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Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the implementation of the ecological focus area obligation under the direct payment scheme

{COM(2017) 152 final}

CONTENTS

LIST OF ACRONYMS

AEC	Agri-environment-climate
BS	Buffer strips
CAP	Common agricultural policy
CF	Conversion factor
CC	Catch crops and green cover
SWD	Commission staff working document
EFA	Ecological focus area(s)
EUNIS	European nature information system
FSS	Eurostat Farm Structure Survey
GAEC	Good agricultural and environmental conditions (of land)
HNV	High nature value
IACS	Integrated administration and control system
JRC	Joint Research Centre
LF	Landscape features
LLF	Land lying fallow
LPIS	Land Parcel Identification System
MS	Member State
NFC	Nitrogen-fixing crops
PPP	Plant protection products
RDP	Rural Development Programme
SMR	Statutory management requirement
WF	Weighting factor

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1. INTRODUCTION

Implementation of the reformed common agricultural policy (CAP) began in 2015 and covers the period up to 2020. The reformed CAP has a new policy instrument under its overarching objective of ensuring sustainable management of natural resources and climate action. This instrument, the **green direct payment** incorporated under the CAP's first pillar, introduces specific measures that contribute to addressing concerns over biodiversity loss, soil and water quality and climate change.

This Commission staff working document (SWD) provides an analytical background to the **progress achieved in implementing** one of the greening obligations presented in the Commission Report, namely the **ecological focus area (EFA) obligation**.

The first chapter of this document explains the mandate, purpose and scope of the initiative, and how it links with past and future initiatives concerning greening. Chapter 2 describes contextual data on the main environmental trends linked to agricultural areas and influenced by agriculture. Chapter 3 explains the purpose of the EFA obligation and details its components. Chapter 4 explains the methodology and outlines the main limitations of the analysis. Chapter 5 analyses national quantitative data on the uptake of EFA. Chapter 6 provides first insights into the likely environmental impacts of the EFA instrument. Chapter 7 lists the bibliographic references.

1.1. Commission EFA report of March 2017: mandate, purpose and scope

The Commission's obligation to present by 31 March 2017 an evaluation report on the implementation of the EFA obligation, accompanied where appropriate by a legislative proposal to increase the EFA percentage from 5 % to 7 %, is laid down in Article 46(1) of Regulation (EU) No 1307/2013 on direct payments ('the Basic Regulation').[1]

Based on this mandate, the Commission Report examines the progress on implementing the EFA obligation. The report:

- looks into the EFA implementation options selected by Member States;
- examines the uptake of EFA elements by farmers;
- explores the potential environmental and climate-related impacts of the EFA obligation in the light of available scientific information on the effectiveness of features and elements that qualify as fulfilling an EFA obligation.

Where relevant, the report also uses information from a dedicated public consultation on greening that the Commission ran in 2015 and 2016.[2]

The report does not constitute an evaluation under the Commission's standards as set out in the Commission's Better Regulation Guidelines of 19 May 2015.[3] Furthermore, it examines only the potential environmental effects of the EFA obligation as is it as yet too early to collect and study evidence of its actual impacts. The evaluation of the real impacts will require also qualitative field data in the future analysis.

[1] Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 December 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC). No 73/2009, OJ L 347, 20.12.2013, p. 608.

[2] https://ec.europa.eu/agriculture/consultations/greening/2015_en.

[3] See COM(2015) 215 final and SWD(2015) 111 final.

1.2. Past and future initiatives relating to greening

Greening review after one year and ensuing legislative amendments

The report builds upon the results of the work done in 2016 as part of the **review of greening after one year of application**.

When the CAP reform was adopted, the Commission committed itself to: reviewing the EFA obligation in the light of the experience gained after the first year of its application; looking into the administrative burden arising from the new rules; the impact on the level playing field for farmers coming from differences in implementation by Member States; and the impact on production potential[4].

The review, conducted as part of **simplifying the CAP** and of the **Commission's 2016 REFIT programme**[5], took a broader view on greening. The review was finalised in 2016 with the publication of the Commission staff working document of 22 June 2016[6] assessing how the system had been applied in the first year, identifying certain weaknesses that prevent full exploitation of its potential, and considering possible ways forward to remedy them.

Following up on the review, the Commission put forward a number of changes to certain parts of the greening legislation[7], focusing mostly on EFAs[8]. The changes are meant for application as of the 2018 claim year, but Member States may implement them already in the 2017 claim year. As of March 2017[9] these changes have not yet entered into force.

Evaluation of all greening measures

A more in-depth assessment of EFAs' environmental performance and of the whole greening obligation will be included in the evaluation scheduled for completion by the end of 2017 or early 2018.[10] The evaluation will be conducted on the basis of the five evaluation criteria as defined in the Commission Better Regulation Guidelines: **effectiveness**, **efficiency**, **coherence**, **relevance** and **EU added value**. The evaluation should also provide timely results for the performance report due in 2018 on the CAP monitoring and evaluation[11].

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[4] Commission Declaration of 2 April 2014; http://ec.europa.eu/agriculture/newsroom/161_en.htm.

[5] Regulatory Fitness and Performance programme, see Annex II to Commission Work Programme for 2016, COM(2015) 610 final.

[6] SWD(2016) 218 final.

[7] Commission Delegated Regulation (EU) No 639/2014 of 11 March 2014 supplementing Regulation (EU) No 1307/2013 of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and amending Annex X to that Regulation, OJ L 181, 20.6.2014, p. 1-47.

[8] Commission Delegated Regulation (EU) …/... of 15.2.2017 amending Delegated Regulation (EU) No 639/2014 as regards the control measures relating to the cultivation of hemp, certain provisions on the greening payment, the payment for young farmers in control of a legal person, the calculation of the per unit amount in the framework of voluntary coupled support, the fractions of payment entitlements and certain notification requirements relating to the single area payment scheme and the voluntary coupled support, and amending Annex X to Regulation (EU) No 1307/2013 of the European Parliament and of the Council, C(2017)735

[9] European Parliament and Council scrutiny on the legislative amendments ongoing.

[10] See the 2017 Management Plan — Agriculture and Rural Development; https://ec.europa.eu/info/publications/management-plan-2017-agriculture-and-rural-development_en and the roadmap: http://ec.europa.eu/smart-regulation/roadmaps/docs/2017_agri_002_evaluation_greening_en.pdf.

[11] Under Article 110(5) of Regulation (EU) No 1306/2013 of the European Parliament and of the Council of 17 December 2013 on the financing, management and monitoring of the common agricultural policy and repealing

2. KEY TRENDS IN ENVIRONMENTAL INDICATORS

Many valuable habitats and the biodiversity they encourage are developed with and rely on farming systems. However, the efforts involved in safeguarding this biodiversity are not recognised by markets and therefore not reflected in the prices farmers receive for their produce. **While the preservation of this biodiversity depends on appropriate management practices, these practices — driven by competitive pressures — have been subject to change,** with increasing specialisation and intensification of production in some areas and land abandonment in others, These have resulted in pressures on biodiversity, detrimental effects on soil, water and climate, **and put the agricultural sector's long-term production potential at risk.**

To monitor the impact of CAP policy between 2014 and 2020, 45 socioeconomic, sectoral and environmental indicators were selected[12], tracking among others the developments described above[13]. The trends most relevant for environmental focus areas are described below, supplemented by information from other relevant sources. However, their evolution depends on the combined effect of various policy instruments, both within CAP and beyond. Furthermore, in many cases, EU aggregations mask regional and national differences. The information below should be read in this context.

- The most commonly used barometer of the general state of biodiversity in agricultural areas is the **farmland bird indicator (FBI).** The indicator keeps track of the populations of selected bird species characteristic of farmland and is used as a barometer of the biodiversity change in agricultural land. Bird populations are considered to be a good indicator of the broad state of wildlife and the countryside because they occupy a wide range of habitats and tend to be near to or at the top of the food chain. Since 1990, farmland bird populations in the EU have decreased by nearly 30 %. While populations of common bird species have started stabilising since 2010, farmland birds have continued declining, albeit at lower rate. The trend shows that bird species that depend on the farmland habitat as created by human activity are increasingly threatened by new agricultural practices. Among them are changes in land use (crop rotation patterns, disappearance of uncultivated verges, disappearance of hedgerows) and the increasing land take (asphalted areas).

- The distribution and share in agricultural areas of land uses and farming systems considered supportive for farmland biodiversity is reflected in **the high nature value (HNV) farming indicator.** While there is no common methodology for identifying HNV in different territories, such territories are most commonly characterised by low-intensity management practices, a significant presence of semi-natural vegetation, and/or diversity of land cover, including features such as ponds, hedges and woodland.

Council Regulations (EEC) No 352/78, (EC) No 165/94, (EC) No 2799/98, (EC) No 814/2000, (EC) No 1290/2005 and (EC) No 485/2008, OJ L 347, 20.12.2013, p. 549.

[12] Commission Implementing Regulation (EU) No 834/2014 of 22 July 2014 laying down rules for the application of the common monitoring and evaluation framework of the common agricultural policy OJ L 230, 1.8.2014, p. 1,

Commission Implementing Regulation (EU) No 808/2014 of 17 July 2014 laying down rules for the application of Regulation (EU) No 1305/2013 of the European Parliament and of the Council on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)

OJ L 227, 31.7.2014, p. 18.

[13] https://ec.europa.eu/agriculture/sites/agriculture/files/cap-indicators/context/2015/indicator-table_en.pdf.

A detailed description of definitions, methodology and data sources is provided in the Technical Handbook on the Monitoring and Evaluation Framework of the Common Agricultural Policy 2014-2020.

The share of HNV in agricultural area varies considerably among Member States, ranging from more than 60 % in some to less than 20 % in others. Typical HNV farmland areas are extensively grazed uplands, alpine meadows and pasture, steppe areas in eastern and southern Europe, and *dehesas* and *montados* in Spain and Portugal. Certain more intensively farmed areas in lowland western Europe can also host concentrations of species of particular conservation interest[14]. However, the HNV indicator does not reflect the current situation of biodiversity in the field.

- The information reported under the Habitats[15] and Birds[16] Directives shows no measurable improvement in the **status** of species and habitats associated with agriculture between the reporting periods 2001-2006 and 2007-2012: for **habitats** (Annex 1 to the Habitats Directive), 4 % of the assessments showed an improvement between the two periods while 39 % of the assessments showed deterioration. For **species** the corresponding figures were 4 % and 20 % respectively.[17] The habitats linked to agriculture (grassland and cropland) have the lowest share of favourable assessments among terrestrial habitats[18].

- The main impacts of agriculture on water are linked to losses of nutrients such as nitrates and phosphates from agricultural soils into freshwaters. Applied in excess, both nitrates and phosphates play a significant role in triggering eutrophication processes. Potential risks in this regard are measured by the **gross nutrient balance indicators.** According to latest data, which covers the period from 2008 to 2011, for the EU-28 the average balance between the nitrogen added to an agricultural system and that removed from it was 47 kg per ha. However, this was almost 16 % lower than in the period 2000-2004. In addition, the figure was much lower in the EU-13 than in EU-15. Nevertheless, on average, the EU still has a significant surplus of nitrogen[19].

- However, actual risks depend on several factors such as intensity of agricultural activities at local level, climate conditions, soil characteristics and certain management practices. **Nitrate concentrations in groundwater and surface waters** are among the criteria for identifying waters polluted or at risk of pollution[20]. As of 2012, most Member States showed a clear prevalence of surface waters with concentrations of nitrates below the drinking water threshold of 50 mg nitrate per litre[21]. However, many still had water bodies with concentrations over the level at which eutrophication and other negative effects on aquatic ecosystems appear. As for ground waters, the share of water bodies exceeding the drinking water threshold was generally higher than for

[14] Paracchini et al., High Nature Value Farmland in Europe, EEA and JRC, 2008: http://agrienv.jrc.it/publications/pdfs/HNV_Final_Report.pdf.

[15] 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.

[16] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, OJ L 20, 26.1.2010, p. 7–25

[17] EU assessment of progress in implementing the EU Biodiversity Strategy to 2020, SWD(2015) 187 final

[18] State of nature in the EU report 2015: http://www.eea.europa.eu/publications/state-of-nature-in-the-eu.

[19] Annual Indicator Report Series (AIRS) — Environmental indicator report 2016: http://www.eea.europa.eu/airs/2016/natural-capital/agricultural-land-nitrogen-balance.

[20] According to Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources, OJ L 375, 31.12.1991, p. 1.

[21] Threshold set by Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption, OJ L 330, 5.12.1998, p. 32.

surface water in most of the countries, with around 85 % of monitoring sites in the EU showing concentration levels below 50 mg nitrate per litre.

- **Soil erosion by water** is one of the most widespread forms of soil degradation in Europe, with the average rate of loss amounting to 2.4 t/ha/year. In 2012 around 6.6 % of the EU total agricultural area was estimated to be suffering from moderate to severe erosion (>11 t/ha/year). Soil degradation by water erosion is particularly significant in some countries of southern Europe and in mountainous countries. Cultivated land (arable and permanent cropland) is estimated to be more affected than permanent grasslands and pasture. Soil erosion trends in EU showed a moderate decrease between 2000 and 2012[22] mainly due to the application of environmentally sustainable agricultural practices such as reduced tillage, plant residues, cover crops, stone walls, contouring and grass margins. It should, however, be noticed that the soil erosion indicator is based on a model which defines only the potential soil erodability without taking into account the actual soil erosion which can only be calibrated through in field observations.

[22] When calculating the indicator, the support practices were estimated for the first time at European level, taking into consideration the good agricultural and environmental conditions (GAEC).

3. EFA OBLIGATION — OBJECTIVES, KEY PROVISIONS AND RELATIONSHIP WITH OTHER CAP INSTRUMENTS

3.1. Key elements and objectives of greening, including EFA

The aim of greening is to enhance the environmental performance of the CAP[23]. The instrument makes a part of direct payments received by farmers conditional on their observance of three 'greening' practices beneficial for the environment and the climate. These **practices** are:

- dedicating 5 % of arable area as an ecological focus area (EFA);
- crop diversification;
- maintenance of permanent grassland.

The overall objective comprises **objectives of**:

- carbon sequestration linked to the maintenance of permanent grassland[24];
- improvement of soil quality associated with crop diversification[25];
- safeguarding and improving biodiversity on farms associated with the establishment of EFAs.[26]

There are two types of **expected effects of EFAs**: (i) those affecting biodiversity **directly**; (ii) those affecting biodiversity **indirectly,** where the improvements are achieved by reducing the inputs on agricultural areas. The legislation underlying greening also refers to certain desired or unwanted effects on other environmental media (i.e. on water) that should be avoided.

The greening obligations aim to make farmers apply certain basic practices to ensure environmental/climate benefits, either by changing their practices (to achieve better environmental/climate outcomes) or by maintaining already applied practices (to maintain environmental/climate benefits).

3.2. Legal basis

The basic rules of greening are set out in Regulation (EU) No 1307/2013 on direct payments ('the Basic Regulation'). The Regulation:

- **establishes the three standard greening obligations**, including the establishment of an EFA and the elements comprising it (Article 46);
- lays down **objectives** linked to the obligations;
- defines **basic concepts and terms**.

Article 43(12) and (13) of the Basic Regulation empowers the Commission to specify **certain technical parameters and implementing arrangements** via delegated and implementing acts. This has been done in Commission Delegated Regulation (EU) No 639/2014 (the

[23] Recital 37 of Regulation (EU) No 1307/2013.
[24] Idem, Recital 42.
[25] Idem, Recital 41.
[26] Idem, Recital 44.

'Delegated Regulation') and Commission Implementing Regulation (EU) No 641/2014 (the 'Implementing Regulation')[27].

The **administration, financing, management and control requirements** are laid down in Regulation (EU) No 1306/2013, while Delegated Regulation (EU) No 640/2014[28] and Implementing Regulation (EU) No 809/2014[29] specify the rules on the integrated administration and control system (IACS).

In addition, Commission services have drawn up **technical guidance** documents for Member State authorities, e.g. on the EFA layer and on the Land Parcel Identification System (LPIS). These guidance documents explain the relevant obligations and put them into context.

3.3. Obligations for farmers

Article 46(1) of the Basic Regulation requires farmers with **arable land** exceeding 15 ha to ensure that at least **5 % of such areas is an ecological focus area.** In Article 46(2) this Regulation defines what may be counted as an EFA area (**the 'EFA types'**).

Some of the EFAs (landscape features and strips of eligible hectares along forest edges) are further categorised in Article 45 of the Delegated Regulation. Various management, control and size-related requirements are also established for each EFA type (e.g. no production, limitation of agro-chemical inputs, maximum and/or minimum dimensions).

One of the main categorisations of EFAs is into areas on which production is possible and areas or features where this is not possible or which by nature exclude production (See Table 1).

Table 1 Productive and non-productive EFA types

Productive EFAs	Non-productive EFAs
Hectares of agro-forestry Strips along forest edges with production Short rotation coppice Catch crops/green cover Nitrogen-fixing crops	Land lying fallow Terraces Landscape features (hedges/wooded strips, isolated trees, trees in line, trees in group/field copses, field margins, ponds, ditches, traditional stone walls, other landscape features undercross-compliance) Buffer strips Strips along forest edges without production

On the basis of the common EFA list, **Member States draw up a list of EFA types** from which their farmers can choose. Member States may also change or add certain requirements for some EFA types. Under Article 45(3), (4) and (5) of the Delegated Regulation, terraces, landscape features and buffer strips which Member States protect under cross-compliance rules can also be selected. Except in a few cases, the legislation does not specify the criteria

[27] Commission Implementing Regulation (EU) No 641/2014 of 16 June 2014 laying down rules for the application of Regulation (EU) No 1307/2013 of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy OJ L 181, 20.6.2014, p. 74.

[28] Commission Delegated Regulation (EU) No 640/2014 of 11 March 2014 supplementing Regulation (EU) No 1306/2013 of the European Parliament and of the Council with regard to the integrated administration and control system and conditions for refusal or withdrawal of payments and administrative penalties applicable to direct payments, rural development support and cross compliance, OJ L 181, 20.6.2014, p. 48.

[29] Commission Implementing Regulation (EU) No 809/2014 of 17 July 2014 laying down rules for the application of Regulation (EU) No 1306/2013 of the European Parliament and of the Council with regard to the integrated administration and control system, rural development measures and cross compliance, OJ L 227, 31.7.2014, p. 69.

for these national choices. Table 4 at the end of the chapter summarises EFA types and attached management requirements.

3.4. Calculation of the EFA area for the purpose of meeting the 5 % requirement

To calculate the EFA, the Basic Regulation established a system according to which each EFA type is assigned specific conversion and weighting factors. The values of these were subsequently established in Annex II to the Delegated Regulation (which amended Annex X to the Basic Regulation):

- **Conversion factors** simplify the measurement of some EFA types such as trees and ponds. Their use is optional for Member States.
- Differentiation of **weighting factors** reflects the fact that individual EFA types have different 'characteristics' and consequently a different impact on/importance for biodiversity in the light of EFA's objective *'to safeguard and improve biodiversity on farms'* (Recital 44 of the Basic Regulation). Accordingly, lower weighting factors (below 1) are assigned to elements that are productive compared with elements that are not productive and whose function, in principle, is only environmental (max. 2) and whose existence is therefore not warranted from a farmer's perspective. Weighting factors below 1 are mandatory.

3.5. Changes to farmers' obligations resulting from the 2016 review

Major changes pursued as a follow-up to the 2016 review of greening include: (i) a grouping of some EFA categories defined in the Delegated Regulation; and (ii) simplification and streamlining of dimension requirements. For the latter in particular, EFA elements that exceed the set dimensions or which are adjacent to a first EFA will no longer be excluded from being counted as EFAs. In addition, the changes include clarifying various requirements and concepts such as what is understood by *'no production'* and how this restriction relates to rules under other CAP instruments and the extent of *'adjacency'*. Some changes also take better account of agronomic realities and seasonal weather conditions, by replacing deadlines with retention periods or changing the composition of certain crops required under an EFA.

The changes aim at:

- reducing the uncertainty farmers encounter in applying different EFA types;
- decreasing the complexity of distinguishing EFA types;
- allowing farmers to count as EFAs environmentally valuable features that have so far been excluded.

In addition, in order to increase the biodiversity benefits of EFAs, plant protection products are banned on (potentially) productive EFAs.

3.6. Exemptions from the EFA obligation

Several categories of farmers are exempt from all greening rules. In addition, there are a number of exemptions specifically from the EFA obligation. These apply particularly to farmers with a large proportion of grassland but also to farmers in predominantly afforested areas in certain Member States. The exemptions are summarised in Table 2.

Table 2 Exemptions from the EFA rules

Legal basis (the Basic Regulation)	Who	Scope	Rationale/category
Art 46(1)	Farmers having less than 15 ha of arable land	EFA	Proportionality (cost /benefit)
Art 61(3)	Farmers participating in the small farmers scheme (SFS)	All greening obligations	Simplification
Art 43(11)	Farmers complying with organic farming rules	All greening obligations	Farmers considered 'green by definition' because their practices are considered to yield at least the same environmental benefit or cases where application of greening rules would run contrary to its objectives e.g. lead to land abandonment
Art 43(10)	Farmers whose holdings are fully or partly located in areas covered by the Birds[30] and Habitats Directives[31] or the Water Framework Directive[32]	Where the greening practices in the holding concerned are not compatible with the objectives of these Directives	
Art 46(4)	Farmers managing a predominant share of their farm as grassland, fallow land or crops under water	EFA	
Art 46(7)	Farmers in areas with natural constraints in countries with a predominant forest area	EFA	

3.7. Relationships between EFA and the rest of the CAP

The greening component of direct payments goes beyond the cross-compliance requirements in place since 2005. The cross-compliance mechanism[33] links CAP payments to farmers' observance of a set of **statutory management requirements** (SMRs) based on EU environment legislation in areas such as biodiversity and water[34] and several **standards for the good agricultural and environmental condition of land** (GAEC), which are defined by Member States:

- Member States may allow their farmers to count as EFA types the following features which require establishing or protecting under the cross-compliance rules: buffer strips along water courses (SMR 1, GAEC 1), terraces (GAEC 7), landscape features (SMR 2, SMR 3, GAEC 7).

[30] Directive 2009/147/EC of the European Parliament and of the Council

[31] Council Directive 92/43/EEC

[32] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1–73

[33] Article 93 of Regulation (EU) No 1306/2013; rules on cross-compliance (SMRs, GAECs) are listed in Annex II to that Regulation.

[34] Besides environmental legislation, SMRs also cover EU legislative standards in the field of food safety, animal and plant health and animal welfare.

- In implementation of SMR 1, certain Member States require farmers to establish catch crops to take up residual nitrogen and so as to avoid bare soil and diffuse pollution in groundwater. Member States may also allow their farmers to qualify these areas with catch crops/green cover as EFA.

