMEF	Available
				SUPPORTING: Area under agri-environmental commitments (per category)	DG AGRI: CMEF	Available
				SUPPORTING: Trends of EU expenditure on agri-environmental measures	DG AGRI: CMEF	Available
				SUPPORTING: Share of agricultural holdings enrolled in agri-environmental measures	DG AGRI: CMEF	Available
		AEI 2	Agricultural areas under Natura 2000	MAIN: Agricultural areas under Natura 2000	EEA: ETC/BD	State of play
				SUPPORTING: UAA under Natura 2000	EEA: ETC/BD	State of play
				SUPPORTING: Share of Natura 2000 payments on total RD expenditure	EEA: ETC/BD	State of play
	Technology and skills	AEI 3	Farmers' training level and use of environmental farm advisory services	MAIN: Number (share) of farmers having participated in vocational trainings and having made use of environmental farm advisory services per year	DG AGRI	Available
				SUPPORTING: Share of farmers having only practical experience, basic agricultural training or full agricultural training	Eurostat: FSS	Available
	Market signals and attitudes	AEI 4	Area under organic farming	MAIN: Share of areas under organic farming in total UAA	DG AGRI	Under preparation
				SUPPORTING: Area under organic farming	Eurostat: FSS	Under preparation
Driving forces	Input use	AEI 5	Mineral fertiliser consumption	MAIN: Application rates (kg per ha) of N (Nitrogen) and P (Phosphorus)	Fertilizers Europe Eurostat questionnaire	Available
				SUPPORTING: Absolute volumes (tonnes) of N and P	Fertilizers Europe Eurostat questionnaire	Available
		AEI 6	Consumption of pesticides	MAIN: Application rates of different pesticide categories	Eurostat questionnaire	Under preparation
				SUPPORTING: Used/sold quantities of pesticide categories	Eurostat questionnaire	Available
		AEI 7	Irrigation	MAIN: Share of irrigable areas in total UAA	Eurostat: FSS	Available
				SUPPORTING: Irrigable areas, irrigated areas	Eurostat: FSS	Available
				SUPPORTING: Irrigated crops	Eurostat: FSS	Available
				SUPPORTING: Irrigation methods	Eurostat: FSS	Available
		AEI 8	Energy use	MAIN: Total direct energy use at farm level in KgOE per ha per year	Joint Eurostat/IEA/UNECE questionnaire	Available
				SUPPORTING: Annual direct use of energy at farm level by fuel type (KgOE per ha)	DG AGRI: FADN	Available
	Land use	AEI 9	Land use change	MAIN: Percentage of the total agricultural area that has changed to artificial surfaces compared to a reference period	EEA: CLC	Available
				SUPPORTING: Land use change from agricultural land to artificial surfaces (ha)	Eurostat: LUCAS	Available
		AEI 10.1	Cropping patterns	MAIN: Share of the main agricultural land types (arable crops, permanent grassland and permanent crops) on UAA	Eurostat: FSS	Available
				SUPPORTING: Area occupied by the main agricultural land types	Eurostat: FSS	Available
		AEI 10.2	Livestock patterns	MAIN: Total livestock density (total livestock per ha of UAA) and grazing livestock density (grazing livestock per ha of fodder area)	Eurostat: FSS	Available
				SUPPORTING: Number and share of major livestock types (cattle, equidae, goats, sheep, pigs and poultry)	Eurostat: FSS	Available
	Farm management	AEI 11.1	Soil cover	MAIN: Share of the year where the arable area is covered by plants or plant residues	Eurostat: FSS, SAPM and Crop Statistics	Available
				SUPPORTING: Share of arable area covered by winter crops or annual green crops	Eurostat: FSS, SAPM and Crop Statistics	Available
		AEI 11.2	Tillage practices	MAIN: Share of arable areas under conventional, conservation and zero tillage	Eurostat: SAPM	Available
				SUPPORTING: Arable areas under convention, conservation and zero tillage	Eurostat: SAPM	Under preparation
		AEI 11.3	Manure storage	MAIN: Share of farms having storage facilities for solid dung, liquid manure and slurry	Eurostat: FSS and SAPM	Available
				SUPPORTING: Share of manure applied with different application techniques and incorporation time	Eurostat: FSS and SAPM	Under preparation
	Trends	AEI 12	Intensification/extensification	MAIN: Trend in the shares of the UAA managed by low, medium and high intensity farms	DG AGRI: FADN	Available
				SUPPORTING: Average inputs expenditures per hectare in constant input prices	DG AGRI: FADN	Available
		AEI 13	Specialisation	MAIN: Share of the UAA managed by specialised farming	Eurostat: FSS	Available
				SUPPORTING: ?	?	Under preparation
		AEI 14	Risk of land abandonment	MAIN: Composite index of the risk of land abandonment	DG AGRI	Available
				SUPPORTING: Key drivers of the risk of land abandonment	JRC	Available

DOMAIN	SUB-DOMAIN	CODE	AEI TITLE	MAIN/SUPPORTING INDICATORS	DATA SOURCE	STATUS
Pressures and benefits	Pollution	AEI 15	Gross nitrogen balance	MAIN: Potential surplus of nitrogen on agricultural land (kg N per ha per year)	Eurostat/OECD Joint Questionnaire	Available
				SUPPORTING: ?	?	Under preparation
		AEI 16	Risk of pollution by phosphorus	MAIN: Potential surplus of phosphorus on agricultural land (kg P per ha per year)	Eurostat / OECD Joint Questionnaire	Available
				SUPPORTING: Vulnerability to phosphorus leaching/run-off	Eurostat / OECD Joint Questionnaire	Under preparation
		AEI 17	Pesticide risk	MAIN: Index of risk of damage from pesticide toxicity and exposure	HAIR project	State of play
				SUPPORTING: ?	?	State of play
		AEI 18	Ammonia emissions	MAIN: Ammonia emissions from agriculture (kilotonnes of NH3 per year)	EEA - CLRTAP	Available
				SUPPORTING: Share of agriculture in total ammonia emissions	EEA - CLRTAP	Available
		AEI 19	Greenhouse gas emissions	MAIN: GHG emissions from agriculture (kilotonnes of CO2 equivalents per year)	EEA - UNFCCC	Available
				SUPPORTING: Share of agriculture in total GHG emissions	EEA - UNFCCC	Available
	Resource depletion	AEI 20	Water abstraction	MAIN: Share of agriculture in water use	EEA: ETC/WTR	State of play
				SUPPORTING: Water use for irrigation (m3 per year)	Eurostat / OECD Joint Questionnaire	State of play
		AEI 21	Soil erosion	MAIN: Areas with a certain level of erosion	JRC: RUSLE	Under preparation
				SUPPORTING: Estimated soil loss by water erosion (tonnes per ha per year)	JRC: RUSLE	Under preparation
		AEI 22	Genetic diversity	MAIN: Number and range of crop varieties and livestock breeds	FAO & others	Under preparation
				SUPPORTING: Share in production of main crop varieties registered and certified for marketing	FAO & others	Under preparation
				SUPPORTING: Number of breeds per total livestock population for different types of livestock	FAO & others	Under preparation
				SUPPORTING: Distribution of risk status of national livestock breeds in agriculture	FAO & others	Under preparation
	Benefits	AEI 23	High Nature Value farmland	MAIN: Share of estimated HNV farmland on total UAA	DG AGRI	State of play
				SUPPORTING:Estimated area of HNV farmland	DG AGRI	State of play
		AEI 24	Renewable energy production	MAIN: Share of primary energy from crops and by-products as of total energy production	DG AGRI	Available
				SUPPORTING: Production of primary energy from crops and by-products	Eurostat: Energy Statistics	Available
				SUPPORTING: Area of energy crops and short rotation forestry	Eurostat: Energy Statistics	Available
				SUPPORTING: Supported areas for renewable energy production	Eurostat: Energy Statistics	Available
State/Impact	Biodiversity and habitats	AEI 25	Population trends of farmland birds	MAIN: Population trends of selected bird species that are common and characteristic of European farmland landscapes	Pan-European Common Bird Monitoring Project	State of play
				SUPPORTING: ?	?	State of play
	Natural resources	AEI 26	Soil quality	MAIN: Composite agri-environmental soil quality index	JRC: European Soil Database; EEA: CORINE LC; Eurostat: LUCAS	Available
				SUPPORTING: Soil biomass productivity index	JRC: European Soil Database	Available
				SUPPORTING: Fertiliser response rate	JRC: European Soil Database	Available
				SUPPORTING: Production stability index	JRC: European Soil Database	Available
				SUPPORTING: Soil environmental services index (Organic carbon storage; Substances filtering; Substances transforming; Biodiversity and biological activity)	JRC: European Soil Database	Available
		AEI 27.1	Water quality - Nitrate pollution	MAIN: Rivers and groundwater with nitrate concentration exceeding the Nitrates Directive limits	EEA: Eionet Water	Available
				SUPPORTING: SShare of agriculture in total nitrate pollution	EEA: Eionet Water	Available
		AEI 27.2	Water quality - Pesticide pollution	MAIN: Groundwater and rivers with pesticide concentrations above Environmental Quality Standards (EQS)	EEA WISE-SoE Groundwater, Rivers	State of play
				SUPPORTING: ?	EEA WISE-SoE Groundwater, Rivers	State of play
	Landscape	AEI 28	Landscape - state and diversity	MAIN: Dominance and internal structure of agrarian landscape; Degree of influence on land cover and state due to human (agricultural) activities	Eurostat: FSS; EEA: CLC; Protected areas, etc.	Available
				MAIN: Social awareness of the agrarian landscape	Eurostat: FSS; EEA: CLC; Protected areas, etc.	Available

Source: Table elaborated by the authors on the basis of data from Eurostat website (http://ec.europa.eu/eurostat/web/agri-environmental-indicators/overview, last accessed 12th March 2015). It must be noted that the information of this webpage is constantly being updated so this table must be considered a snapshot of the current indicator status.