Table 3 Links between EFA and cross-compliance mechanism

EFA	Issues, requirements and standards under cross-compliance mechanism		
Buffer strips	Water	SMR 1	Nitrates Directive[35] (Articles 4 and 5)
		GAEC 1	Establishment of buffer strips along water courses
Landscape features	Biodiversity	SMR 2	Birds Directive[36], Article 3(1), Article 3(2)(b), Article 4(1), (2) and (4)
		SMR 3	Habitats Directive[37], Article 6(1) and (2)
Landscape features and terraces	Landscape, minimum level of maintenance	GAEC 7	Retention of landscape features, including, where appropriate, hedges, ponds, ditches, trees in line, trees in group or isolated, field margins and terraces, and including a ban on cutting hedges and trees during the bird breeding and rearing season and, as an option, measures for avoiding invasive plant species

Source: DG AGRI, based on Annex II to Regulation (EU) No 1306/2013

For some of the areas or features mentioned above, farmers have to observe **additional requirements** to qualify these areas or features as an EFA, motivated by the biodiversity objective of the EFA obligation. For example, they are not allowed to have production on buffer strips or they must sow a mixture of species when sowing catch crops.

Together with cross-compliance, greening represents part of the **'baseline' or 'reference level'** for voluntary agri-environment-climate (AEC) measures financed under Rural Development Programmes (RDPs). To avoid the risk of double funding (between AEC payments and green direct payments), financial support for such voluntary measures cannot compensate practices equal or similar to greening requirements. Instead, payments for these AEC measures are calculated on the basis of income foregone and costs incurred for practices going beyond the 'baseline'. It is the responsibility of Member States to ensure that there is no duplication of funding.

3.8. Additional approaches

Based on Article 46(5) and (6) of the Basic Regulation, Member States may decide to implement the EFA requirement **regionally or collectively** in order to concentrate EFA areas within a particular territory. Under this approach, farmers are required *('regional implementation'*, Article 46(5), or allowed *('collective implementation'*, Article 46(6)) to organise themselves in such a way that they attain half of their EFA percentage requirements through adjacent EFAs, when these are located on the land of only some of the farmers involved, as this is considered more beneficial for the environment. The Delegated Regulation specifies rules and criteria to be met in this respect (Articles 46 and 47).

[35] Council Directive 91/676/EEC

[36] Directive 2009/147/EC of the European Parliament and of the Council

[37] Council Directive 92/43/EEC

3.9. Alternatives to EFA obligation

According to Article 43(3) of the Basic Regulation, Member States may allow farmers to meet one or more greening requirements through **equivalent** (alternative) practices. The concept was introduced to accommodate the diversity of agricultural systems and the different environmental situations across Europe. The equivalent practices must be carried out either under AEC schemes within Member State RDPs, or in accordance with national or regional certification schemes. They must also yield an equivalent or higher level of benefit for the climate and the environment compared to one or more of the greening requirements. An exhaustive list of practices equivalent to 'standard' EFAs is provided in Annex IX to the Basic Regulation, together with certain management requirements. This covers:

- ecological set-aside;
- creation of 'buffer zones';
- management of uncultivated buffer strips and field margins;
- borders, in-field strips and patches;
- management of specified landscape features;
- keeping arable peaty or wet soils under grass (no use of fertilisers and no use of plant protection products);
- production on arable land with no use of fertiliser and/or plant protection products, and not irrigated, not sown with the same crop 2 years in a row;
- conversion of arable land into permanent grassland.

According to Article 43(8) of the Basic Regulation, it is for the Commission to decide whether a practice notified by a Member State can be recognised as being covered by Annex IX. Article 10 of the Implementing Regulation establishes the procedure for assessing these notifications and the applicable deadlines.

3.10. IACS and greening: control requirements and the penalties system

Like other direct payment schemes, the green direct payment is managed through the **integrated administration and control system (IACS).** A common set of IACS rules applies to all direct payments. These rules are designed to ensure that EU taxpayers' money is correctly spent. However, a number of specific requirements apply to the green direct payment.

Article 70(2) of Regulation (EU) No 1306/2013 requires Member States to ensure by claim year 2018 at the latest that the LPIS contains the **'EFA layer'**, a reference layer that includes EFAs. Information from the EFA layer is then used: (i) to help beneficiaries correctly declare their EFAs (the administration gives information on EFAs in the pre-established form that is provided to beneficiaries); and (ii) for cross-checking the EFAs declared by the farmer against the information in the EFA layer.

Farmers who fail to comply with the greening rules do not receive the full greening payment. Delegated Regulation (EU) No 640/2014 specifies the applicable rules on reductions and penalties. Reductions reflect the number of hectares identified as non-compliant with the greening obligations; as of 2017, administrative penalties apply as well, as provided for in the third subparagraph of Article 77(6) of Regulation (EU) No 1306/2013.

In line with the proportionality principle, the amount of the penalty depends on: (i) the severity and scope of non-compliance; (ii) whether it has a lasting impact; and (iii) whether it recurs. Details of reductions and administrative penalties are laid down in Articles 24 to 29 of Delegated Regulation (EU) No 640/2014.

In order to identify areas that are not compliant with the rules, Member States have to carry out **inspections** in line with the principles and rules set out in the IACS legislation. Article 31 of Regulation (EU) No 809/2014 is of particular importance for **on-the-spot-checks** on greening. It requires, as a rule, on-the-spot checks for:

- 5% of all beneficiaries required to observe greening (supplemented by 5% of all beneficiaries who are required to have EFAs if the Member State concerned does not yet have an EFA layer in place);
- 3% of beneficiaries who are exempted from complying with the greening obligations.

Several other provisions in that Regulation are also relevant for greening. One such provision is Article 26(4), which stipulates that additional visits may be required for certain EFA types, where it is possible to check certain eligibility criteria only during a specific time period.

Table 4 Summary of EFA types and attached requirements

EFA type		Cross-compliance	Dimensions Art. 45 (non-cross-compliance)		Key requirements / management conditions set in Art. 45	Obligations / option for Member State to specify or change management conditions	CF (m/tree to m^2)	WF	Changes following the 2016 review
			Minimum limit	Maximum limit					
Land lying fallow					No agricultural production		n.a.	1	Ban on the use of PPPs 6 month min. retention period specified 'No production' specified, sowing of mixtures of flower seeds allowed
Terraces		GAEC 7	MS shall set min. height				2	1	
Landscape features	**Hedges/wooded strips**	GAEC 7 SMR 2 & 3		10 m (width)	Features adjacent to arable land also eligible		5	2	Under one category with trees in line — see below
	Isolated trees	GAEC 7 SMR 2 & 3	4 m (diameter); MS may include valuable trees < 4 m diameter		Features adjacent to arable land also eligible		20	1.5	Rule on minimum diameter removed Features adjacent to the adjacent EFAs also eligible
	Trees in line	GAEC 7 SMR 2 & 3	4 m (diameter); MS may include valuable trees < 4 m diameter	5 m (space between crowns)	Features adjacent to arable land also eligible		5	2	One category with hedges / wooded strips. Area calculated to a maximum width of 10 m Rules on min. diameter and maximum space between crowns removed Features adjacent to the adjacent EFAs also eligible
	Group of trees/field copses	GAEC 7 SMR 2 & 3		0.3h a	Features adjacent to arable land also eligible		n.a.	1.5	One category including field copses, trees, bushes or stones Area calculated to a maximum 0.3 ha Features adjacent to the adjacent EFAs also eligible
	Field margins	GAEC 7 SMR 2 & 3	1 m	20 m; MS may decide on a lower max. limit	No agricultural production Features adjacent to arable land also eligible		6	1.5	Under one category with buffer strips — see below
	Ponds	GAEC 7 SMR 2 & 3	MS may set up min. area	0.1h a; MS may allow inclusion of riparian vegetation of max 10 m in pond area	Concrete/plastic reservoirs excluded Features adjacent to arable land also eligible	MS may establish criteria to ensure ponds' natural value	n.a.	1.5	Area calculated to a maximum 0.3 ha Riparian vegetation always included in the calculation of the area Features adjacent to the adjacent EFAs also eligible
	Ditches	GAEC 7 SMR 2 & 3		6 m	Concrete channels excluded Features adjacent to arable land also eligible		3	2	Features adjacent to the adjacent EFAs also eligible
	Traditional stone walls	GAEC 7 SMR 2 & 3	MS may decide min. height and width	MS may decide min. height and width	Features adjacent to arable land also eligible		1	1	Features adjacent to the adjacent EFAs also eligible
	Other landscape features under cross-compliance	GAEC 7 SMR 2 & 3			Features adjacent to arable land also eligible		n.a.	1	Features adjacent to the adjacent EFAs also eligible
Buffer strips		GAEC 1 SMR 1 & 10	MS to decide min. width provided not < 1 m	Max 10 m strip of riparian vegetation (included in buffer strip)	No agricultural production Features adjacent to arable land also eligible	MS may allow cutting and grazing provided buffer strips are distinguishable	6	1.5	Under one category with field margins — see below 'No production' specified, sowing of mixtures of flower seeds allowed Area calculated to a maximum width of 20 m MS to establish min. width not lower than 1 m Features adjacent to the adjacent EFAs also eligible
Hectares of agro-forestry							n.a.	1	
Strips along forest edges without production			MS to decide min. width provided not < 1 m	10 m	No agricultural production	MS may allow cutting and grazing provided strips are distinguishable	6	1.5	'No production' specified, sowing of mixtures of flower seeds allowed Area calculated to a maximum width of 20 m
Strips along forest edges with production			MS to decide min. width provided not < 1 m	10 m			6	0.3	Ban on the use of PPPs Area calculated to a maximum width of 10 m
Short rotation coppice					No use of mineral fertiliser (MF) and/or plant protection products (PPPs)	MS shall establish list of species most suitable from ecological perspective (excluding clearly non-indigenous) MS shall establish requirements on MF and PPP	n.a.	0.3	
Afforested areas							n.a.	1	
Catch crops/green cover		SMR 1			Sown at latest 1 October Only mixture of crops or under sowing grass Areas under winter crops excluded	MS to establish start & end date of sowing MS to establish list of crops MS may establish additional conditions, esp. production methods	n.a.	0.3	Deadline for sowing of catch crops/green cover replaced by min. retention period of 8 weeks to be set by MS Undersowing by leguminous made possible Ban on the use of PPP; for undersowing applicable from harvesting of main crop for at least 8 weeks or until sowing of next main crop
Nitrogen-fixing crops (NFC)					Crops contributing to biodiversity objectives Mixtures with crops other than NFC not possible	MS shall establish a list of crops (biodiversity contribution) MS shall establish rules on where NFC grown (risk of nitrate leaching) MS may establish additional conditions, esp. production methods	n.a	0.7	Ban on the use of PPP Mixtures with crops other than NFC possible provided NFC remain predominant Obligation for MS to set rules on location of NFC replaced by specification that the risk of leaching be taken into account within possible additional conditions

3.11. Notifications by Member States

The legislation specifies the schedule for Member States to notify the Commission of their implementation choices and information on the uptake of greening. This is summarised in Table 5.

Table 5 Member States' notifications on greening choices relating to EFA

Greening obligation	Type	Deadline	Legal reference	Content
Equivalence (incl. EFA)	Decision on implementation	1 August 2014 1 July following years	Basic Regulation Article 43(8) Implementing Regulation Article 10	Use of equivalent practices (optional)
EFA	Decision on implementation	1 August 2014 (annual review possible)	Basic Regulation Article 46(8) Delegated Regulation Article 65(2)	Activation of EFA types
				Activation of conversion and weighting factors
			Delegated Regulation Article 65(3)	Regional and collective implementation
			Delegated Regulation Article 65(4)	Forest exemption
All	Monitoring output indicators	15 December each year	Delegated Regulation Article 65(1)(c)[38]	Implementation data for all greening obligations and exemptions

[38] The notification on implementation data under Article 65(1)(c) of the Delegated Regulation is also referred to in Regulation (EU) No 834/2014, where these indicators are part of the common monitoring and evaluation framework and in that context are qualified as output indicators in Section 3 of the Annex to the Regulation.

4. METHODOLOGY, DATA SOURCES AND LIMITATIONS

4.1. Approach to assessment

The analysis covered by this document is mainly based on implementation information (information concerning Member State decisions and farmers' uptake of EFA), some statistical context information and a literature review. This analysis is based on both qualitative and quantitative evidence and covers two years of implementation of greening, namely 2015 and 2016.

Implementation information is dealt with in the report based on:

- the notifications by Member States of their national choices on EFA elements and related requirements;
- the implementation data on the uptake by farmers of each greening measure compared against the statistical information on agricultural holdings in the EU (e.g. the Farm Structure Survey conducted by Eurostat).

Information for 2015, the first year of implementation, was gathered and published for the first time in the SWD of 22 June 2016. This report provides updates using the latest 2015 figures and also the available data for 2016, explained more in detail in the next chapters.

The quality of the Commission's assessment relies on the quality and timeliness of the Member States' reports. While preparing this report, the Commission was in regular informal contact with the Member States' authorities to ensure that reported data are as consistent as possible. There are, nevertheless, examples where reporting contains gaps or could contain contradictions.

Analysis of the potential environmental impact of the EFA obligation in the scientific literature is still at an early stage. After two years of implementation just a few studies have been produced on the subject. This report contains first observations on the potential environmental impact based on:

- the analysis made by Commission's Joint Research Centre (JRC) using a tool called the *'EFA calculator'* (explained in detail in Chapter 4.6);
- information from other scientific and academic sources on the effectiveness of the different elements of EFAs, detailed in Chapter 4.8.

The limitations of the analysis, which is still preliminary, are highlighted in each of the following chapters.

Where relevant, the assessment is supplemented by:

- other studies (see Chapter 4.7);
- input from stakeholders, including:
    - in the expert group and civil dialogue group formats;
    - from the stakeholder consultation on greening that the Commission conducted from mid-December 2015 until mid-February 2016.

4.2. Analysis of Member State decisions and implementation data

This report is based on data notified by Member States for the years indicated in Table 6. Decisions on approaches to implementation apply in the claim year following the year of notification. For example, notification on an EFA sent by 1 August 2014 was applicable for claim year 2015.

Table 6 Availability of notifications related to EFA submitted by Member States

Content	Year of notification	Year of implementation
Equivalence (including EFA)	2014	2015
	2015	2016
	2016	2017
EFA (Activation of EFA types — conversion and weighting factors — Regional and collective implementation — Forest exemption)	2014	2015
	2015	2016
	2016	2017
Implementation data for greening obligations and exemptions		2015
		2016

To ensure comparability and consistency of the analysis, this report is primarily based on data for claim year 2015, for which the Commission has received most complete information. Where data already available for the claim year 2016 point to differences in Member States' decisions and implementation data, these are also taken into account.

4.3. Data on the uptake of greening and EFA obligation

Member States have to provide the Commission with data on the uptake of greening each year by 15 December (see Table 5).

This data should be interpreted bearing in mind that greening is an obligatory scheme for all farms applying for direct payments in the period 2014-2020. Farms that have to meet greening obligations are therefore a subset of the farms under the direct payments scheme, the only difference between the two groups being farms exempted from greening (see Chapter 3.6).

This document builds upon the data provided by Member States for the following:

- **main indicators** on the number of farmers and hectares subject to at least one greening obligation[39], reflecting the overall coverage of greening;
- a selection of **specific indicators** on farms subject to[40] and exempted from the EFA obligation.[41]

The information was broken down geographically at NUTS 3 level (see below).

Based on the structure set out in the legislation[42], the data, in excel format, was extracted by Member States' authorities from their respective IACS, which stores all direct payments and rural development applications.

[39] Article 65(1)(c)(i) of the Delegated Regulation.
[40] Idem, Article 65(1)(c)(vii).
[41] Idem, Article 65(1)(c)(ii).
[42] See footnotes 36 to 38.

- The **number of farmers** means the number of beneficiaries of direct payments, including both exempted farms and those subject to greening obligations. In practical terms, the number of beneficiaries of direct payments (and greening) can be considered as equivalent to the number of holdings (farms) available in the Eurostat Farm Structure Survey.
- The **number of hectares**, depending on the indicator in question, is calculated as the most relevant of the following:
    - total agricultural area (farms with at least one greening obligation, those under the small farmers' scheme and organic farms);
    - arable land; or
    - the EFA area.
- Member States should use the **areas farmers declared** in their applications, **or** the **areas established following administrative and on-the-spot checks**, where these figures are available at the time when the data are extracted from the database.

The data used in this document are based on the figures available at the end of January 2017, which encompasses:

- all Member States except France for 2015;
- 19 Member States for 2016[43].

Data for some Member States still require certain verification, especially for 2016. The figures for 2015 sent by Member States were verified and comments were sent to the countries where the data were found to be not consistent. Further updates on 2015 figures were received from six countries after the SWD on the review of greening after one year was completed[44]. Possible caveats are indicated under each section of analysis.

4.4. Context data

To calculate the relative proportion of farms subject to greening requirements in Chapter 5 **on the state of play of implementation data**, information is needed on the contexts in which greening is applied. The main types of context data that are useful when calculating greening indicators are:

- **agricultural statistics:** the greening data are analysed, taking the total number of farms and areas in the EU, the Member State or the region as the total population. The dataset used in this document is the Eurostat Farm Structure Survey (FSS) data for 2013. This is the most recent dataset available and is based on a survey, whereas the 2010 FSS data were taken from the agricultural census. Eurostat annual statistics have been used to analyse the trends of land lying fallow. The time series considered range from 2010 to 2015. Data for 2015 were not yet available when the SWD on the review of greening after one year was completed.

[43] 2016 uptake data were received from 18 Member States (Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Spain, Croatia, Latvia, Lithuania, Luxembourg, Hungary, Malta, Austria, Poland, Portugal, Romania, Slovakia, Finland) and 2 UK regions (Wales and Northern Ireland).

[44] 2015 data were updated for Bulgaria, Austria, Poland, Finland and the UK (for Scotland). Some estimations were made on the data from Italy.

- **direct payments data:** in principle, greening is applied in all farms applying for direct payments, as it is an obligatory scheme under Regulation (EU) No 1307/2013. The total number of farms applying for direct payments is therefore the most accurate measure of the population these data are drawn from. Farms that are exempted from greening obligations, such as farms operating under the small farmer scheme and organic farms, are also beneficiaries of direct payments. The data for 2015 were not yet available for all Member States when this document was drafted. Data on direct payments for 2014 could be used, but as the number of beneficiaries in the direct payments system has also changed starting from claim year 2015, it is not possible to use these data throughout. That is why Eurostat FSS data for 2013 are used to represent the population in most of the analysis.

4.5. Classification of NUTS 3 regions based on EFA implementation data

Member States were asked to provide the **monitoring data on the uptake of greening at NUTS 3 level** (regions): in 2015, all the countries except France provided such data. NUTS 3 regions with no or non-reliable data were excluded from the analysis. For example, data were excluded for France, for which information are still missing, Italy, where errors on EFA areas figures were detected, and for individual NUTS 3 regions in other Member States.

All remaining **926 NUTS 3 regions were first automatically classified** using a *'k-means clustering algorithm'* on the distribution of the EFA types declared. This algorithm consists in partitioning observations into clusters in which each observation belongs to the cluster with the nearest mean, which then serves as a prototype of the cluster under analysis.

Changing the number of clusters in the algorithm showed that **using nine clusters was the optimal configuration** (i.e. the optimal compromise between homogeneity within the clusters and heterogeneity between the clusters, while still keeping the number of clusters low). These nine clusters were distributed as:

- **six** clusters with high cumulated percentages of **catch crops** (CC), **nitrogen-fixing crops** (NFC) and **land lying fallow** (LLF);
- **three** clusters with high cumulated percentages of **landscape features** (LF) and **buffer strips** (BS).

In NUTS 3 regions with a high proportion of landscape features, landscape features are essentially represented by **hedges**.

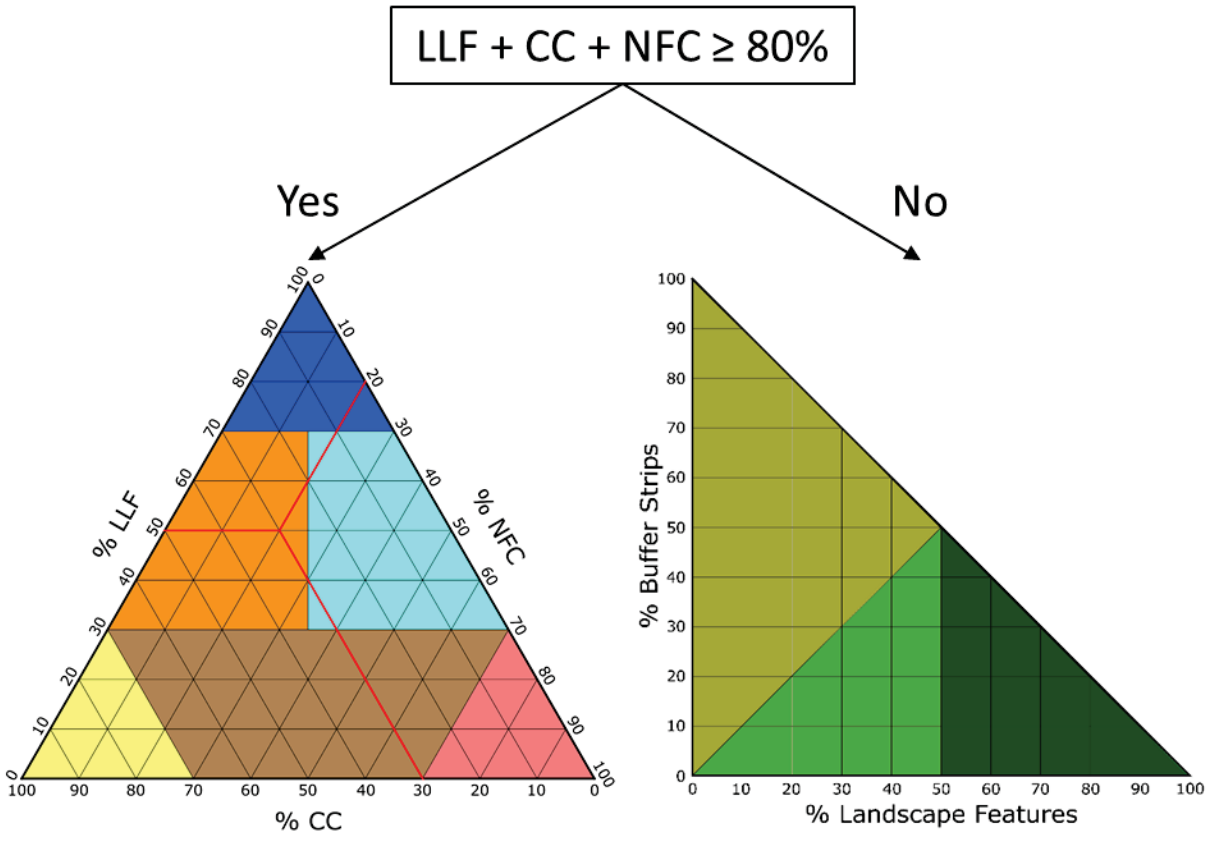
Based on this first exploratory analysis, the final nine categories were defined as rounded percentages of EFA types declared, as reported in Table 7 and Figure 1.

Table 7 Classification criteria of NUTS 3 regions

Category	*First sub-division*	*Second sub-division*	*Composition of EFA types*
1	LLF+CC+NFC < 80 %	LF ≥ 50 %	LLF+CC+NFC < 80 % - LF more than 50 %
2	LLF+CC+NFC < 80 %	LF < 50 % BS < LF	LLF+CC+NFC < 80 % - Relative abundance of LF
3	LLF+CC+NFC < 80 %	LF < 50 % LF < BS	LLF+CC+NFC < 80 % - Relative abundance of BS
4	LLF+CC+NFC ≥ 80 %	LLF ≥ 70 %	LLF+CC+NFC > 80 % - Prevalence of LLF
5	LLF+CC+NFC ≥ 80 %	CC ≥ 70 %	LLF+CC+NFC > 80 % - Prevalence of CC
6	LLF+CC+NFC ≥ 80 %	NFC ≥ 70 %	LLF+CC+NFC > 80 % - Prevalence of NFC
7	LLF+CC+NFC ≥ 80 %	LLF < 30 % mix of CC and NFC	LLF+CC+NFC > 80 % - Low LLF — Mix of CC and NFC
8	LLF+CC+NFC ≥ 80 %	30 % < LLF < 70 % NFC > CC	LLF+CC+NFC > 80 % — Intermediate LLF — Relative abundance of NFC
9	LLF+CC+NFC ≥ 80 %	30 % < LLF < 70 % NFC < CC	LLF+CC+NFC > 80 % — Intermediate LLF — Relative abundance of CC

Figure 1 helps to visualise this methodology. The red lines in the left triangle show a NUTS 3 region with more than 80 % for the sum of fallow land, catch crops and nitrogen fixing crops and 50 % of LLF, 30 % of CC and 20 % of NFC. The NUTS region therefore falls in category 9 as the percentage of LLF is included between 30 and 70 % and CC is prevalent over NFC.

Figure 1 Visual representation of the nine categories



4.6. Simulations of potential impact of EFA

4.6.1. EFA calculator - introduction

With the sparse and incomplete data availability, it is still very difficult to find and conduct very robust greening impact studies.

The Commission's Joint Research Centre (JRC) recently asked for an EFA calculator to be developed.

The calculator is a **farm-level tool** intended to raise farmers' awareness of the implementation of EFA and provide **guidance to them on EFA selection**. The software estimates for a specific farm what that farm's current level of performance is on biodiversity and ecosystem services, depending on its EFA share and composition.

Considering that the data reported by Member States to DG AGRI on greening implementation are available mainly at regional level and not for individual farms, it was decided to run a study on the potential impact of EFA implementation in the EU. The supporting assumption was to divert the farm tool from its original aim and run it at NUTS 3 level by **simulating** the **characteristics of EFA farms representative for each NUTS 3 region** in question (producing **an 'average farm'**), using data reported by Member States.

By doing so, a rough estimate can be made of what the current possible impact of EFA is on biodiversity and ecosystem services in a specific NUTS 3 zone (through the 'average representative farm').

The EFA calculator is based on a large and robust **scientific review**. However, underlying assumptions for its use at regional level obviously place some **restraints** on the actual quantitative results and further analyses are needed to actually test its robustness. Nevertheless, it provides a useful method to catch an early estimate of the potential impact of greening.

4.6.2. Structure and foundation of the EFA calculator

The software, known as the *'EFA calculator'*, was developed by the University of Hertfordshire and is coordinated by the JRC. For a detailed description of the tool and its scientific basis, see the final report of the study on the EFA calculator (Tzilivakis, J., et al. 2015).

The software estimates an **individual farm's current performance** on biodiversity and ecosystem services **depending on its EFA share and composition**. This makes it possible for a user to test changes in the composition and quantity of the EFA on the farm and to simulate what the resulting impact could be.

A literature review forms the foundation for the software tool. Over 350 papers, reports and guides were collated, reviewed and structured for the individual EFA types specified in the EFA legislation. The information from the literature review process was then converted into a form that could be used in the software. Ecosystem services and biodiversity were selected as a means of assessing the ecological benefit of EFAs.

For **biodiversity**, this analysis is based on the diversity and populations of species. For the latter, there is specific focus on the EFA's potential impact on enhancing populations. EUNIS species groups were used (EEA (2015b) (See Chapter 6.2.1).

The analysis concerning ecosystem services does not cover ecosystem disservices, where ecosystem functions are harmful to human well-being. However, it does cover negative impacts resulting from positive services (for example, creation of woodland may decrease water provision downstream in a catchment area). The Common International Classification of Ecosystem Services (CICES) system was followed (Haines-Young and Potschin, 2013) (See Chapter 6.2.1).

4.6.3. **Impact scores**

A bespoke scoring system was developed based on the **characteristics and potential impact of each EFA feature.** The latter (known as the *'feature impact'*) was determined and is presented in Figures 2 and 3. Ticks in the matrix correspond to where evidence was found that the EFA feature has an impact (positive or negative) on the corresponding category of biodiversity groups or ecosystem services.

Figure 2 Broad impact matrix between EFA types and biodiversity EUNIS groups

Land/feature / Impact category	Agroforestry	Ancient monuments	Ancient stones	Archaeological sites	Catch crops or green cover	Ditches	Fallow land	Garrigue	Hedges or wooded strips	Isolated trees	Land strips (adjacent/parallel to water)	Land strips (other)	Natural monuments	Nitrogen fixing crops	Ponds	Short rotation coppice	Terraces	Traditional stone walls	Trees in line	Woodland
Biodiversity																				
Amphibians	✓				✓	✓	✓			✓	✓	✓		✓	✓	✓				
Aquatic plants						✓									✓					
Biodiversity (general)						✓									✓					✓
Birds	✓				✓	✓	✓		✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
Fish						✓									✓					
Fungi			✓															✓		✓
Invertebrates	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓		✓
Lichens																		✓		✓
Mammals	✓				✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓		✓
Reptiles	✓		✓		✓		✓	✓		✓	✓	✓		✓		✓	✓	✓		
Terrestrial plants	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓		✓		✓		✓		✓

Figure 3 Broad impact matrix between EFA types and ecosystem services

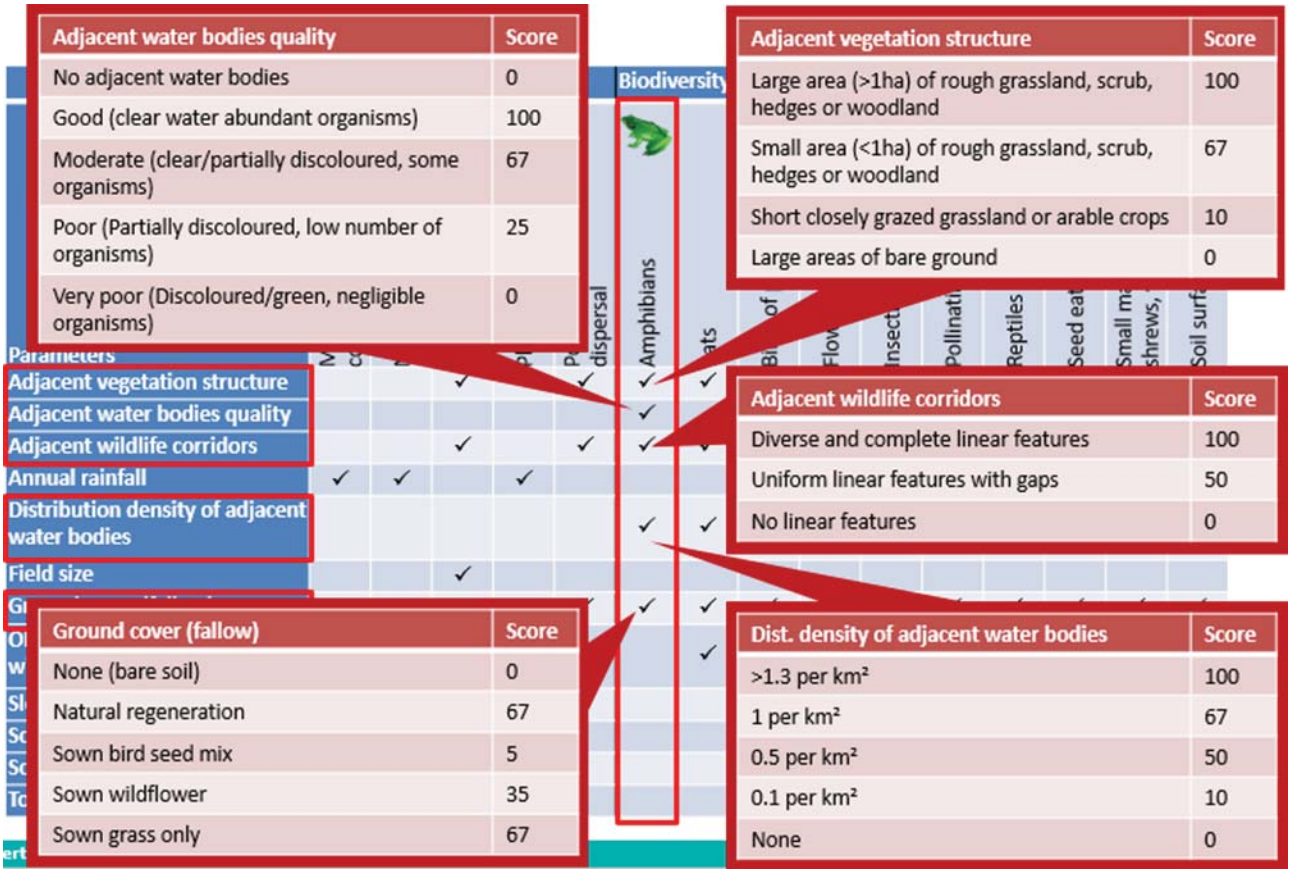
Land/feature / Impact category	Agroforestry	Ancient monuments	Ancient stones	Archaeological sites	Catch crops or green cover	Ditches	Fallow land	Garrigue	Hedges or wooded strips	Isolated trees	Land strips (adjacent/parallel to water)	Land strips (other)	Natural monuments	Nitrogen fixing crops	Ponds	Short rotation coppice	Terraces	Traditional stone walls	Trees in line	Woodland
Ecosystem services																				
Provisioning:																				
Provision of water as a material																	✓			✓
Provision of water for nutrition																				✓
Regulation & maintenance:																				
Global climate regulation																				✓
Pollination & seed dispersal	✓					✓	✓	✓	✓		✓	✓		✓	✓	✓				✓
Pest control	✓				✓		✓		✓					✓		✓			✓	
Chemical condition of freshwaters	✓				✓	✓	✓		✓		✓			✓	✓	✓			✓	✓
Flood protection						✓														✓
Mass stabilisation & control of soil erosion	✓				✓		✓				✓			✓		✓	✓			✓
Filtration/sequestration by flora and fauna									✓		✓								✓	
Mediation of smell/noise/visual impacts									✓										✓	
Cultural:																				
Aesthetic services		✓	✓	✓		✓			✓	✓			✓		✓		✓	✓		✓
Heritage & cultural services		✓	✓	✓						✓										

Each EFA feature may impact one or more group of species (biodiversity) and/or one or more ecosystem service. These impacts depend on a set of parameters, each one consisting of several classes which reflect the impact score.

For instance, to assess the potential impact of the EFA type fallow land on amphibians (Figure 4), the parameters used included:

- quality of adjacent water bodies (with classes such as no adjacency, good water quality, moderate water quality);
- ground cover (with classes such as bare soils, natural regeneration, sown bird seed mix).

Figure 4 Impact matrix for fallow land on amphibians



Relative impact scores were derived for each feature-impact combination (as described above). Each feature impact was scored **on a scale of −100 to +100** for negative and positive impacts respectively. Two techniques were developed to score impacts:

- A **semi-quantitative approach** is used when the combinations of parameters are based on the quantified data. Scores were calculated for each of the possible combinations of relevant parameters then converted into a -100 to + 100 scale using a calibration table. This approach could only be applied to a few impacts (e.g. nitrate leaching and phosphate run-off, soil erosion).
- A **qualitative approach**, where scores are awarded for each class, then the scores for the classes selected are added together and weighted for each parameter. To make this approach less subjective, a protocol was used to derive scores and weights systematically, taking into account where possible existing scoring techniques,

indicators or indices in specialist literature. This approach was applied to impacts where the semi-quantitative approach could not be used.

On a scale of 100-0, the scores represent the potential impact that an EFA element can have on the ecosystem service or the biodiversity EUNIS species group. This ranges from the best impact (all parameters and classes fulfil the best condition) to no impact (the EFA elements do not fulfil any conditions for each parameter and related classes). Negative scores are calculated in the same way for negative impacts resulting from services.

4.6.4. **The aggregation process**

Given the range of potential impacts on ecosystem services and biodiversity and the number of impact indices and data, some aggregation was required to facilitate simple assessment and interpretation. **Positive and negative impact scores are averaged** and **aggregated separately.** This is to avoid potential negative impacts becoming hidden by being 'cancelled out' by positive scores (and vice versa). The aggregation process potentially results in four values: positive and negative values for ecosystem services and positive and negative values for biodiversity.

To make results comparable, these impact scores are also calculated per hectare. As described in the chapters that follow, the **impact scores per hectare** are the ones used in the analysis carried out in this study at NUTS 3 level. In this way comparison is possible as results are not influenced by farm size or by the size of the NUTS 3 regions.

In the EFA calculator, impacts are assessed not on the basis of a change from a baseline situation (baseline impact assessment) but on a functional basis (**functional impact assessment**). In a functional impact assessment, the assessment of performance would be concerned with the impact the EFA element (e.g. a hedge) has in terms of the functions and services it provides for both biodiversity and ecosystem services. This applies to both existing and new features (including features that may have been specifically created for EFA). **Performance will not be based on changes to a baseline.**

4.6.5. **Use of the EFA calculator with NUTS 3 regions**

As already mentioned, to analyse and understand the potential impact on the environment of the EFA types declared by farmers in the EU, it was decided to use the EFA calculator at NUTS 3 level, where a region was considered as 'one farm' represented by the average farm as declared within the corresponding NUTS 3 region.

Having made a rough estimate of the current possible impact of EFA on biodiversity and ecosystem services in a specific NUTS 3 zone through the average representative farm, it is then possible to make further analyses to estimate the potential impact of EFA in such region, depending on its general natural and semi-natural characteristics.

To use the EFA calculator at NUTS 3 level, three types of data were introduced into the calculator:

A. **Characterisation of the NUTS 3 (whole farm parameters)**

For the analysis at NUTS 3 level, the parameters that could be used are those **describing the NUTS 3 regions as a whole**: dominant soil texture, mean slope, mean annual rainfall, mean annual precipitation, risk of acid deposition, risk of nitrogen deposition, ecological zones, mean annual temperature, mean hydraulic conductivity of the soil, erosion risk in catchment.

Nevertheless, it was **not possible** to take into account in a regional context **some specific attributes and practices** linked to the EFA elements (such as floral diversity, landscape connectivity, hedge cutting season), which are relevant for assessing the impact on biodiversity and which can be used to fine-tune the EFA calculator scores.

B. Average farm size

The arable area of the 'NUTS 3 farm' was calculated as the average arable area of all farms implementing EFA in the specific NUTS 3 region.

C. Area of EFA types

The area of each EFA type for this 'NUTS 3 farm' was derived while maintaining the same proportion of the EFA types declared in the NUTS 3 region. For this, we used EFA implementation data 2015 notified by Member States to the European Commission at NUTS 3 level.

The EFA calculator **was run on 121 selected NUTS 3 regions**, selected as follows:

- Exclusion of Member States and NUTS 3 regions whose **data have not been notified** to the Commission or contained inconsistencies when the study was carried out (Italy, France, UK (Scotland));

Among the remaining NUTS 3 regions it was decided that the sample should contain:

- NUTS 3 regions covering **different** percentages of **EFA types declared**;
- NUTS 3 regions in **each ecological zone of the EU** (temperate oceanic forest, temperate continental forest, temperate mountain, boreal coniferous forest, boreal mountain, sub-tropical dry forest, sub-tropical mountain, temperate steppe);
- NUTS 3 regions that **present a potential risk** for biodiversity and ecosystem services due to specialist cereals systems or a low level of semi-natural vegetation;
- **neighbouring NUTS 3 regions** (clustering) in order to check that the EFA calculator provides similar outputs for similar NUTS 3 regions (i.e. same type of farming systems, landscapes, climate conditions etc.).

Among NUTS 3 regions selected there are regions with a high percentage of **farms exempted** from EFA (e.g. in Member States with an EFA forest exemption such as Sweden, Estonia, Latvia or with small farms like in southern Poland). Even if the percentage of the arable land affected by EFA in these regions is low, it was important to include them in the sample as the scores calculated by the tool are influenced by the region's characteristics (soil, climatic data etc.). Excluding them would have made the sample less representative i.e. some ecological zones would have not been represented. Anyway, these regions will be excluded when analysing the results at territorial level due to the low potential effects that the EFA policy can have in areas with an insignificant number of farms implementing EFA.

Based on this NUTS 3 approach, the analysis was carried out for the nine aggregated and detailed impact categories referred to in Chapter 4.5 (see table on classification criteria of NUTS 3 regions).

4.6.6. **Warnings and limits in the use of the calculator**

The following assumptions and constraints should be kept in mind when analysing the results.

The EFA calculator is a farm level-based tool which uses literature findings and evidence to build an impact matrix. The impact scoring system draws upon a broad variety of different measures and metrics then harmonises them using a common scoring scale (-100 to +100). This means that the **results are not absolute** in terms of numbers, but they **depend on the circumstances of the farm described.** This also means that the results **do not indicate,** especially for biodiversity, **that any one EFA element is generically better than another** EFA element — this will depend on the circumstances in which it is applied.

When applying the EFA calculator at NUTS 3 level, it must be remembered that the **parameters describing the geographical context are considered** (even if as an average in the NUTS 3 region), whereas those related to **management factors and local landscape conditions** (e.g. floral diversity, landscape connectivity etc.) **are not taken into account**.

The scores calculated for each NUTS 3 region represent **potential impacts** generated by average regional data and are not based on the specific characteristics, management practices and landscape conditions of a real farm. Therefore these scores should **not be considered as absolute values** of the **actual impact of EFA implementation on the environment**. Instead they represent the potential impact on the environment of the EFA-type composition declared in the NUTS 3 region.

The software tool is structured in a way so that not all data has to be entered. However**, the more data entered, the more accurate the assessment of impact** will be. If not all data are entered, a range of potential impact values will exist for the feature, ranging from the best case to the worst. For the NUTS 3 level analysis, the software was set to **an average case** (following the precautionary principle). This makes it possible to calculate results even if some data are missing. Obviously the results obtained have less variability than those that can be calculated in a real farm. This is because the parameters referring to specific management factors and local landscape characteristics (e.g. connectivity) can fine-tune the impacts.

Another point to underline, and one which probably applies to all studies of this nature, is that the **evidence for the impacts is variable in terms of its quantity and robustness**. For some EFA elements, like hedgerows, there are already lots of studies. However, for others like nitrogen-fixing crops, there is less evidence for some impact categories, so we should bear in mind that scientific understanding of these latter could be improved.

In the EFA calculator reports, overviews are provided of the reliability of the scientific literature used for each impact categories and feature combinations.

4.7. Study requested by the Commission

The study 'Mapping and analysis of the implementation of the CAP'[45] was commissioned by DG AGRI and undertaken in 2016. Its results were used in Chapter 6.1 covering drivers behind Member States' EFA choices.

The study focuses on the effects of implementation choices on the three main CAP objectives, analysing the motivation behind the choices and making a preliminary assessment of the implications for administrative burden and the overall likely policy impact to be expected.

The study also provided an exhaustive review of the choices made by the 28 Member States in both pillar 1 and pillar 2 of the CAP. For the mapping of Member State implementation choices, information available at the beginning of 2016 was used to produce 'mapping fiches' that describe the choices regarding both pillars in the 28 Member States. The main sources of information were Member States' notifications to the European Commission on direct payments and the 118 rural development programmes (RDPs). Interviews in the 28 countries served to shed light on the main factors that influenced the decision-making process in each country. Member States were grouped in clusters following a typology based on an analysis involving a set of 12 indicators summarising the main implementation choices.

Answers to the evaluation questions were provided based on case study work conducted in 10 Member States (Bulgaria, Finland, France, Germany, Italy, Poland, Slovenia, Spain, the Netherlands and the United Kingdom). The results provided only a preliminary idea of the potential policy impact as the evaluation focused on the measures put in place in only 10 Member States or regions, and was not based on data of uptake or implementation by beneficiaries.

4.8. Other relevant scientific literature

Other literature was also considered when undertaking the exercise to assess the potential impact of EFA on environment and climate.

- 'Ecological Focus Area choices and their potential impacts on biodiversity. Report for BirdLife Europe and the European Environmental Bureau'. This report, drawn up by the Institute for European Environmental Policy[46], focused on the potential biodiversity impacts of EFA on farmland, studying the literature evidence;
- Pe'er, G., et al., (2016), 'Adding Some Green to the Greening: Improving the EU's Ecological Focus Areas for Biodiversity and Farmers'. This evaluates the ecological effectiveness and farmers' perception of the different EFA options using the combination of survey method analysis of the uptake data and socioeconomic factors influencing farmers' decisions.
- 'EIP-AGRI Focus Group on Ecological Focus Areas: Final report'. This is a study on how EFA and more specifically landscape features contribute to the profitability of arable crop production, based on the review of scientific literature.

[45] https://ec.europa.eu/agriculture/external-studies/mapping-analysis-implementation-cap_en.

[46] http://www.ieep.eu/work-areas/agriculture-and-land-management/policy-evaluation/2016/12/ecological-focus-areas-what-impacts-on-biodiversity.

Since greening and the related EFAs have only been in place since 2015, a full-fledged field study of the real impacts EFAs have on the environment was not yet possible. The above-mentioned studies rely on other sources than field data, so their outcomes have to be considered bearing in mind these limitations.

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COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the implementation of the ecological focus area obligation under the direct payment scheme

{COM(2017) 152 final}

CONTENTS

LIST OF ACRONYMS

AEC	Agri-environment-climate
ANC	Area of natural constraint
BS	Buffer strips
CC	Catch crops and green cover
SWD	Commission staff working document
EFA	Ecological focus area(s)
FSS	Eurostat Farm Structure Survey
GAEC	Good agricultural and environmental condition (of land)
JRC	Joint Research Centre
LF	Landscape features
LLF	Land lying fallow
LPIS	Land Parcel Identification System
MS	Member State
NFC	Nitrogen-fixing crops
RDP	Rural Development Programme
SMR	Statutory management requirement
SRC	Short rotation coppice

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5. STATE OF PLAY

5.1. Summary of Member States' main decisions on EFAs in 2015 and the following years

Figures and tables presented in this subchapter are based on DG AGRI data taken from Member State notifications.

5.1.1. List of areas or features qualifying as EFA

It was up to national authorities to decide which of the non-productive and productive areas could be considered as EFAs.

The choice of elements that farmers could use to comply with their EFA obligation varied between countries.

In 2015, five Member States (Finland, Lithuania, the Netherlands, Slovenia and Spain) offered a limited selection of types (two to four).

In contrast, 14 (Austria, Belgium, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Ireland, Italy, Luxembourg, Poland, Romania and Slovakia) offered an extensive list of EFA types (10 or more).

Another nine (Cyprus, Denmark, Estonia, Greece, Latvia, Malta, Portugal, Sweden and the United Kingdom) opted for a list of intermediate length (see Table 8 and Figure 5).