Annex 4   Linkages between environmental context indicators and AEIs

IRENA CODE	IRENA TITLE	AEI CODE	AEI TITLE	CMEF PREVIOUS CODE	CMEF PREVIOUS TITLE	CMEF CONTEXT ENVIRONMENT	CMEF CONTEXT ENVIRONMENT TITLE
IRENA 01	Area under agri-environment support	AEI 1	Agri-environmental commitments	None	None	None	None
IRENA 04	Area under nature protection	AEI 2	Agricultural areas under Natura 2000	C10	Natura 2000 areas	C.34	Natura 2000 area
IRENA 06	Farmers' training level	AEI 3	Farmers' training level and use of environmental farm advisory services	None	None	None	None
IRENA 07	Area under organic farming	AEI 4	Area under organic farming	O23	Soil: Organic farming	None	None
IRENA 08	Mineral fertiliser consumption	AEI 5	Mineral fertiliser consumption	None	None	None	None
IRENA 09	Consumption of pesticides	AEI 6	Consumption of pesticides	None	None	None	None
IRENA 10	Water use intensity	AEI 7	Irrigation	C15	Water use	None	None
IRENA 11	Energy use	AEI 8	Energy use	None	None	C.44	Energy use in agriculture, forestry and food industry
IRENA 12	Land use change	AEI 9	Land use change	None	None	None	None
IRENA 13	Cropping/livestock patterns	AEI 10.1	Cropping patterns	None	None	None	None
IRENA 13	Cropping/livestock patterns	AEI 10.2	Livestock patterns	None	None	None	None
IRENA 14.2	Farm management practices - Soil cover	AEI 11.1	Soil cover	None	None	None	None
IRENA 14.1	Farm management practices - Tillage practices	AEI 11.2	Tillage practices	None	None	None	None
IRENA 14.3	Farm management practices - Manure	AEI 11.3	Manure storage	None	None	None	None
IRENA 15	Intensification/extensification	AEI 12	Intensification/extensification	C9	Areas of extensive agriculture	C.33	Farming intensity
IRENA 16	Specialisation/diversification	AEI 13	Specialisation	None	None	None	None
IRENA 17	Marginalisation	AEI 14	Risk of land abandonment	None	None	None	None
IRENA 18	Gross nitrogen balance	AEI 15	Gross nitrogen balance	O20	Water quality: Gross Nutrient Balances	C.40	Water quality
None	None	AEI 16	Risk of pollution by phosphorus	None	None	None	None
IRENA 20	Pesticide soil contamination	AEI 17	Pesticide risk	None	None	None	None
IRENA 18sub	Atmospheric emissions of ammonia from	AEI 18	Ammonia emissions	None	None	None	None
IRENA 19/34.1	GHG emissions/Share of agriculture in GHG emissions	AEI 19	Greenhouse gas emissions	O26	Climate change: GHG emissions from agriculture	C.45	Emissions from agriculture
IRENA 22/34.3	Water abstraction/Share of agriculture in water use	AEI 20	Water abstraction	None	None	C.39	Water abstraction in agriculture
IRENA 23	Soil erosion	AEI 21	Soil erosion	O22	Soil: Areas at risk of soil erosion	C.42	Soil erosion by water
IRENA 25	Genetic diversity	AEI 22	Genetic diversity	None	None	None	None
IRENA 26	High nature value farmland areas	AEI 23	High Nature Value farmland	O18	Biodiversity: High Nature Value farmlands	C.37	HNV farming
IRENA 27	Renewable energy from agricultural sources	AEI 24	Renewable energy production	O24	Climate change: Production of renewable energy from agriculture and forestry	C.43	Production of renewable energy from agriculture and forestry
IRENA 28	Population trends of farmland birds	AEI 25	Population trends of farmland birds	O17	Biodiversity: Population of farmland birds	C.35	Farmland birds index (FBI)
IRENA 29	Soil quality	AEI 26	Soil quality	None	None	C.41	Soil organic matter in arable land
IRENA 30.1	Nitrates in water	AEI 27.1	Water quality - Nitrate pollution	O21	Water quality: Pollution by nitrates and pesticides	C.40	Water quality
IRENA 30.2	Pesticides in water	AEI 27.2	Water quality - Pesticide pollution	O21	Water quality: Pollution by nitrates and pesticides	C.40	Water quality
IRENA 32/35	Landscape state/ Impact on landscape diversity	AEI 28	Landscape - state and diversity	None	None	None	None
None	None	None	None	C7	Land cover	C.31	Land Cover
None	None	None	None	C8	Less favoured areas	C.32	Less favoured areas
None	None	None	None	None	None	C.36	Conservation status of agricultural habitats
None	None	None	None	C11	Biodiversity: Protected forest	C.38	Protected forest

Note: Sorted by AEI code in first place and then by CMEF CONTEXT ENVIRONMENT code (both in red).

Source: Table elaborated by the authors on the basis of data from the report "CAP Context Indicators 2014-2020" (DG AGRI, 2014) and Eurostat website (http://ec.europa.eu/eurostat/web/agri-environmental-indicators/overview; http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicators, last accessed 12th March 2015).