Table 8 Member States' choices on EFA qualifying types for 2015, sorted by number of EFA types selected by country

Countries	a. Land lying fallow	b. Terraces	c. Landscape features including 'other landscape features'[1]	d. Buffer strips	e. Ha of agro-forestry	f. Strips eligible ha along forest edges — NO PRODUCTION	f. Strips eligible ha along forest edges — WITH PRODUCTION	g. Areas with short rotation coppice	h. Afforested areas	i. Areas with catch crops or green cover	j. Areas with nitrogen-fixing crops	EFA types (a–j)/ countries
IT	X	X	8–(9)	X	X	X	X	X	X	-	X	**18**
HU	X	X	7–(8)	X	X	X	X	X	X	X	X	**18**
DE	X	X	7–(8)	X	X	X	-	X	X	X	X	**17**
FR	X	-	8	X	X	X	X	X	X	X	X	**17**
LU	X	-	6	X	X	X	X	X	X	X	X	**15**
PL	X	-	7	X	-	X	X	X	X	X	X	**15**
BE-FL	X	-	5	X	X	X	X	X	X	X	X	**14**
BE-WA	X	-	7	X	X	X	-	X	-	X	X	**14**
BG	X	X	7	X	-	X	-	X	-	X	X	**14**
HR	X	-	7	X	-	X	-	X	-	X	X	**13**
RO	-	X	7	X	-	-	-	X	X	X	X	**13**
CZ	X	X	5–(6)	-	-	-	-	X	X	X	X	**12**
IE	X	-	4	X	-	-	-	X	X	X	X	**10**
SK	X	X	4	X	-	-	-	X	-	X	X	**10**
UK-NI	X	-	3–(4)	-	X	-	-	X	X	-	X	**9**
EE	X	-	5	-	-	-	-	X	-	-	X	**8**
LV	X	-	3–(4)	X	-	-	-	-	-	X	X	**8**
AT	X	-	3–(4)	-	-	-	-	X	-	X	X	**8**
MT	X	-	4–(5)	-	-	-	-	-	-	-	X	**7**
DK	X	-	1–(2)	X	-	-	-	X	-	X	-	**6**
EL	X	-	3	X	-	-	-	-	-	-	X	**6**
UK-WA	X	-	2	-	-	-	-	X	X	-	X	**6**
CY	X	-	0	X	X	-	-	-	X	-	X	**5**
PT	X	-	0–(1)	-	X	-	-	-	X	-	X	**5**
SE	X	-	1	-	-	-	-	X	-	X	X	**5**
UK-EN	X	-	1	X	-	-	-	-	-	X	X	**5**
UK-SC	X	-	1	X	-	-	-	-	-	X	X	**5**
ES	X	-	0	-	X	-	-	-	X	-	X	**4**
NL	-	-	1	-	-	-	-	X	-	X	X	**4**
FI	X	-	0–(1)	-	-	-	-	X	-	-	X	**4**
SI	X	-	0	-	-	-	-	-	-	X	X	**3**
LT	X	-	0	-	-	-	-	-	-	-	X	**2**
Countries/ EFA	**30**	**7**	**(28)**	**19**	**11**	**10**	**6**	**22**	**15**	**21**	**31**	

[1] The total number of landscape features selected, including 'other landscape features', is mentioned under brackets.

Figure 5 Grouping of Member States by number of activated EFA types for 2015

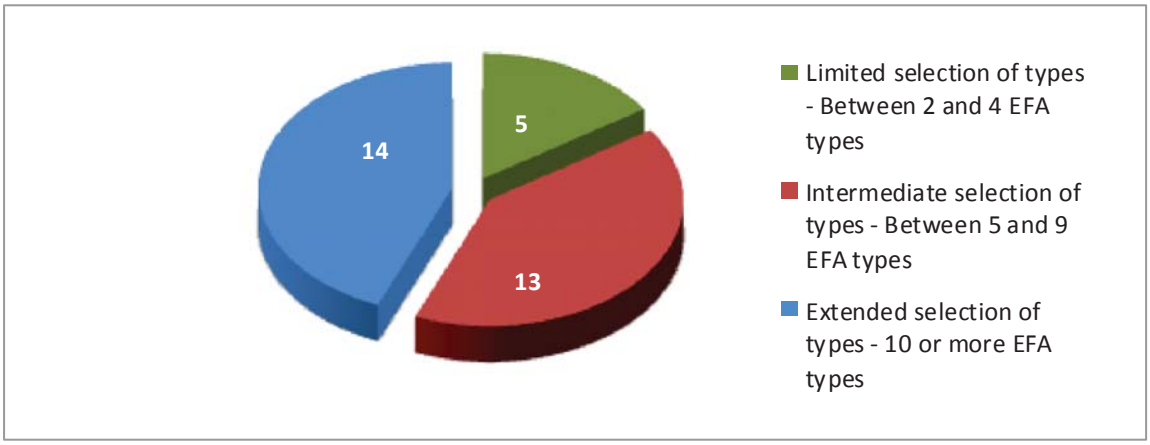


Table 9 Member States' choices on EFA landscape features qualifying types for 2015, sorted by number of EFA types selected by country

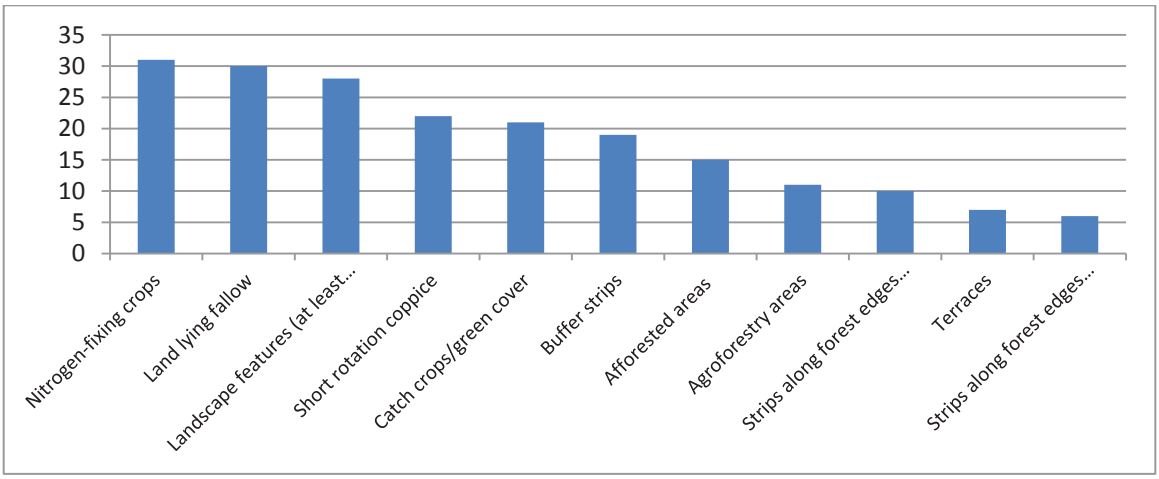
Countries	Hedges or wooded strips	Isolated trees	Trees in line	Trees in groups and field copses	Field margins	Ponds	Ditches	Traditional stone walls	Other landscape features	EFA per Member State/ region
IT	X	X	X	X	X	X	X	X	X	9
DE	X	X	X	X	X	-	X	X	X	8
FR	X	X	X	X	X	X	X	X	-	8
HU	X	X	X	X	X	X	X	-	X	8
BE-WA	X	X	X	X	X	X	X	-	-	7
BG	X	X	X	X	X	X	X	-	-	7
HR	X	X	X	X	-	X	X	X	-	7
PL	X	X	X	X	X	X	X	-	-	7
RO	X	X	X	X	X	X	X	-	-	7
CZ	-	X	X	X	X	-	X	-	X	6
LU	X	X	X	X	X	X	-	-	-	6
BE-FL	X	-	-	X	X	X	X	-	-	5
IE	X	-	X	X	-	-	X	-	-	4
SK	-	X	X	X	X	-	-	-	-	4
EE	X	-	X	X	-	-	X	X	-	5
MT	-	X	X	X	X	-	-	-	X	5
LV	-	-	-	X	X	X	-	-	X	4
AT	-	-	-	-	-	X	X	X	X	4
UK-NI	X	-	-	-	-	-	X	X	X	4
EL	-	-	X	X	-	-	X	-	-	3
DK	-	-	-	-	-	X	-	-	X	2
UK-WA	X	-	-	-	-	-	-	X	-	2
PT	-	-	-	-	-	-	-	-	X	1
SE	-	-	-	-	X	-	-	-	-	1
UK-EN	X	-	-	-	-	-	-	-	-	1
UK-SC	-	-	-	-	X	-	-	-	-	1
CY	-	-	-	-	-	-	-	-	-	0
NL	-	-	-	-	X	-	-	-	-	1
FI	-	-	-	-	-	-	-	-	X	1
ES	-	-	-	-	-	-	-	-	-	0
LT	-	-	-	-	-	-	-	-	-	0
SI	-	-	-	-	-	-	-	-	-	0
Member States incl. regions/EFA	16	13	16	18	17	13	16	8	11	

The three groups of Member States determined by number of selected types in Figure 5 can be characterised as follows (see also Table 11):

- countries or regions with an extensive list of EFA types have all selected land lying fallow, areas with short rotation coppice, areas with nitrogen-fixing crops, buffer strips (except the Czech Republic), areas with catch crops /green cover (except Italy) and at least four different types of landscape features (primarily, trees in group and trees in line);
- countries or regions with an intermediate list of EFA types have all chosen land lying fallow, areas with nitrogen-fixing crops (except Denmark) and less than five different types of landscape features;
- countries with a limited list of EFA types have all selected areas with nitrogen-fixing crops, land lying fallow (except the Netherlands) and one or no type of landscape feature.

As a result of Member States' decisions, areas with nitrogen-fixing crops, land lying fallow and landscape features are the most selected EFA types across EU. Hectares of agro-forestry, strips of eligible hectares along forest edges and terraces are the least chosen by Member States (see Figure 6).

Figure 6 Number of Member States selecting each EFA type for 2015



As with short rotation coppice, catch crops or green cover and nitrogen-fixing crops, it was for Member States to draw up a list of trees or crops with a view to optimising their agronomic and environmental contribution to biodiversity. Member States selected a great diversity of species (see Table 10).

Table 10 List of species most selected as short rotation coppice, nitrogen-fixing crops and catch crops/green cover

Countries	Most selected species
Short rotation coppice	Willow (*Salix* spp.) chosen by all Member States (22), poplar (*Poplus* spp.) by 19, alder (*Alnus* spp.) by 16, Birch (*Betula* spp.) by 12 and Ash (*Fraxinus* spp.) by 11
Nitrogen-fixing crops	Broad beans (*Vicia faba*) chosen by all Member States, peas (*Pisum*) and alfalfa (*Medicago*) by 26, clover (*Trifolium*) and lupin (*Lupinus*) by 24, vetch (*Vicia*) by 23 and beans (*Phaseolus*) by 18
Catch crops / green cover	*Brassicaeae* by 17 Member States, *Phacelia* sp. by 17, *Raphanus* sp. by 16, *Trifolium* sp. by 14, *Vicia* sp. by 14, *Avena* sp. by 12, *Lolium* sp. by11, *Lupinus* sp. by 9, *Medicago* sp. by 8, *Festuca* sp. by 7

Member States drew up their list of EFA types in the light of different considerations that are further explained in chapter 6.1.

5.1.2. Changes in Member State decisions between 2015 and 2017

Member States are allowed to review their initial choices on EFA implementation, in particular to take into account difficulties national administrations might face in implementing the EFA obligation (e.g. establishing the EFA layer in the LPIS). Between 2015 and 2017, nine Member States changed their decisions. The changes concern mainly the list of EFA types that farmers can use to meet the EFA obligation (see Tables 8 and 11 — countries/regions highlighted in yellow or green):

- six countries (Cyprus, Latvia, Lithuania, the Netherlands, Portugal and Slovakia) extended their list of EFA types so as to offer more possibility to farmers, seemingly having set up the necessary administrative system to check how they are applied;
- three countries/regions (Belgium (the Wallonia region), Bulgaria and Malta) withdrew some EFA types, noting the very low number of farmers using them.

Table 11 EFA types added or withdrawn by Member States between 2015 and 2017

Countries	EFA types added	EFA types withdrawn
Belgium-Wallonia		Hectares of agro-forestry
Bulgaria		Terraces, landscape features (isolated trees, ponds and ditches) and buffer strips
Cyprus	Landscape features (isolated trees and field margins)	Landscape features (field margins)
Latvia	Landscape features (isolated trees and trees in line)	Buffer strips
Lithuania	Landscape features (trees in group and field copses, field margins ponds and ditches), areas with short rotation coppice, areas with catch crops/green cover	
Malta		Landscape features (isolated trees, trees in line, trees in group and field copses, field margins and other landscape features protected under cross-compliance rules)
Netherlands	Landscape features (hedges or wooded strips, isolated trees, trees in line, trees in group and field copses and ponds)	
Portugal	Landscape feature (trees in group and field copses)	
Slovakia	Landscape feature (hedges or wooded strips)	

5.1.3. Member States' decisions on options aimed at acknowledging the contribution to biodiversity of cross-compliance rules, other practices equivalent to EFA and certain holdings surrounded by forest

5.1.3.1. Cross-compliance rules

In order to take account of farmers' past efforts for biodiversity and for the sake of clarity from their perspective, national authorities may consider as EFAs:

- terraces and landscape features protected under cross-compliance rules (GAEC 7, SMR 2 or SMR 3, as referred to in Annex II to Regulation (EU) No 1306/2013);

- buffer strips required under these rules (GAEC 1, SMR 1 or SMR 10, as referred to in Annex II to Regulation (EU) No 1306/2013).

In 2015, almost of all countries decided to qualify buffer strips or at least one landscape feature protected under cross-compliance rules as EFAs:

- only six countries/regions decided not to consider any feature required or protected under cross-compliance as EFAs;
- 10 Member States qualified the buffer strips and all landscape features protected under GAEC 7 as EFAs;
- 18 countries/regions opted to qualify the required buffer strips along watercourses as EFAs.

Table 12 Buffer strips and landscape features protected under GAEC 7 qualifying as EFA, by country in 2015

Countries	Buffer strips	Hedges	Ponds	Ditches	Trees in line	Group of trees	Isolated trees	Field margins	Terraces	Traditional stone walls	Other landscape features
BE-FL	✓E	✓	✓	-	✓	-	-	-	-	-	✓E
BE-WA	✓E	✓E	✓E	✓E	✓E	✓E	✓E	✓	-	-	✓
BG	✓E	-	-	-	-	-	-	✓E	✓E	-	
CZ	✓	-	✓	✓E	✓E	✓E	✓E	-	✓E	-	✓E
DK	✓E	-	✓E	-	-	-	-	-	-	-	✓E
DE	✓E	✓E	-	✓E	✓E	✓E	✓E	✓E	✓E	✓E	✓E
EE	✓	✓E	-	✓E	✓E	✓E	-	-	-	✓E	✓E
IE	✓E	✓E	-	✓E	✓E	-	-	-	-	-	✓E
EL	✓E	✓	✓	✓	✓E	-	-	-	✓	-	
ES	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓
FR	✓E	✓E	✓	-	-	✓E	-	-	-	-	
HR	✓E	✓E	✓E	✓E	✓E	✓E	✓E	-	-	✓E	
IT	✓E	✓E	✓	✓	✓E	-	✓E	-	✓E	✓E	
CY	✓E	✓	✓	✓	✓	✓	✓	-	✓	-	
LV	✓E	-	-	-	-	-	-	-	-	-	✓E
LT	✓	-	-	-	-	-	-	-	-	-	✓
LU	✓E	✓E	-	-	✓E	✓E	✓E	-	✓	-	✓
HU	✓E	-	✓E	-	-	✓E	✓E	-	✓E	-	✓
MT	✓	-	-	-	✓	✓	✓	✓	-	-	✓E
NL	✓	✓	-	-	-	-	-	-	-	-	
AT	✓	-	✓E	✓E	-	-	-	-	-	✓E	✓E

PL	✓E	-	✓E	✓E	-	-	✓E	-	-	-	
PT	✓	-	-	✓	-	✓	✓	-	✓	-	✓E
RO	✓E	-	-	-	-	-	✓	-	✓E	-	
SI	✓	-	✓	-	✓	✓	✓	-	✓	✓	
SK	✓E	-	-	-	✓E	✓E	✓E	✓E	✓E	-	
FI	✓	-	-	-	-	-	-	-	-	-	✓E
SE	✓	-	✓	✓	-	-	✓	-	-	✓	
UK-EN	✓E	✓E	-	-	✓	✓	✓	-	-	✓	✓
UK-NI	✓	✓E	-	✓E	-	-	-	-	-	✓E	✓E
UK-SC	✓E	✓	✓	-	✓	✓	✓	-	-	✓	✓
UK-WA	✓	✓	✓	✓	-	-	-	✓	-	✓	
Countries / EFA	**18**										

✓: buffer strips required under GAEC 1 or landscape features protected under GAEC 7
E: features qualifying as EFA

5.1.3.2. Practices equivalent to EFA

Member States can allow farmers to fulfil one or more of the standard greening requirements (crop diversification, permanent grassland maintenance and having an EFA on the agricultural area) via **equivalent practices**.

In 2015, two Member States (the Netherlands and Austria) notified the Commission of their wish to propose to their farmers a practice equivalent to the standard EFA requirement (see Table 14):

- The Netherlands proposed two certification schemes:
    - under the *Akkerbouw-strokenpakket, incl. Vogelakker*, farmers can replace the standard EFA requirement with mandatory field margins/strips which cover at least 30 % of EFA and which are managed in an environmentally friendly way. The remaining part of the EFA (70 %) can be fulfilled by ditches and landscape features and productive areas such as catch crops and nitrogen-fixing crops;
    - the *Skylark foundation* provides for equivalence under EFA-equivalent practice (3) '*Management of uncultivated buffer strips and field margins*';
- Austria decided to provide for equivalence under EFA-equivalent practice (1) via an AEC measure for *ecological set-aside*, under which at least 5 % of the beneficiary's arable land is dedicated to area beneficial for biodiversity e.g. with specific mixtures of seeds, a minimum period of flower cover and a ban on using fertiliser and plant protection products.

Since 2015, Italy has also applied for equivalence for EFA and the Netherlands has submitted an additional certification scheme:

- **Italy** notified in 2016 a scheme that comes under EFA-equivalent practice (3) '*Management of uncultivated buffer strips and field margins'*. The scheme is to be applied as part of the rural development programme of the Marche region. Under the AEC measure concerned, farmers are required to convert at least 10 % of their arable land into field margins;

- Under the *'Duurzaamheidscertificaat Vezelhennep*' certification scheme addressed to hemp producers, **the Netherlands** offered to replace the standard EFA requirement with the EFA-equivalent practice (7) '*production on arable land with no use of fertilisers*'.

Table 13 Summary of equivalent practices adopted by Member States in 2016

Member State	**Description**	**Equivalent practice (Annex IX to Regulation (EU) No 1307/2013)**
Italy	AEC measure	EFA — (3) Management of uncultivated buffer strips and field margins
Netherlands	Scheme 1: Akkerbouw-strokenpakket, incl. Vogelakker scheme	EFAs - (3) Management of uncultivated buffer strips and field margins - (4) Borders, in-field strips and patches - (5) Management of landscape features - (7) Production on arable land with no use of fertilisers
	Scheme 2: Skylark foundation scheme	EFAs - (3) Management of uncultivated buffer strips and field margins - (7) Production on arable land with no use of fertilisers
	Scheme 3: Biodiversity-plus certificate scheme (not implemented in 2015 and 2016)	Exhaustive set of practices equivalent to the three standard greening measures • crop diversification • permanent grassland • EFA
	Scheme 4: Vezelhennep (Hemp) scheme	- (7) Production on arable land with no use of fertilisers
Austria	AECM	Crop diversification — (1) Crop diversification (withdrawn in 2016)
		EFA — (1) Ecological set-aside

5.1.3.3. Forest exemption as regards EFA

To avoid land abandonment in certain predominantly forested areas, Member States with more than 50 % of their total land surface area covered by forest were able to exempt certain holdings in areas facing natural constraints (ANCs)[2] from meeting the EFA requirement. The exempted holdings are those located in an area designated as an ANC in which 50 % of the land surface is covered by forest and the ratio of forest land to agricultural land is higher than 3:1. Both ratios are to be assessed on an area equivalent to local administrative unit 2 or another clearly delineated unit which covers a single clear contiguous geographical area with similar agricultural conditions.

According to Eurostat data, when the decision was taken by the countries in question (1 August 2014), this option was available to five Member States (EE, LV, SI, FI and SE) that met the criterion of having more than 50 % of their total land surface area covered by forest. Of the five, EE, LV, FI and SE decided to apply the exemption.

5.1.4. Member States' decisions on options aimed at enhancing the effectiveness of the EFA obligation

To preserve the biodiversity benefits of certain EFA types or to increase their environmental contribution to biodiversity, Member States have been able to establish additional conditions or extend the definition of a few EFA types. Except for the use of weighting factors, few Member States have made use of these optional provisions:

- **Extending the definition** of certain EFA types (see Table 15):
    - to qualify ponds as EFAs, national authorities set a minimum size. They decided that a strip up to 10 m wide with riparian vegetation along the water would be included in the size of the pond and established criteria to ensure that ponds are of natural value, taking into account their conservation role for habitats and species;
    - national authorities could also consider the following as EFAs: terraces other than those protected under cross-compliance rules, buffer strips other than those required under cross-compliance rules and trees with a crown diameter of less than 4 m, if they are recognised as valuable landscape features;

Table 14 Number of Member States having extended the definition of certain EFA types

	Ponds			Other terraces	Other buffer strips	Valuable trees
	Minimum size	Inclusion of a strip of riparian vegetation	Criteria to ensure natural value of ponds			
Member State implementing the options/ Member State having activated EFA in question	**2/13**	**5/13**	**0/13**	**1/7**	**11/18**	**3/16**

[2] As designated in accordance with point (a) or (b) of Article 32(1) of Regulation (EU) No 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005, OJ L 347, 20.12.2013, p. 487.

- **Establishing additional conditions**, in particular for production methods for EFA catch crops/green cover or EFA nitrogen-fixing crops, and allowing grazing or cutting on buffer strips or strips along forest edges:
    - in order to maximise the benefits of having productive EFAs on arable land, Member States were able to establish additional conditions, in particular for production methods;
    - to preserve their biodiversity benefits (avoiding pesticides and limiting the use of fertilisers), buffer strips counted as EFAs cannot be used for production. However, given the relatively low impact of forage production on biodiversity, the national authorities were able to decide whether or not to allow grazing and cutting for forage.

Table 15 Number of Member States having established additional conditions or allowed cutting or grazing on certain EFA types

	Conditions on production methods		Allowing cutting or grazing	
	Catch crops / green cover	Nitrogen-fixing crops	Buffer strips	Strips along forest edges
Member State implementing the options/ Member State having activated EFA in question	**12/21** **Including input restrictions: 4/21**	**9/31** **Including input restrictions: 1/31**	**18/18**	**10/10**

- Benefiting from **regional or collective implementation** of the EFA requirement (see Table 17):
    - so as to obtain adjacent EFAs, which are more beneficial for the environment, Member States could decide to implement up to half of the 5 % of EFA required at regional level. To make this possible, countries have to designate the areas and obligations of participating farmers or groups of farmers in such a way to ensure that they support the implementation of EU policies on the environment, climate and biodiversity;
    - so as to obtain adjacent EFAs, which are more beneficial for the environment, Member States were able to allow farmers with holdings in close proximity to fulfil the EFA obligation collectively, provided that the EFAs are contiguous. In order to support implementation of EU policies on the environment, climate and biodiversity, national authorities were able to designate areas on which such collective implementation is possible and impose further obligations on the (groups of) farmers concerned.

Table 16 Number of Member States implementing the regional or collective approach for EFA

	Regional implementation of EFA	Collective implementation of EFA
Number of countries	**0**	**2 (NL and PL)**

- Using **conversion** and/or **weighting factors**: when Member States calculate the total hectares of EFA on a holding, they can use the conversion and/or weighting factors set out in the Basic Regulation. This simplifies administration, takes account of the characteristics of the types of EFA and makes it easier to measure them. The conversion factors are based on experience of measuring features and experience of their specific character. The weighting factors reflect the features' varying degrees of importance for biodiversity.

  The use of the conversion and weighting factors differs significantly between Member States:

  - 14 countries/regions (BE-Flanders, BE-Wallonia, CZ, DK, DE, EE, IT, LU, HU, MT, NL, AT, SK and UK-Scotland) decided not to use the conversion factors for measuring one or all of the features qualifying as EFAs;
  - four Member States (DK, EE, NL and AT) chose not to use the weighting factors.

5.2. Implementation of EFA and context data

5.2.1. Implementation data on greening in 2015 and 2016

In 2015[3], agricultural land covered by at least one greening obligation accounts for 75 % of the total EU agricultural area. The proportion of farmers under at least one greening obligation stands at around 35 % of direct payment beneficiaries.

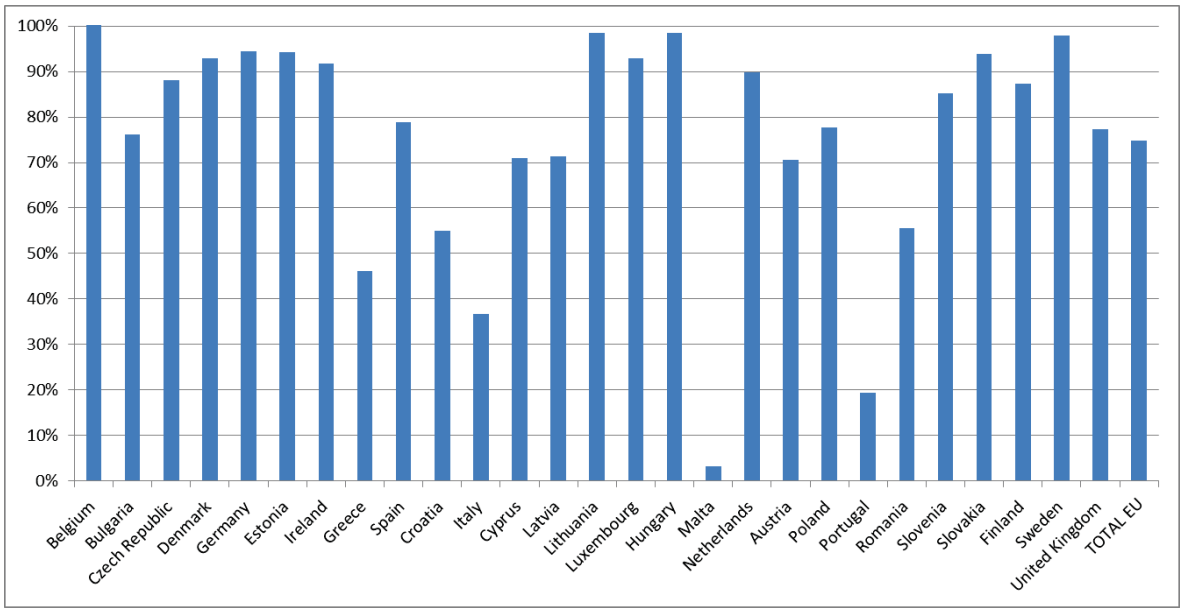
Areas not covered by any of the green direct payment obligations correspond to:

- agricultural areas not under the system of direct payments (which account for approximately 11 % of the EU's total agricultural area);
- areas exempted from the greening obligations, i.e. farmers benefiting from the small farmers scheme, organic farms or farms with less than 10 ha of arable land. These exemptions can overlap with the small farmers scheme, organic farms and farms with less than 10 ha of arable land, which means that the overall percentage cannot be ascertained); or
- areas under permanent crops, which account for 6 % of the total EU agricultural area. Such areas receive green direct payments even though no greening obligations are applicable to these types of crop. The data presented on the implementation of greening excludes areas of farms that have only permanent crops.

[3] This is an update to the data provided in SWD(2016)2016. This latest data takes account of the implementation data for the UK (Scotland), which was not included in that SWD and further adaptations from other Member States.

The situation is uneven across Member States, reflecting the relative importance of exempted farms at national level. Figure 7 shows that the highest percentages of hectares under at least one greening obligation are found in mostly northern countries and the lowest in southern countries, which in general have smaller farms.

Figure 7 Rate of hectares under at least one greening obligation compared with total agricultural area [4]



Source: Member States' implementation data 2015, Eurostat Farm Structure Survey 2013

In 2016, the proportion of farmers under at least one greening obligation compared to direct payment beneficiaries was 37 %, while the areas of total agricultural land were 77 % of the EU total. 2016 data indicate a slight increase on 2015.

[4] Data are missing for France; for other Member States, the data are taken from the most recent notifications available.

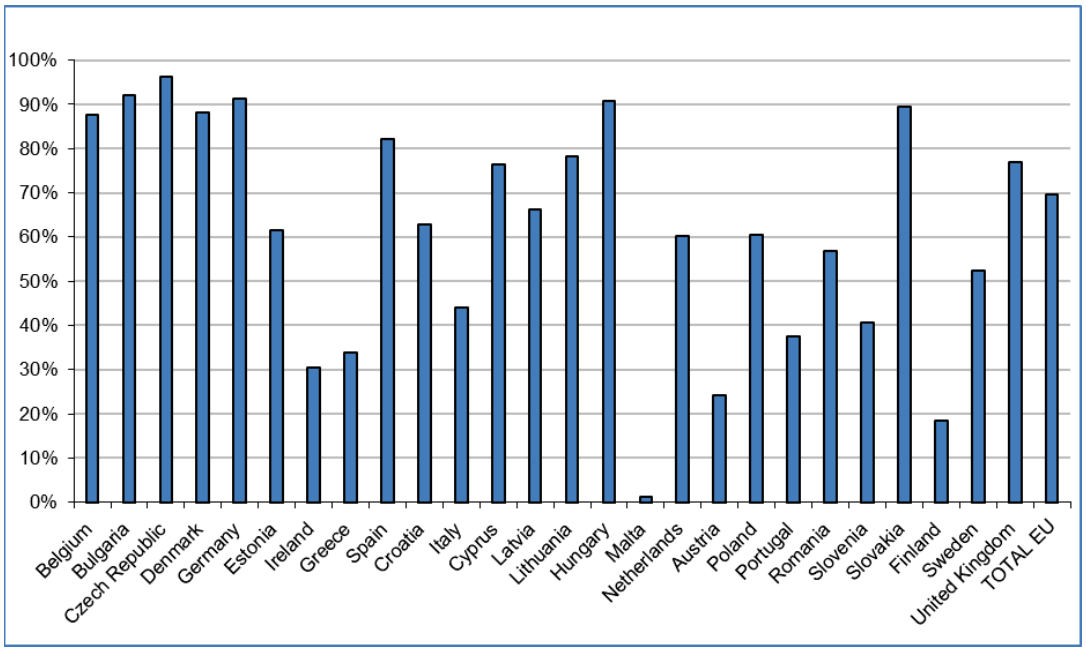
5.2.2. **Implementation data on EFA**

5.2.2.1. General EFA implementation in 2015

According to implementation data received for 2015, the proportion of total arable land (according to Eurostat data) that belongs to farms covered by the EFA **obligation is 70 % of the total arable land at EU level**, compared to the 75 % belonging to farms covered by at least one greening obligation. Figure 8 shows that:

- the proportion of arable land belonging to farms covered by the EFA obligation is around 90 % in Belgium, Bulgaria, the Czech Republic, Denmark, Germany, Hungary and Slovakia;
- a number of other Member States recorded values between 40 % and 80 %;
- the Member States that have a lower percentage of arable land on farms covered by the EFA obligation are those where:
    - more farms benefit from exemptions (e.g. Malta and Greece);
    - there is a high percentage of permanent grassland (e.g. Ireland and Austria);
    - the forest exemption is applied (e.g. Finland).

Figure 8 Total area of arable land that belongs to farms covered by EFA obligations in 2015 as a proportion of the total arable area, according to Eurostat FSS data for 2013, by Member State[5]



[5] 2015 data are missing for France; for other Member States, the data are taken from the most recent notifications available.

Figure 9 analyses the different types of exemption from the EFA that farms may qualify for. These are:

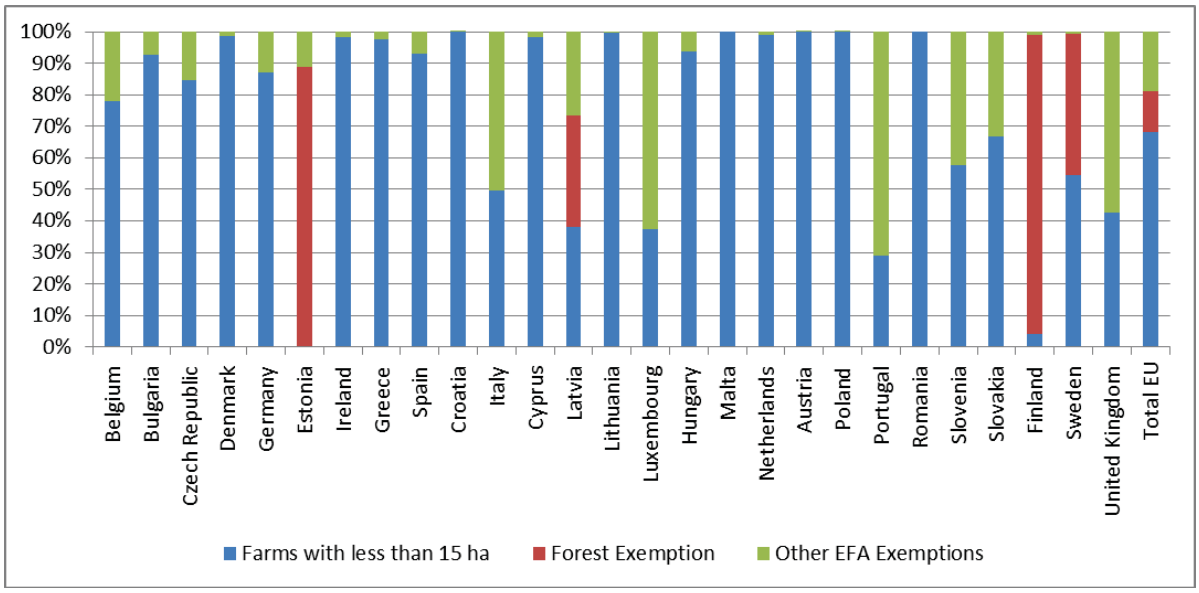
- exemptions for farms with less than 15 ha of arable land;
- exemptions allowed in Member States where above 50 % of the total land surface area is covered by forest (shown in the graph as 'Forest exemption');
- exemptions where more than 75 % of the agricultural area is occupied by grassland or leguminous crops (shown in the graph as 'Other EFA exemptions').

The most common type of **exemption** in most Member States is for **farms of under 15 ha**. This type of exemption accounts for almost 70 % of the total area of land exempted across all Member States, and for close to 100 % in Denmark, Ireland, Greece, Croatia, Cyprus, Lithuania, Malta, the Netherlands, Austria and Romania.

In Estonia and Finland, the **forest exemption** accounts for almost 100 % of the exempted arable land in the country, while in Latvia and Sweden it accounts for 36 % and 45 % respectively of the total exempted land.

The **other types of exemption** are more common in Portugal, Luxembourg, Italy and Slovenia.

Figure 9 Area of arable land on farms exempted from the EFA obligation, by type of exemption [6]



[6] 2015 data are missing for France; for other Member States, the data are taken from the most recent notifications available.

Figure 10 shows the proportion of **arable land on which the EFA obligation** is being implemented. This is calculated before and after applying the **weighting factors** set out in Annex 2 to Regulation (EU) No 639/2014. The weighting factors are applied to the physical area actually occupied by EFAs (corresponding to the calculation before the weighting factor is applied), and reflect the ecological value of the different EFA types and the duration of their effects.

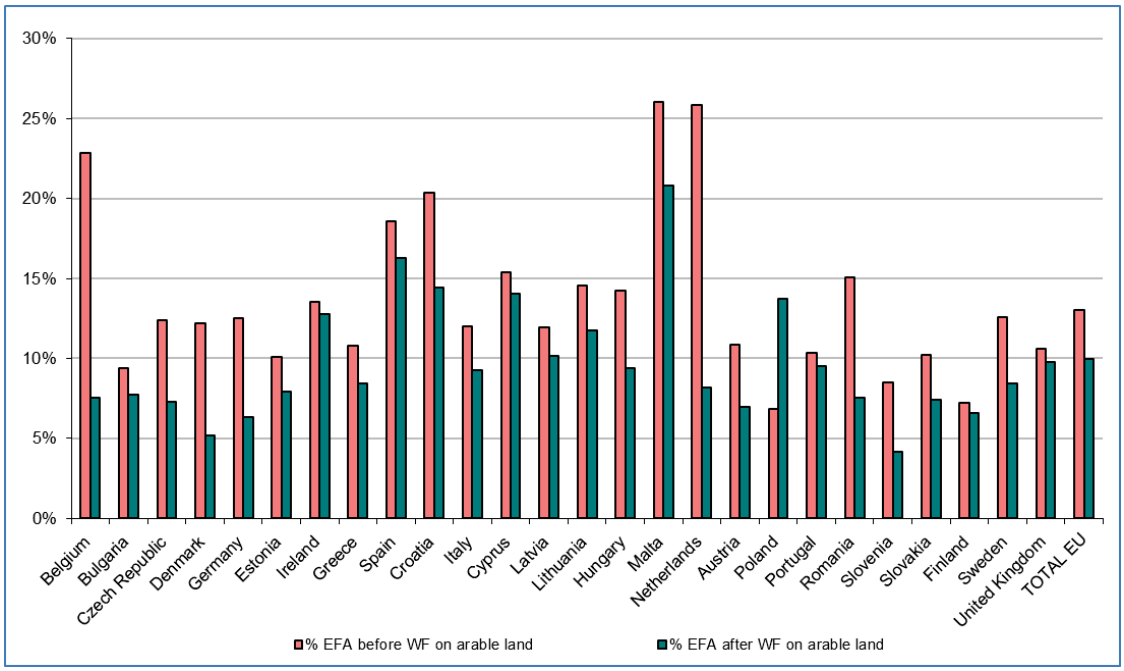
The 5 % minimum EFA area/arable land area that farmers are required to achieve is calculated **after** the application of weighting factors: **the actual ratio for the EU as a whole is 10 %,** almost double the percentage that farmers are legally required to observe under the EFA requirement (percentages may differ at farm level).

The proportion of arable land on which the EFA is applied is particularly high in Malta (21 %), Spain (16 %), Croatia and Cyprus (14 %), Lithuania and Ireland (12 %), Latvia and the UK (10 %). The Member States where the EFA area is only just above the regulatory 5 % are Denmark, Germany, Austria, Slovenia and Finland.

The ratio of the **EFA area to total arable land, as calculated before weighting factors are applied, is 13 % in the EU as a whole.** The ratio is particularly high in the Netherlands and Malta (26 %), Belgium (23 %) and Croatia (20 %).

Compared to the analysis in the staff working document for the review after one year, the percentages of EFA areas on arable land were 9 % and 14 %, therefore only slightly changed after the last updates.

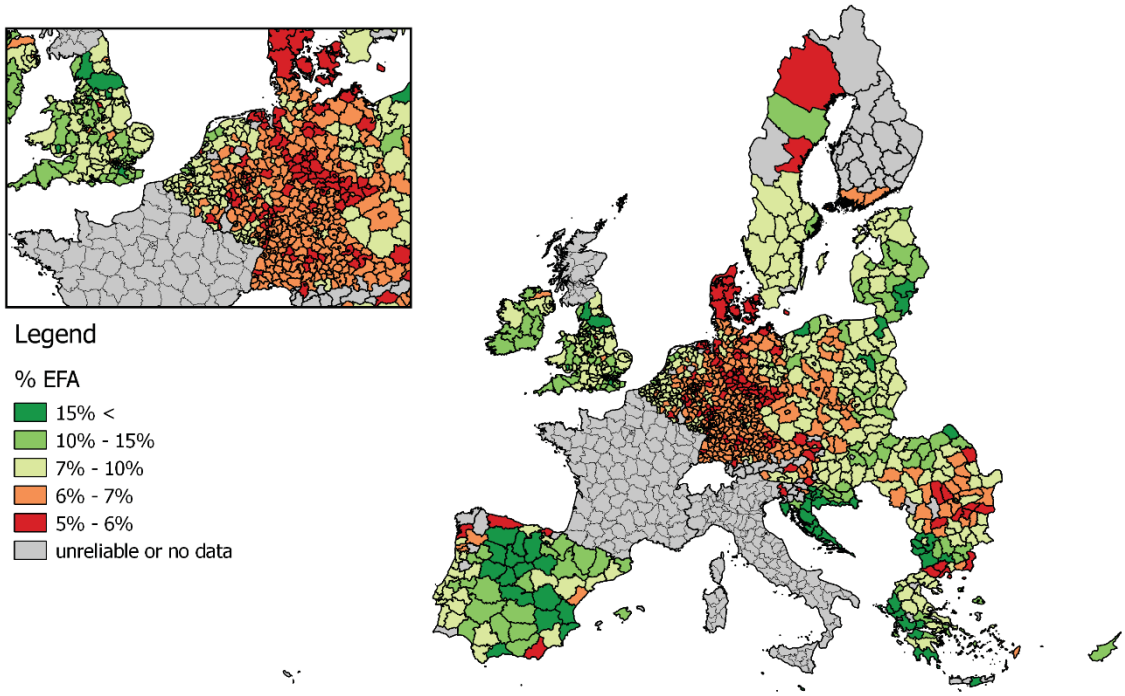
Figure 10 Percentage of arable land under EFA before and after applying weighting factors [7]



[7] 2015 data are missing for France and Luxembourg; for other Member States, the data are taken from the most recent notifications available.

The map in Figure 11 shows the classification of NUTS 3 regions based on the percentage of EFA area compared to the total arable land. Regions with highest share of EFA areas are located in Croatia, Spain, Ireland and the United Kingdom. Central Europe is the area where the shares of EFA are the lowest. The regional representation provides a more precise pattern, showing differences within Member States, especially in Romania, Spain and Sweden, where both high and low intensities of EFA shares were recorded.

Figure 11 Implemented EFA share of arable land in the NUTS 3 regions[8]



5.2.2.2. EFA types distribution in 2015

Figure 12 compares the relative size of the different types of EFA areas (at EU level) before and after applying the weighting factors.

The sum of the three main types of EFA is 94 % before weighting factors are applied (equivalent to physical areas on the ground), slightly decreasing to 93 % after applying the weighting factors.

- The largest reduction caused by applying the weighting factors is for catch crops, where a 0.3 factor is applied. The proportion of the EFA area in this category falls from 33 % before applying the weighting factors to 15 % after, while the percentage of the EFA area used for nitrogen-fixing crops (with a weighting factor of 0.7) slightly increases from 37.4 % before applying the weighting factor to 39.1 % after.
- The proportion of land lying fallow (for which the weighting factor is 1) increases from 26 % before to 38.5 % after.

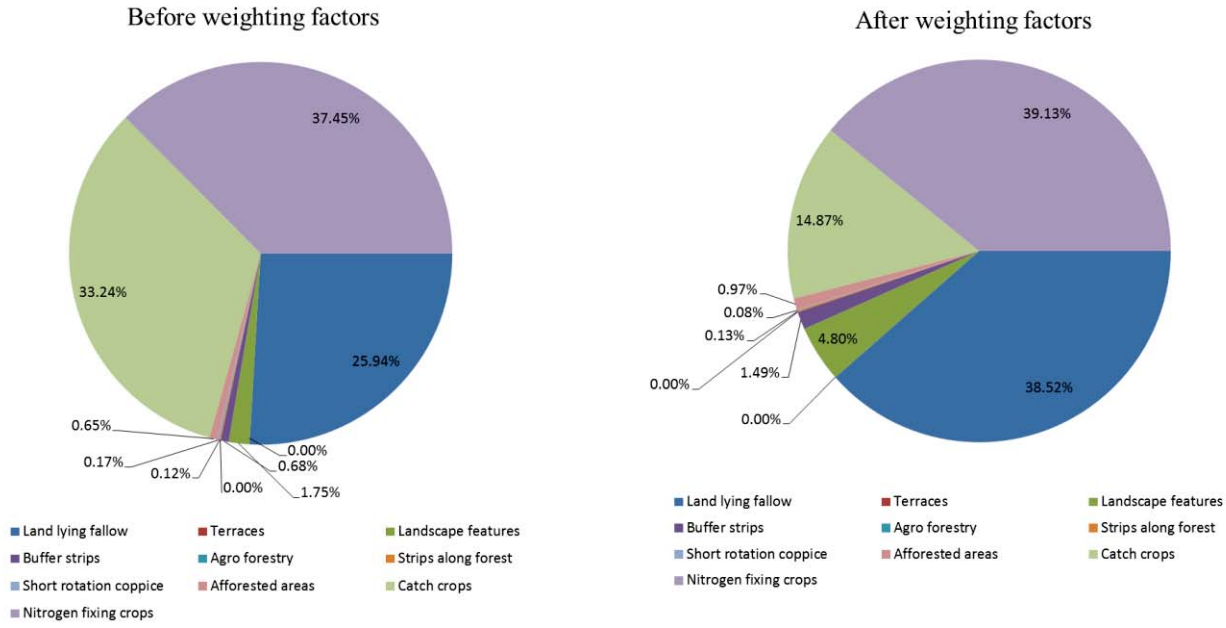
[8] 2015 data not available or not reliable for France, Italy and Scotland; for other Member States, the data are taken from the most recent notifications available. Regions not classified in Finland are covered by the 'forest exemption'.

- The proportion of EFA for landscape features increases from 1.7 % before to 4.8 % after. The percentage of the EFA area for buffer strips increases from 0.7 % before to 1.5 % after.

EFAs linked to a productive activity (i.e. nitrogen-fixing crops and catch crops) account for 70.6 % of the total EFA area before application of weighting factors and reach 54 % on the weighted areas (39 % and 15 % respectively). This was 5.4 % of the arable land under the obligation and seems to have contributed to overshooting the required 5 % at farm level.

The data on areas before weighting factors are different from the results of the same analysis undertaken for the greening review after one year: fixing certain mistakes in the EFA areas in Italy caused a significant decrease in the quantity of nitrogen-fixing crops and landscape features.

Figure 12 Breakdown of EFA areas by main EFA type, at EU level, before and after the application of weighting factors [9]



The **total absolute area of EFA is 8 million ha across the EU, based on the physical area and before applying weighting factors**. The composition between the four main Member States described below follows the distribution of the arable land between these countries, which accounts for 49 % of the EU total arable land (excluding France). However the EFA areas are more concentrated in these four countries, reaching around 4.7 million ha, 58 % of the total EFA area in Europe. The other Member States account for less than 6 % each at EU level.

- Spain is the country with the largest EFA area (1.7 million ha, 22 % of the total; arable land in Spain account for 13 % of the EU total). The largest single type of EFA in Spain is land lying fallow, which accounts for almost 1 million ha (12 % of the total EFA area across the EU), followed by nitrogen-fixing crops, which account for 0.7 million ha (9 % of the total).

[9] 2015 data are missing for France and Luxembourg; for other Member States, the data are taken from the most recent notifications available. Data for Italy are estimated.

- Germany has the second largest EFA area in absolute terms, at 1.3 million ha (17 % of the total EFA area in the EU), with catch crops and land lying fallow being the two most significant types of EFA.
- Poland accounts for 11 % of the total EFA area (0.9 million ha) with mostly catch crops and nitrogen-fixing crops.
- Romania is the fourth placed Member State with 0.7 million ha, equally divided between catch crops and nitrogen-fixing crops.

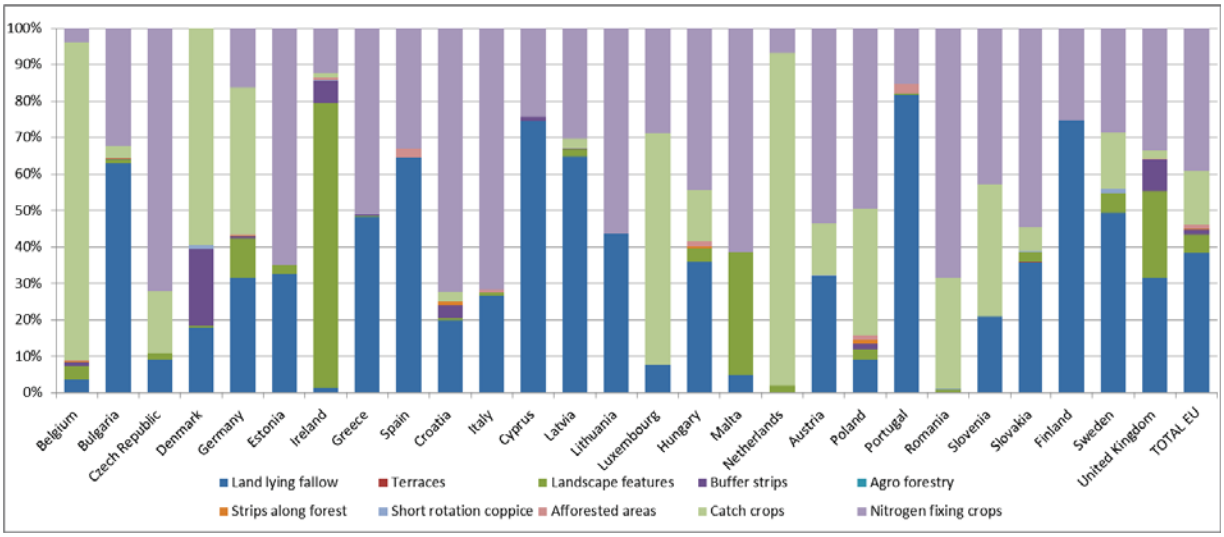
Table 17 EFA areas by main EFA type at Member State level, before the application of weighting factors (thousands ha) [10]

MS	Land lying fallow	Terraces	Land features	Buffer strips	Agro-forestry	Strips along forest	Short rot. coppice	Aff. areas	Catch crops	Nitrogen-fixing crops	**TOTAL EU**
BE	1.95	-	1.04	0.30	0.01	0.49	0.07	0.02	153.34	2.92	**160.15**
BG	147.04	0.02	1.36	0.20	-	0.18	0.08	-	26.48	107.64	**283.00**
CZ	16.13	0.00	1.84	-	-	-	0.08	0.18	99.19	179.65	**297.06**
DK	19.54	-	0.66	15.44	-	-	3.89	-	217.81	-	**257.35**
DE	217.78	0.00	41.83	2.80	-	0.61	1.89	1.55	927.24	159.79	**1 353.48**
EE	9.98	-	0.77	-	-	-	-	-	-	28.31	**39.05**
IE	0.56	-	15.73	1.68	-	-	0.18	0.32	1.50	7.14	**27.11**
GR	47.84	-	0.15	0.19	-	-	-	-	-	55.72	**103.90**
ES	975.49	-	-	-	-	-	-	37.47	-	711.24	**1 724.21**
HR	19.69	-	0.68	3.41	-	0.23	0.03	-	8.97	102.69	**135.69**
IT	75.64	-	1.05	-	-	-	0.59	2.16	-	289.75	**369.19**
CY	6.37	-	-	0.07	-	-	-	-	-	2.97	**9.42**
LV	52.42	-	0.30	0.01	-	-	-	-	7.44	34.99	**95.17**
LT	90.91	-	-	-	-	-	-	-	-	168.11	**259.01**
LU	0.22	-	-	-	-	-	-	-	6.19	1.21	**7.62**
HU	119.73	-	7.15	0.01	-	1.83	0.57	4.80	154.81	211.49	**500.41**
MT	0.00	-	0.01	-	-	-	-	-	-	0.02	**0.02**
NL	-	-	1.04	-	-	-	0.02	-	155.91	4.94	**161.90**
AT	7.32	-	0.01	-	-	-	0.26	-	10.72	17.55	**35.86**
PL	40.97	-	6.67	4.89	-	6.64	1.91	5.11	513.39	312.71	**892.29**
PT	43.67	-	0.26	-	-	-	-	1.46	-	11.60	**57.00**
RO	-	0.11	1.88	0.26	-	-	0.24	0.28	356.99	341.96	**701.71**
SI	0.61	-	-	-	-	-	-	-	3.54	1.79	**5.94**
SK	32.36	0.02	1.43	0.06	-	-	0.29	-	20.05	70.38	**124.60**
FI	19.98	-	-	-	-	-	0.00	-	-	9.70	**29.69**
SW	56.13	-	4.17	-	-	-	4.23	-	58.82	46.59	**169.94**
UK	149.25	-	56.75	26.97	0.01	-	0.13	0.81	35.06	226.14	**495.12**
TOT **EU**	**2 151.58**	**0.15**	**144.78**	**56.30**	**0.02**	**9.98**	**14.46**	**54.17**	**2 757.45**	**3 106.98**	**8 016.02**

[10] 2015 data are missing for France; for other Member States, the data are taken from the most recent notifications available. Data for Italy are estimated.

In addition, Figure 13 shows the proportion of the EFA area occupied by each of the main types of EFA after the application of the weighting factors. The three main types of EFA are available to farmers in almost all Member States (land lying fallow in 26 Member States, nitrogen-fixing crops in 27, and catch crops in 20), but the relative proportions of land allocated to each vary considerably between Member States.

Figure 13 Breakdown of the main types of EFA area, after applying the weighting factors [11]



When analysing NUTS 3 regions data, even more complex patterns appeared.

[11] 2015 data are missing for France and Luxembourg; for other Member States, the data are taken from the most recent notifications available. Data for Italy are estimated.

To obtain a more detailed view on how EFAs were implemented from place to place, the JRC analysed the figures for NUTS 3 regions as a preliminary analysis to support the EFA calculator estimations[12].

Table 18 show the results of the classification at EU and by NUTS 3 region-level based on the nine categories of EFA composition, as set out in Chapter 4.5.

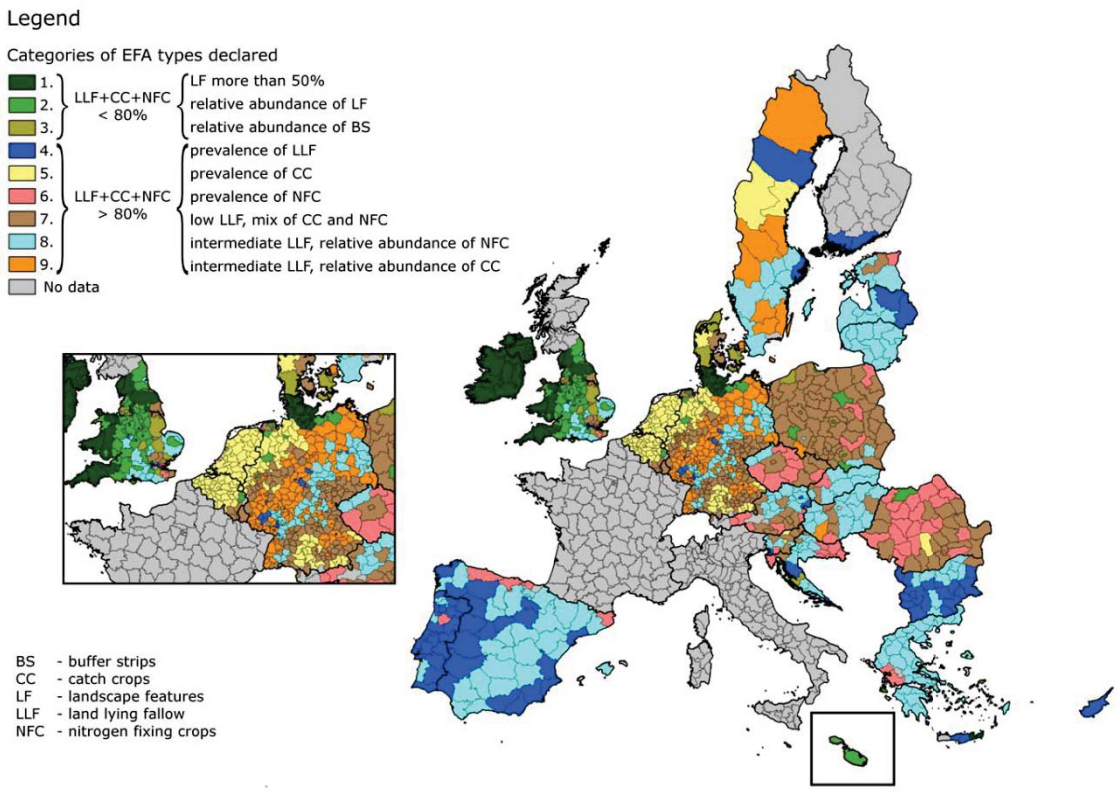
Table 8 Classification of NUTS 3 regions by proportion of EFA types declared (LLF - land laying fallow, CC - catch crops, NFC - nitrogen-fixing crops, LF - landscape features, BS - buffer strips)

Category	*First sub-division*	*Second sub-division*	*Occurrence in all NUTS 3 regions*	*EFA area after weighting factors applied [thousand ha]*
1	LLF+CC+NFC < 80 %	LF ≥ 50 %	52	166.02
2	LLF+CC+NFC < 80 %	LF < 50 % BS < LF	72	186.06
3	LLF+CC+NFC < 80 %	LF < 50 % LF < BS	19	162.98
4	LLF+CC+NFC ≥ 80 %	LLF ≥ 70 %	98	759.87
5	LLF+CC+NFC ≥ 80 %	CC ≥ 70 %	144	233.74
6	LLF+CC+NFC ≥ 80 %	NFC ≥ 70 %	73	403.37
7	LLF+CC+NFC ≥ 80 %	LLF < 30 % mix of CC and NFC	231	1 055.07
8	LLF+CC+NFC ≥ 80 %	30 % < LLF < 70 % NFC > CC	222	2 075.83
9	LLF+CC+NFC ≥ 80 %	30 % < LLF < 70 % NFC < CC	142	278.54
TOTAL NUTS 3 REGIONS (excluding those for which data not available)			**1 053**	**5 321.48**

[12] See chapter 4.5 for explanation of the classification methodology.

Figure 14 shows the spatial distribution of the nine categories attributed for each NUTS 3 region. The spatial distribution of the categories of NUTS 3 regions gives a clear indication of how the different categories are distributed in the Member States. In some Member States one category is sufficient to describe the composition of EFA declared in the country (e.g. Poland, the Netherlands, Lithuania and Ireland).

Figure 14 Spatial distribution of the categories attributed to each NUTS 3 region[13]



The results of the distribution at Member State level and the classification for NUTS 3 regions provide a clearer picture of the geographical patterns.

A large share of the most valuable EFA for biodiversity (landscape features and buffer strips) was found in Ireland, the UK and Malta only. Land lying fallow is more present in Mediterranean countries like Spain, Portugal and Cyprus but also in Member States located in boreal environments like Finland and Latvia. Nitrogen-fixing crops are prevalent in Croatia, the Czech Republic, Italy, Poland and Romania, while catch crops are more significant in Belgium, Denmark, Germany, Luxembourg and Netherlands.

[13] 2015 data are missing for France, Italy and Scotland; for other Member States, the data are taken from the most recent notifications available.

The NUTS 3 regions were also classified according to seven classes based on the average percentage of EFA areas out of the region's total arable land (e.g. from 5 to 6 %, from 6 to 7 % etc.). This was done to assess the change in EFA-type composition depending on the increasing amount of EFA in each NUTS 3 region.

Farmers seem to use EFA types differently depending on percentage of EFA reached.

For the NUTS 3 where the EFA declared was between 5 and 6 % (lower share of EFA implemented), the most widely used EFA type is catch crops. However, in NUTS 3 regions with a percentage of EFA higher than 8 %, the percentage of catch crops starts to decrease. In the NUTS 3 regions with a higher percentage of EFA (from 10 to 15 %), the percentage of landscape features on the total of the EFA declared increases (as does the percentage of nitrogen-fixing crops), while the percentage of catch crops decreases. The contribution of land laying fallow on EFA appears stable (around 30 %) in the categories between 5 % and 8 %, but increases when the percentage of EFA is above 9 %, reaching 60 % in the highest category.

Figure 15 Composition as a percentage of the most common EFA types in NUTS 3 regions in relation to the EFA percentage declared, expressed as relative values

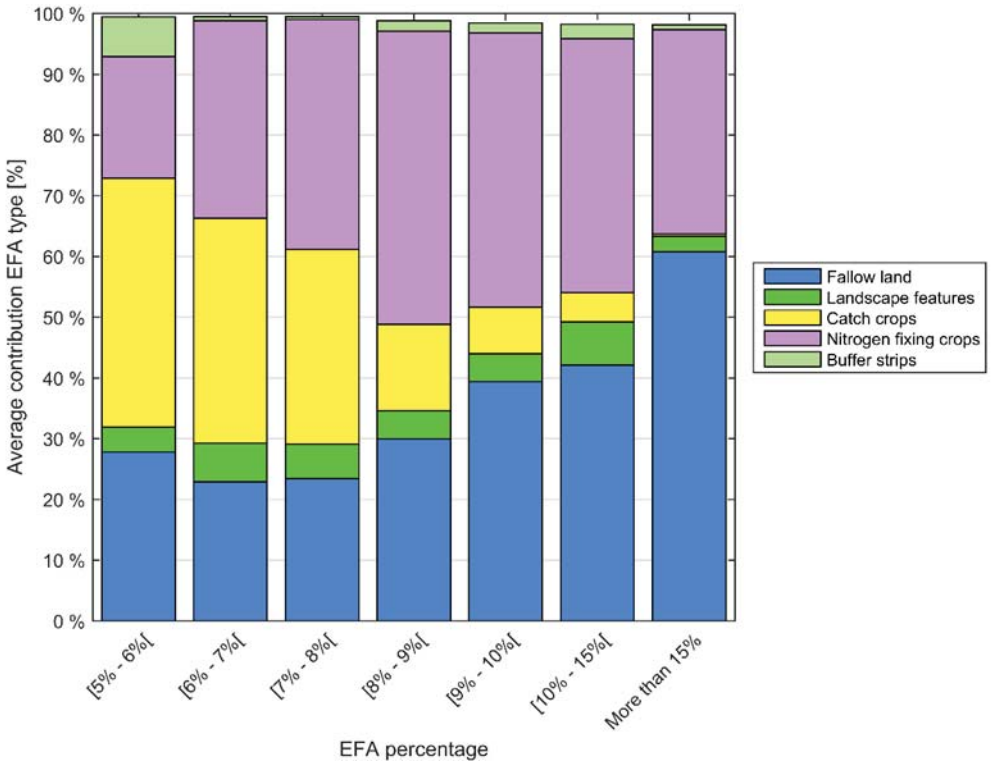


Figure 16 shows the areas of the most common EFA types in relation to the EFA percentage declared. Since they are calculated before the application of the weighting factor, they display the different EFA types' real presence on the ground.

These data suggest that catch crops are mainly used to reach the requested 5 % threshold, whereas landscape features are not systematically declared even if they are present. This behaviour should be better analysed at farm level through case studies. This distribution could also depend on the combinations that may exist between the EFA percentage and the list of EFA types available to farmers (since farmers' uptake can be limited by the Member State's choice of what is included on the EFA list).

Figure 16 Composition as a percentage of the most common EFA types in NUTS 3 regions in relation to the EFA percentage declared, based on absolute values of EFA areas before weighting factors

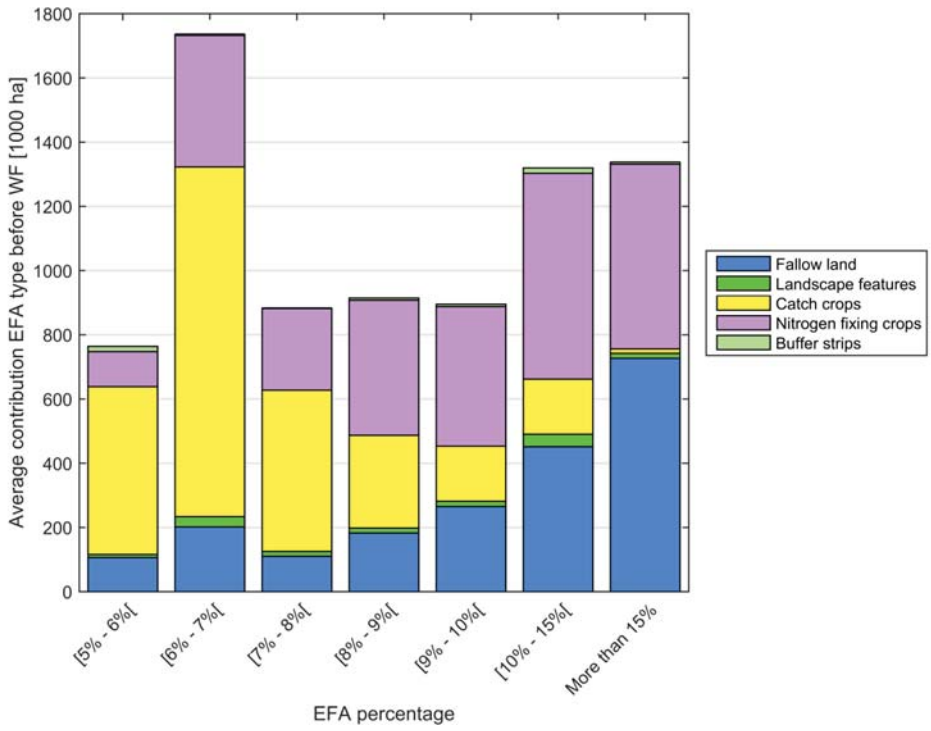
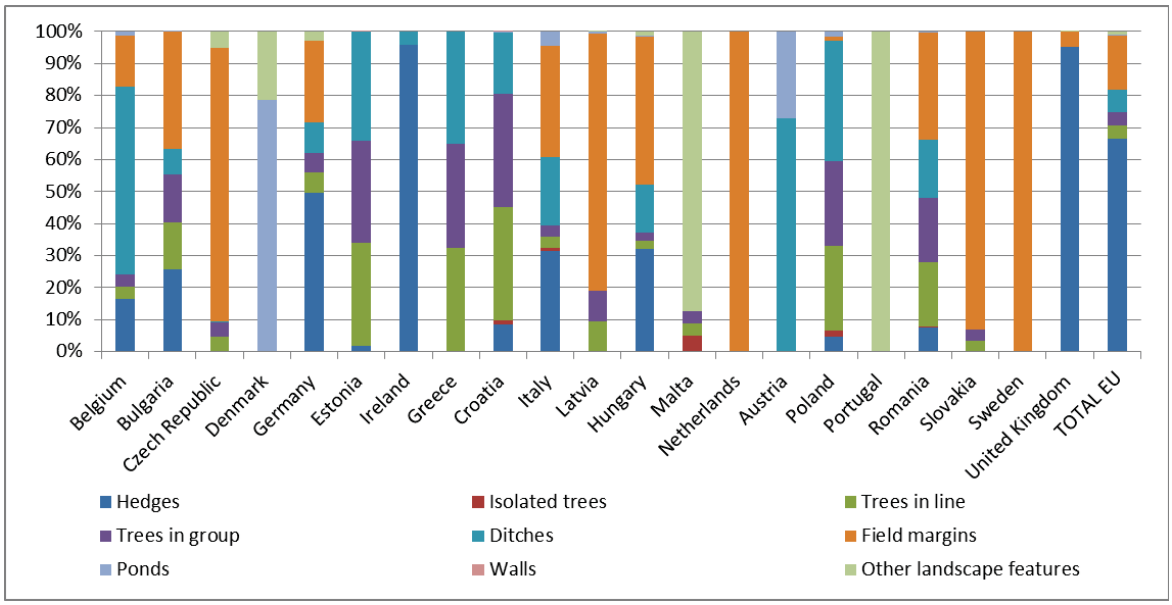


Figure 17 gives a breakdown by Member State of the different types of landscape features. The features account for around 145 000 ha of physical area at EU level and are available to farmers in 15 Member States as a type of EFA.

The types of landscape feature most often chosen by farmers are hedges and wooded strips, which account for 67 % of the EU area for landscape features in the Member States involved.

- The relative areas accounted for by **hedges** and **wooded strips** are highest in the UK, Germany and Ireland. Hedges in the UK, Germany and Ireland accounted for 40 %, 14 % and 11 % respectively of the total EU area of landscape features.
- **Field margins** represented 15 % of the total EU EFA area for landscape features (and are available for farmers in 17 Member States). They are the main type of EFA landscape feature in five Member States (the Czech Republic, Latvia, the Netherlands, Slovakia and Sweden).

Figure 17 Breakdown of EFA landscape features areas, after applying the weighting factors [14]



5.2.2.3. Collective implementation of EFA

In accordance with Article 46(5) and (6) of Regulation (EU) No 1307/2013, Member States can decide to apply the **EFA obligation at regional or collective level** in order to concentrate the EFA areas within a limited territory.

In 2014 and the following years, only two Member States (the Netherlands and Poland) decided to implement the obligation at collective level and none chose to use regional implementation.

The data for farms that implemented the collective approach in the two Member States allowing this are shown in Table 19.

- There were a total of 35 holdings involved in collective implementation, covering between them 3 005 ha of arable land and 307 ha of EFA (after applying the weighting factors). These areas were mostly concentrated in Poland (78 % of the arable land and 82 % of the EFA).

[14] The data are only for Member States where landscape features are recognised as a type of EFA.

- The farms using collective implementation represented less than 1 % of the total number of farms under the EFA obligation in the two Member States (excluding exempted farms).

Table 19 Member States implementing collective EFA

Member State	No of farmers	Arable land area (ha)	EFA area before applying weighting factors (ha)	EFA area after applying weighting factors (ha)
Netherlands	12	656	169	55
Poland	23	2 349	146	252
Total EU	**35**	**3 005**	**315**	**307**

5.2.2.4. EFA implementation in 2016

By the time this document was drafted, 18 Member States (Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Spain, Croatia, Latvia, Lithuania, Luxembourg, Hungary, Malta, Austria, Poland, Portugal, Romania, Slovakia, Finland) and 2 UK regions (Wales and Northern Ireland) had sent data for 2016 through the Information System for Agricultural Market Management and Monitoring (ISAMM) form. The agricultural areas of the Member States from which **data have been received** account for **39 % of the total agricultural land** in the EU.

In order to have a consistent comparison with the greening implementation in 2015 and with context data, the UK has not been considered in the following analysis as 2016 implementation data are still incomplete. Some Member States have not yet provided data, specifically those with substantial EFA absolute areas (e.g. Germany and Italy) and specific EFA types (e.g. the UK (England) and Ireland, where landscape features areas account for a significant area). Therefore some of the trends described in this chapter may change significantly when those figures are received.

The proportion of total arable land (according to Eurostat data) that belongs to farms under the EFA obligation is **69 % of the total arable land** at EU level, compared to 70 % calculated for 2015.

At EU level, the **percentages of EFA areas compared to the arable land** remained **stable at 10 % considering the areas after weighting factors** and slightly **increased to 15 % for areas before weighting factors**. In absolute values, the EFA areas declared slightly increased by about 130 000 ha, which was 2 % of the total areas for those Member States that have made their data available.

The proportion of EFA types at EU level **did not change much in the 2016 data,** where the three main EFA are still the same. Considering the variations between the two years, a general **decrease of land lying fallow** (-10 %) was **compensated by an increase of catch crops** (+10 % and nitrogen-fixing crops (+5 %). Elements like **landscape features and buffer strips** decreased in some Member States. These changes are, however, quite specific for each Member State, so this picture will probably change when data are received from the other countries.

Considering the **composition of EFA types at Member State level**, there is a **stable situation** compared to 2015 in around half of the countries, while in the other Member States there has been some change. Also, the absolute **changes in the three main types** (maximum

92 000 ha increase in nitrogen-fixing crops in Lithuania) are much higher compared to other EFAs.

In Bulgaria, Lithuania and Hungary, the decrease in land lying fallow was compensated by increases in catch crops and nitrogen-fixing crops. In Hungary, Croatia and Poland, decreases in landscape features were noted, sometimes accounting for around half of the areas declared in 2015, but amounting to a maximum 3 000 ha. In the case of Luxembourg, EFA areas were incomplete in 2015, while in 2016 around 800 ha (9 % of the country's total EFA) were declared as strips along forest edges. In Denmark, 6 % of buffer strips were recorded in 2015. The following year, the percentage of this EFA drastically decreased (-12 000 ha), whereas catch crops, land lying fallow and landscape features increased. In Romania, the total EFA area increased by 50 000 ha (6 % of the total area), with this increase covered exclusively by nitrogen-fixing crops. In Portugal the overall reduction of EFA areas was about 15 000 ha, almost exclusively due to a reduction in land lying fallow.

Data for collective implementation are available only for Poland: in 2015 23 farms accounting for around 252 ha of EFA area (after weighting factors) declared collective EFAs in 2015. In 2016, just 14 farms declared collective EFAs, accounting for 30 ha of EFA areas.

5.2.2.5. Use of equivalent practices in 2015 and 2016

Out of the five Member States which applied equivalence in 2015, only the Netherlands and Austria selected equivalent practices to EFA.

In the Netherlands and Austria, equivalent practices were implemented by 11 % of farmers under at least one greening obligation. These accounted for 30 % of the total arable land.

- In the Netherlands, 320 farmers implemented equivalent practices in place of the EFA, covering 28 400 ha of arable land and 2 691 ha of EFA area (which represent 5 % of the total EFA area in the country). The EFA areas are mainly made up of field margins, meaning that the proportion of this category is 72 % of the total area of landscape features.
- In Austria, in 2015 almost 12 000 farmers applied for the equivalent agri-environment-climate measures, which is a significant proportion of the total number of beneficiaries under greening. They represented 19 % of the total by number of farms, 53 % of the arable land and 65 % of the total EFA area. In 2016, the percentage of equivalent areas slightly increased to more than 12 000 farmers (17 % of the total farmers) and more than 41 000 ha of EFA (67 % of total EFA areas).

2016 data for Italy and Netherlands are not yet available.

Table 20 The number of farmers, area of arable land and EFA area where equivalent practices were used in 2015, in absolute terms and as a percentage of all farms under at least one greening obligation

Member State	No of farmers	Arable land area (ha)	EFA area after applying weighting factors (ha)	% of farmers	% of arable land	% EFA after applying weighting factors
Netherlands	320	28 400	2 691	1%	3%	5%
Austria	11 831	597 410	38 665	19%	53%	65%
Total EU	12 151	625 810	41 356	11%	30%	37%

Table 21 The number of farmers, area of arable land and EFA area where equivalent practices were used in 2016, in absolute terms and as a percentage of all farms under at least one greening obligation

Member State	No of farmers	Arable land area (ha)	EFA area after applying weighting factors (ha)	% of farmers	% of arable land	% EFA after applying weighting factors
Italy	N/A	N/A	N/A	N/A	N/A	N/A
Netherlands	N/A	N/A	N/A	N/A	N/A	N/A
Austria	12 290	620 998	41 641	17 %	56 %	67 %
Total EU	12 290	620 998	41 641	17 %	56 %	67 %

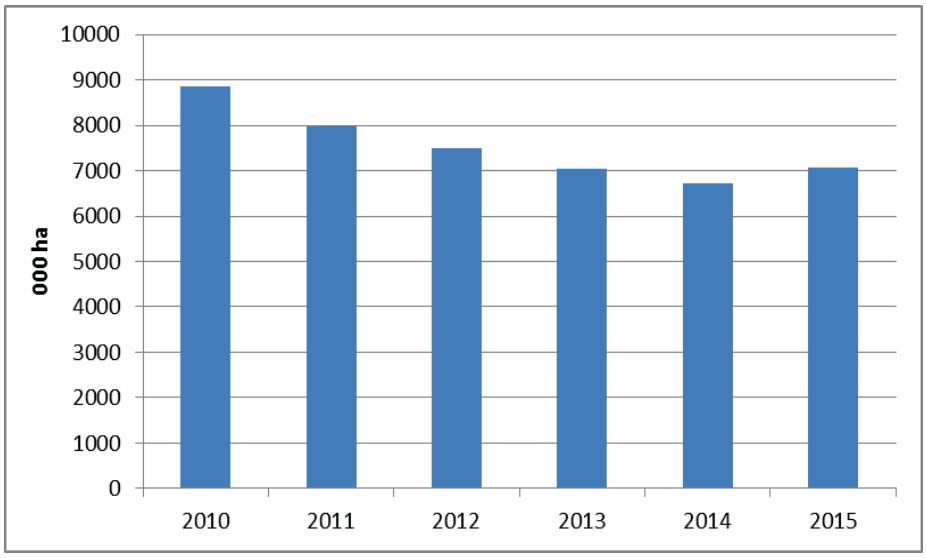
5.2.3. **Context data on land lying fallow**

Eurostat annual statistics from 2010 to 2015 were used to analyse the trend in statistical data for crops relevant to the EFA obligation.

The trend of land lying fallow continuously decreased from 2010 to 2014, recording a reduction of 24% during this period. In 2015, the first year of implementation of greening, this decreasing trend was reversed and a slight increase of around 300 000 ha was recorded, bringing it back to the same level as in 2013.

Compared to the implementation data in 2015, the area under the land lying fallow EFA amounted to 2.2 million ha (excluding France where data are not yet available), accounting for 34 % of the EU land lying fallow area.

Figure 18 Area of land lying fallow (thousand ha)



Source: Eurostat annual crops statistics, main area

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COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the implementation of the ecological focus area obligation under the direct payment scheme

{COM(2017) 152 final}

CONTENTS

LIST OF ACRONYMS

AEC	Agri-environment-climate
CAP	Common agricultural policy
SWD	Commission staff working document
EFA	Ecological focus area(s)
EUNIS	European nature information system
JRC	Joint Research Centre
LPIS	Land Parcel Identification System
RDP	Rural Development Programme

LIST OF FIGURES

6. FIRST OBSERVATIONS ON THE POTENTIAL ENVIRONMENTAL AND CLIMATE EFFECTS OF EFA

6.1. Causal analysis on implementation choices

This chapter aims at identifying and exemplifying drivers of Member States' implementation choices and farmers' uptake. The lists presented below are not exhaustive and, in the light of present knowledge, it can neither be determined whether any of these drivers played a dominating role.

6.1.1. Drivers of Member States' choices

Member States' choices appear to have been driven by the need to find a balance between maximum flexibility for farmers and minimum administrative complexity.

More specifically, the evidence collected[1] so far suggests that Member States' implementation choices have been driven mostly by the following:

- the inclination to **offer farmers as many options as possible**, enabling them to exploit the usual practices;

- the **cost of complying** with specific inspection requirements (e.g. maximum dimensions or continuity of some landscape features) and mapping permanent EFA elements in a dedicated LPIS layer. This consideration has been repeatedly mentioned (through working groups or the public consultation) by certain administrations to justify why their national authorities did not select landscape features or catch crops/green cover as EFA types (e.g. Spain);

- **particular circumstances** and **environmental conditions –** intended to ensure the effectiveness of the scheme (e.g. presence of terraces, 'natural' heterogeneity of the allocation of stable landscape features or pollution of surface waters or ground water from agricultural sources) and the need to take into consideration both the biodiversity objective of ecological focus areas and their environmental needs;

- **the more EFA types a country selected the more landscape features types were included**. Bearing this in mind, the comparison of the maps on the number of EFA types selected by Member States (Figure 19) and on the abundance of semi-natural vegetation in EU-27 (Figure 20) shows that this feature could have driven certain Member States' choices (e.g. France and Italy where the semi-natural vegetation is abundant, but also Finland or Sweden where it is scarce); and

[1] From the 'Mapping and analysis of the implementation of the CAP' study (p. 279) and from feedback given by Member States in different expert groups or voiced in the public consultation on greening.

Figure 19 Number of EFA types selected in 2015, by country

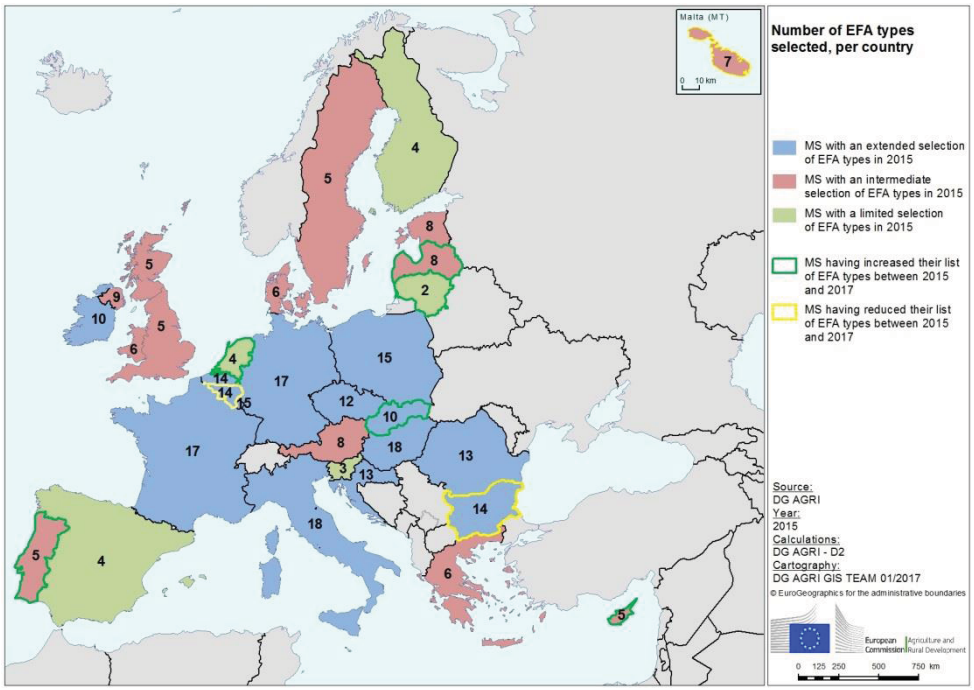
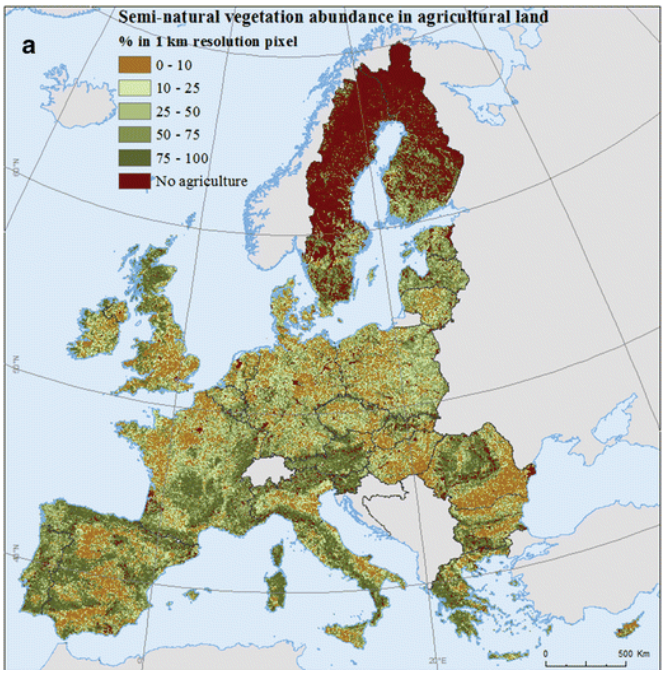


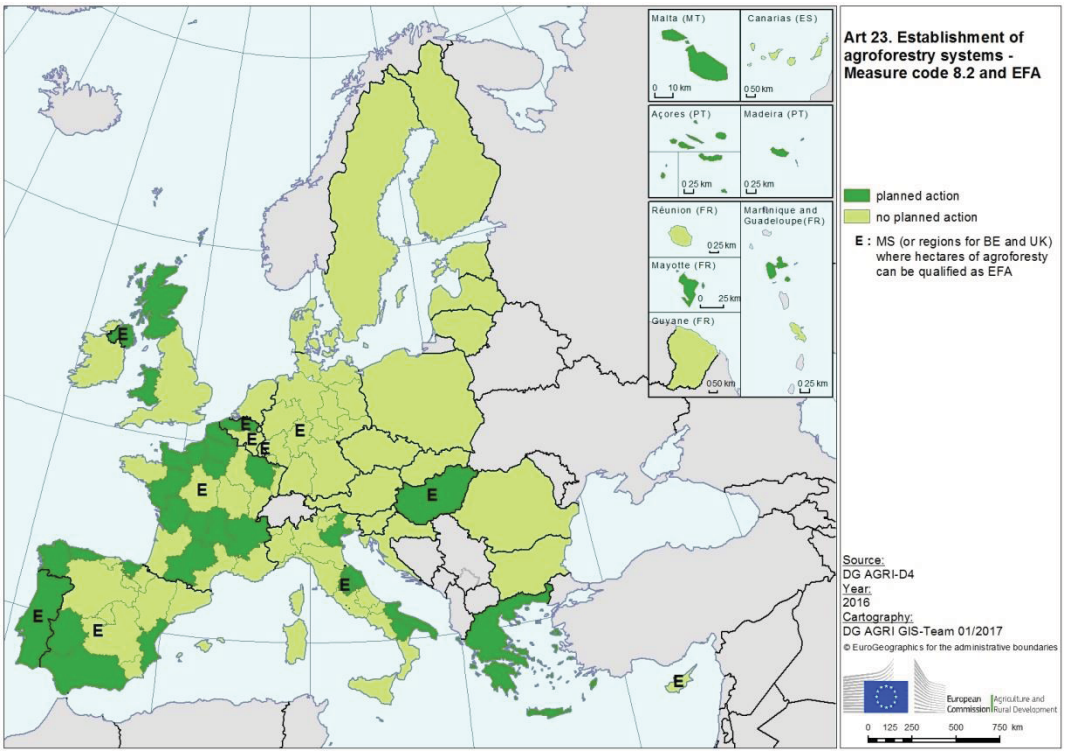
Figure 20 European Union-27 semi-natural vegetation abundance maps at 1 km resolution level



- **decisions taken under other CAP instruments or resulting from EU environmental legislation** (e.g. mandatory establishment of catch crops under nitrates action programmes). For example, afforested areas or hectares of agro-forestry can be qualified as EFA if they receive or have received support under the relevant rural development measure. Therefore, if a country or a region did not implement these measures under its rural development programme, it makes no sense to select the EFA type in question.

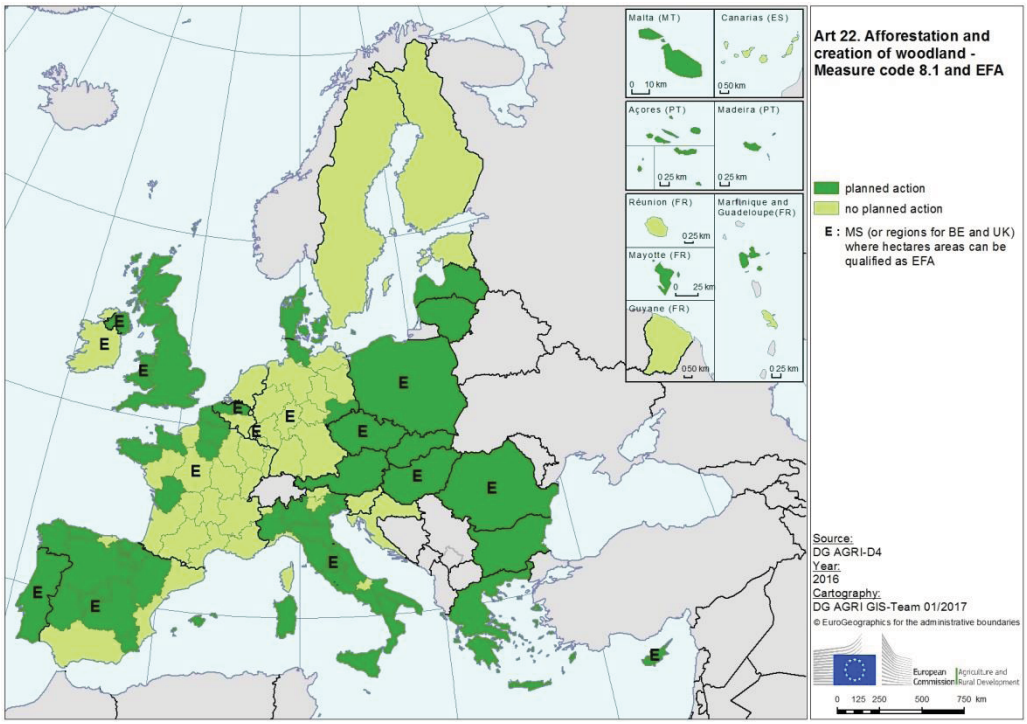
Eight Member States/regions have programmed support to create agro-forestry systems in their current RDP(s) (see Figure 21).

Figure 21 Member States having programmed support for creation of agro-forestry systems in their current RDPs



20 Member States programmed support for afforestation and creation of woodland in their current RDP(s), including in some cases only old commitments which originated in the previous programming period.

Figure 22 Member States having programmed support for afforestation and creation of woodland in their current RDPs



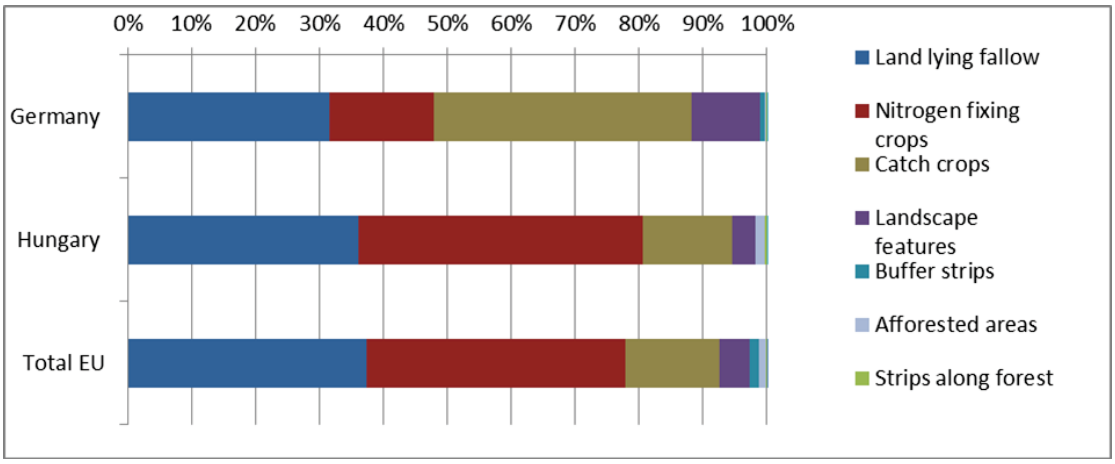
6.1.2. Drivers of farmers' choices

Based on the findings in the scientific literature (Pe'er et al., 2016) and the outcomes of the public consultation, the key determinants commonly used to explain farmers' decisions appear also to apply to their uptake of EFA:

- **economic determinants** leading to the choice of the least costly and the most productive EFA;
- **policy and administrative factors**:
    - limitations imposed on farmers by their national authorities, such as the decision to restrict the choice of EFA (e.g. Member States having selected three or four EFA types);
    - a high risk of inspections and non-compliance (e.g. field margins exceeding the maximum width). This could also explain why some farmers decided to use 'safe' EFA types such as land lying fallow, areas with catch crops or nitrogen-fixing crops. It could also explain farmers' applications in countries where they were able to select from all possible types of EFA to comply with the 5 % obligation. Since Germany and Hungary are the two countries that offered all possible types, their farmers can be seen as a reference group for use of areas

and features as EFAs.[2] Application data (see Figure 24) indicate that around 90 % of EFAs declared by German and Hungarian farmers in 2015 consisted of land lying fallow, areas with nitrogen-fixing crops and areas with catch crops or green cover. Of 19 possible EFA types, these three are those used most to qualify for EFAs;

Figure 24 EFAs declared by German, Hungarian and all EU farmers (2015)



- reductions in the administrative burden, for example through the use of a pre-filled single application form with all landscape features qualifying as EFAs on their farm. Conversely, the relative administrative difficulties involved in declaring each EFA, in particular landscape features, may explain the very low uptake among farmers of these EFA types.

- farmers' perceptions and knowledge of the EFA obligation (e.g. the general understanding among farmers of the benefits of certain EFA types or farmers' perception that declaring landscape features such as hedges or trees would commit themselves on the land use for several years).

[2] Despite the great number of EFA types selected in France and Italy, it was not possible to use these two Member States as a reference. This was because France did not communicate data and Italy did not select catch crops/green cover, which is a key EFA type in this context.

6.2. Potential effects on biodiversity, ecosystem services and climate change adaptation and mitigation

This chapter focuses on the potential effects different types of EFA might have on biodiversity, ecosystem services and climate change adaptation and mitigation. It analyses how different EFA features, attributes and the type of management might influence the impact. The Basic Regulation[3] stipulates that the EFA should be established, in particular, *in order to safeguard and improve **biodiversity on farms***. However, this report notes that the EFAs can have **potential side effects** (co-benefits, trade-offs) on other phenomena closely connected to biodiversity, on other environmental media and the climate. Therefore, when assessing the potential impact of EFA, these other potential effects cannot be ignored. This chapter is based on the results from the EFA calculator and a review of selected specialist literature.

6.2.1 Definitions

Effectiveness

Within the meaning of this report, 'effectiveness' is the EFA measure's potential to improve or maintain the current state of biodiversity, ecosystem services and climate change adaptation and mitigation. The hypothetical question about effectiveness is:

- To what extent could the EFA measure potentially impact: (i) biodiversity and (ii) other environmental areas, such as soil and water quality, climate?

Biodiversity

This report uses the definition of 'biodiversity' given in the EU Biodiversity Strategy to 2020[4]: '*Biodiversity — the extraordinary variety of ecosystems, species and genes that surround us — is our life insurance, giving us food, fresh water and clean air, shelter and medicine, mitigating natural disasters, pests and diseases and contributes to regulating the climate. Biodiversity is also our natural capital, delivering ecosystem services that underpin our economy.*'

Ecosystem services

'*Ecosystem services' are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling. The human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services*'. (Costanza, R., 1997,[5] Millennium Ecosystem Assessment 2005[6])

[3] Recital 44 of Regulation (EU) 1307/2013.
[4] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0 478.
[5] Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., van den Belt, M., 1997. The value of the world's ecosystem services and natural capital. Nature 387, 253-260.
[6] http://www.millenniumassessment.org/en/index.html.

'*They include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth*.' (Millennium Ecosystem Assessment 2005)

Climate change adaptation and mitigation

'Climate change adaptation and mitigation' refers to the adjustments that societies make in order to limit the negative effects of climate change and efforts to reduce or prevent the greenhouse gas emission. These adaptation and mitigation practices may vary. For agriculture, they usually encompass changing management practices.

6.2.2. Potential effects on biodiversity

6.2.2.1. EFA calculator results

The analysis focuses on **the diversity and populations of species**, with specific focus on the potential impact EFAs may have on enhancing populations. The following EUNIS species groups[7] (EEA (2015b) were used: amphibians, birds, invertebrates, mammals, reptiles and terrestrial plants.

As regards EFA type impact, the analysis was conducted depending on **the composition of the EFA area**. Nine categories of different composition were selected following the method as described in Chapter 4.5 and the NUTS 3 regions were classified accordingly. In order to explore more closely the influence of EFA type, a specific simulation was performed by isolating certain single EFA types and by identifying their individual impact (the exercise was limited to two case studies, the UK and Spain).

EFA type impact depends also on **factors** such as the physical context in which EFAs are implemented and located and other qualitative features of EFA type such as size, species compositions or management requirement. Further analysis has been done by looking more specifically at **spatial conditions and species**.

Given the limitations of the EFA calculator, as explained in previous chapters, the outcomes have to be considered as potential impacts and treated as such.

[7] http://eunis.eea.europa.eu/species.jsp.

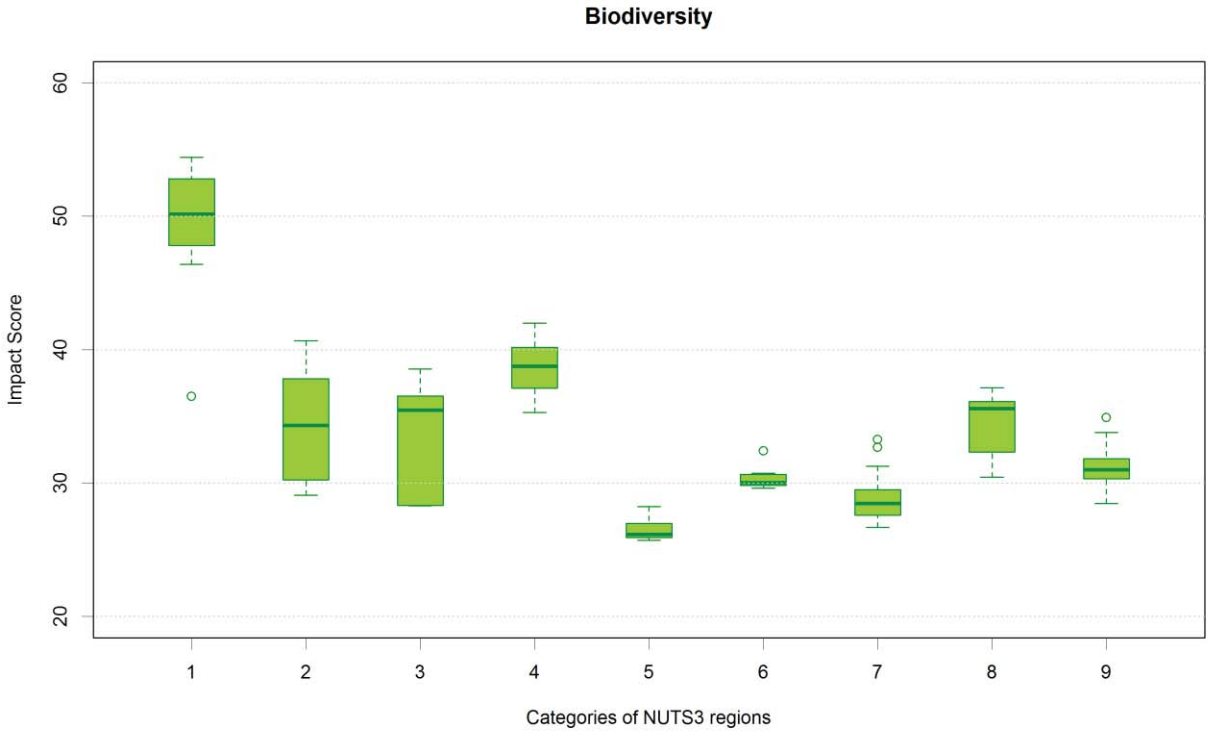
6.2.2.1.1. Overall impact on biodiversity

The impact score for biodiversity is the result of aggregating and normalising the impacts for the different EUNIS species groups (EEA, 2015b) using the scoring system of the EFA calculator (see Chapter 4.6.3). Positive and negative impact scores are averaged and aggregated separately to avoid hiding possible bad effects. Only total impact scores (resulting from adding together positive and negative scores) have been presented for overall biodiversity. This was to take account of cases where there was no or very low negative impact.

The score for biodiversity of the 121 NUTS 3 regions was analysed using different compositions of EFA type (see the nine categories defined above). As described in the paragraph on methodology, these scores should not be considered as absolute values of the actual impact of EFA implementation on biodiversity, but instead as the potential impact on biodiversity of the EFA-type composition declared in the NUTS 3 region. They can be used to compare how different compositions of the EFA type declared can potentially affect biodiversity.

Figure 25 shows results of the total score for biodiversity according to the EFA calculator for the nine categories of NUTS 3 regions. **Category 1 (landscape feature more than 50 % of EFA declared) appears to perform much better than the others.** Category 4 (more than 70 % of EFA as land laying fallow) also achieved good scores. The lowest scores were obtained for category 5 (more than 70 % of EFA declared as catch crop).

Figure 25 Potential impact on biodiversity of categories of NUTS 3 regions



6.2.2.1.2. Biodiversity at species group level

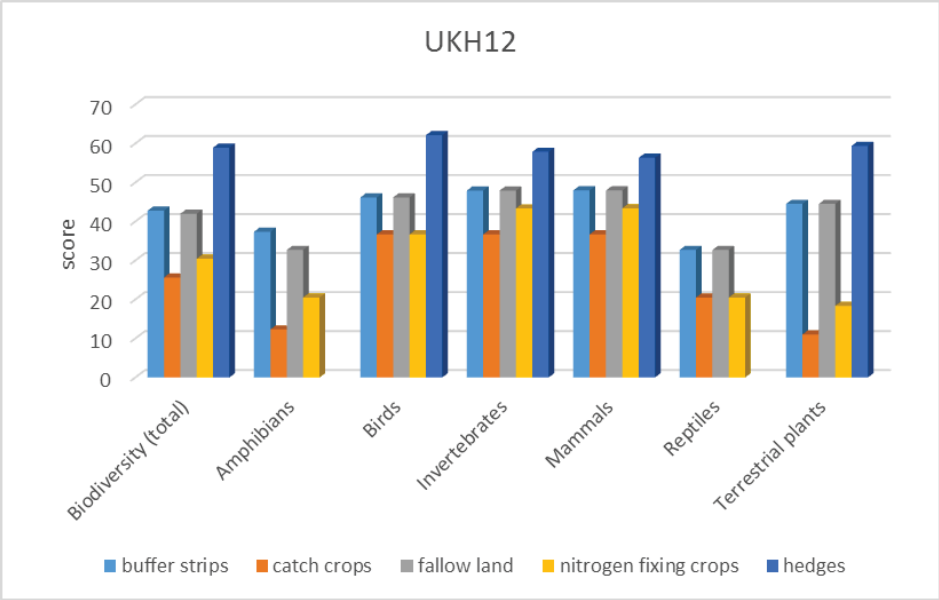
When considering the score at species group level, some similar trends are observed and they confirm the ranking for overall biodiversity impacts, as indicated by the graph above. This analysis underlines the **positive impact of the landscape features** on invertebrates, birds and terrestrial plants. For reptiles and amphibians, a higher presence of **buffer strips and fallow land** in the category class gives higher positive impact scores. Nevertheless, it is not possible to draw any concrete conclusions on the real impacts since they are dependent on very localised factors and features (which are not described in the region files, where an average value is used).

6.2.2.1.3. Analysis per EFA type

From the analysis of scores of different categories of NUTS 3 regions, the percentage of each EFA types greatly affects the impact scores. So to explore the impact of each EFA type, a simulation has been carried out to generate impact scores for each EFA type and compare them.

The results obtained clarify the impacts of different EFA types on biodiversity. Hedges represent the EFA type with highest positive effects on biodiversity, as shown in Figure 26.

Figure 26 Impact scores of different EFA types calculated for biodiversity (total) and some EUNIS species groups in the UK



6.2.2.1.4. Additional analysis

The impact of EFA measures also depends on some other features that are characteristic of the measure. Therefore the impact of EFA should be analysed in a broader perspective, taking account of other factors such as specific local issues and other qualitative aspects of EFA.

EFA type and regional context

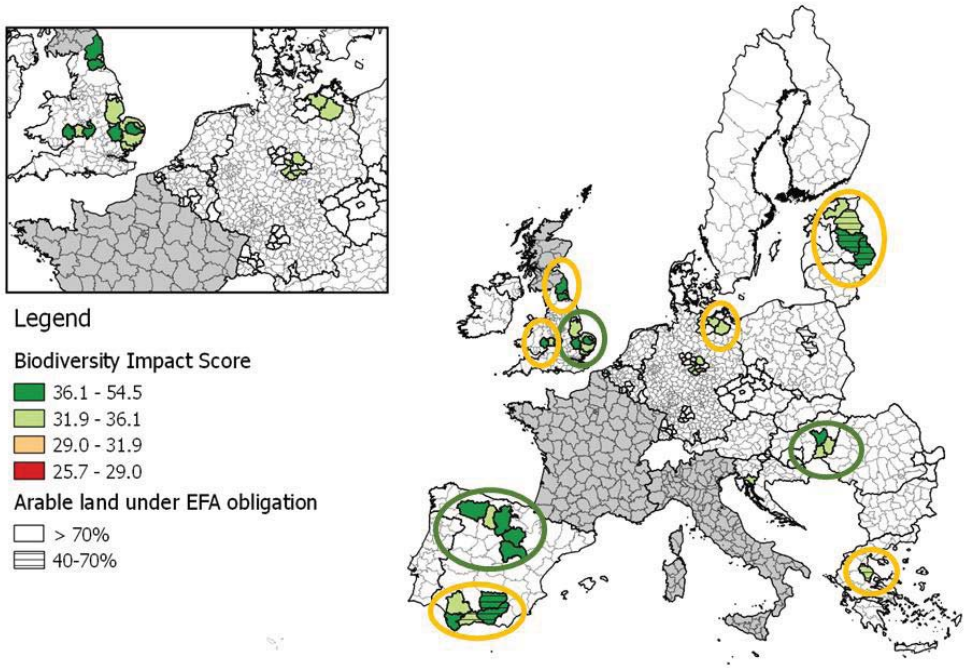
The results of the analysis of the potential impacts of different EFA-type composition could be supplemented by **a spatial analysis** where potential impacts are overlaid with specific environmental issues. This allows understanding whether the declared EFA composition could address specific local issues. Biodiversity scarcity has been considered as one of these

local issues. For this purpose a map was used showing the distribution of semi-natural vegetation in agricultural land (Garcia-Feced et al., 2015[8]) aggregated at NUTS 3 level.

By overlaying these two kinds of information (NUTS 3 regions with scarce semi-natural vegetation and NUTS 3 regions with good or low scores for biodiversity), it is possible to highlight areas where greening policy implementation could have an impact on biodiversity, as well as different potential effects of the EFA-type composition on biodiversity as shown by figure 25.

In Figure 27, areas highlighted with green and yellow circles are those where EFA-type composition declared seems to have: a very positive effect (good scores for biodiversity in areas where the current level of semi-natural vegetation is very low); and a positive effect (good scores for biodiversity in areas where the current level of semi-natural vegetation is low or the area under EFA obligation is between 40 and 70 %).

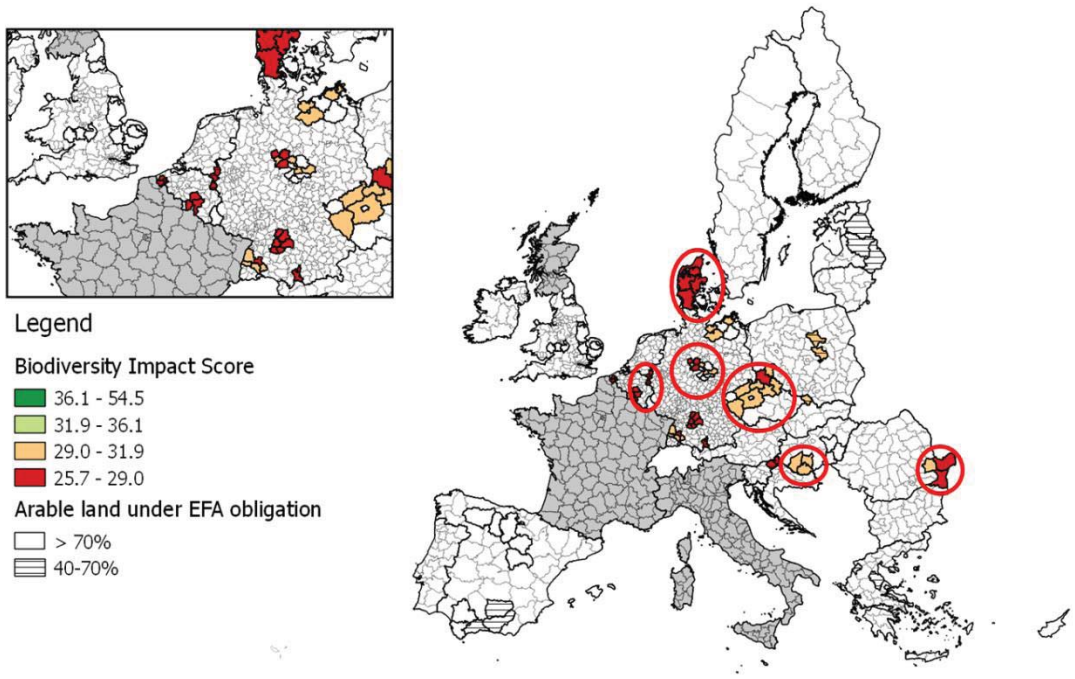
Figure 27 Biodiversity impact scores in NUTS 3 region with more than 40 % of arable land under an EFA obligation



[8] http://link.springer.com/article/10.1007/s13593-014-0238-1.

In Figure 28, areas highlighted with red circles are those where the EFA-type composition declared seems not to provide benefits on biodiversity (i.e. low scores for biodiversity in areas where the current level of semi-natural vegetation is very low or low).

Figure 28 Biodiversity impact scores in NUTS 3 region with more than 40 % of arable land under an EFA obligation



In some regions of eastern England, northern Spain and south-eastern Hungary where semi-natural vegetation is scarce, biodiversity scores are good. The great amount of landscape features and fallow land declared as EFA determines these results. Nevertheless, it is still not possible to determine the real impact of landscape features since already existing landscape features such as hedges are declared in significant quantities by farmers.

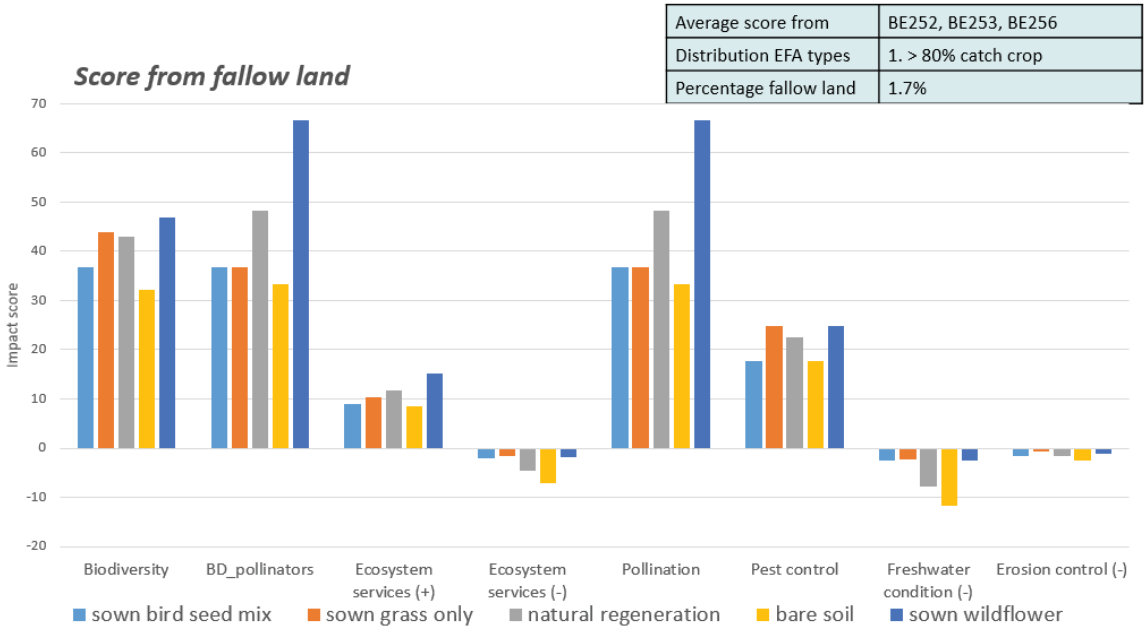
On the contrary, in some regions with scarce semi-natural vegetation (e.g. Denmark, some regions in the Netherlands and Belgium, south-western Hungary and Romania) but with lower scores for biodiversity, it is possible to highlight areas where the EFA-type composition declared does not seem to be able to provide benefits for biodiversity. In this case EFA features declared are represented by EFA types with low impacts on biodiversity (mainly catch crops) in areas where the presence of semi-natural vegetation is also scarce.

EFA feature and species

The impact of **additional features and the choice of species** sown have been explored using the EFA calculator. Simulations have been carried out to assess how scores for biodiversity and ecosystem services can vary according to some specific characteristics for land laying fallow, catch crops or green cover and nitrogen-fixing crops.

Impact scores for **land laying fallow** were calculated specifying different types of **vegetation cover** (sown bird seed mix, sown grass only, natural regeneration, bare soil, sown wildflower). The results (Figure 29) show that for pollinators, sown wildflower produces the highest scores and bare soil the worst. Natural regeneration is also a good option to foster biodiversity and pollination. Natural regeneration may offer potential for the growth of arable flora that also favours pollinating invertebrates.

Figure 29 The effects on biodiversity and ecosystem services of different types of land lying fallow in selected Belgian NUTS 3 regions



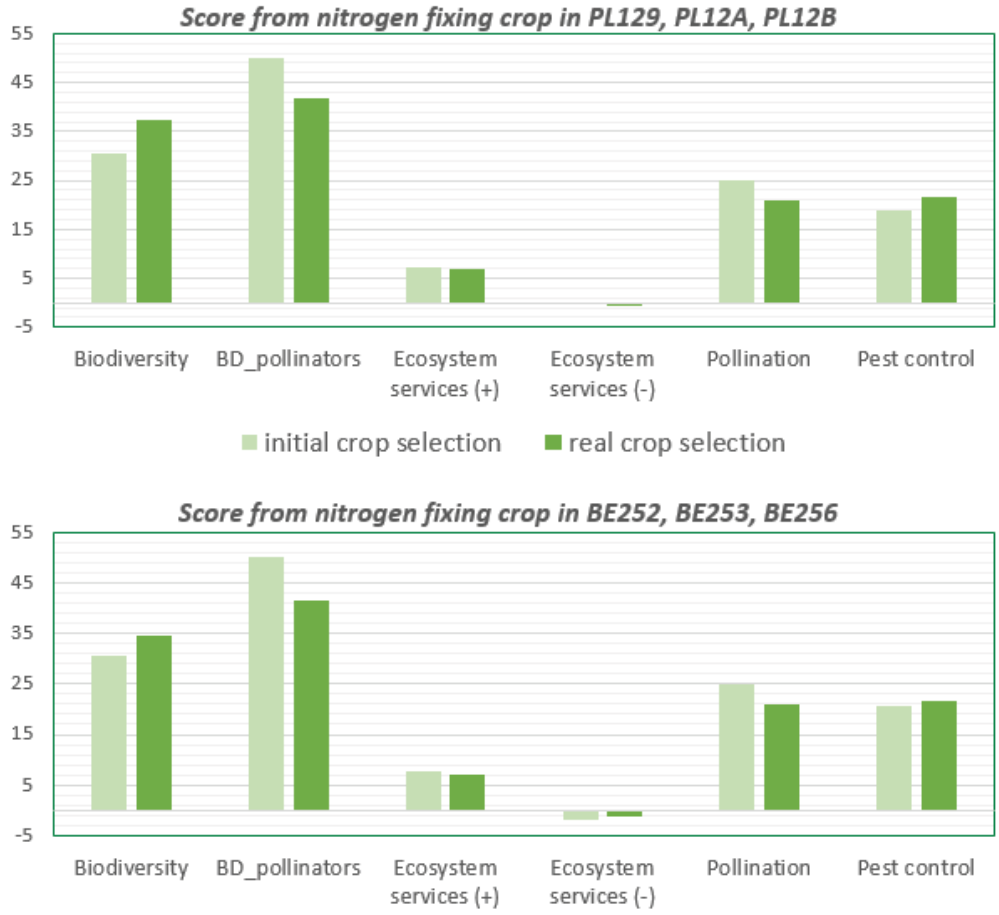
For catch crops and nitrogen-fixing crops, simulations involved changing some **species compositions.**

In the case of **catch crops,** the standard mixture used by EFA calculator was composed of *Sinapis alba* and *Lotus spp*. For the simulation, other compositions were introduced based on a possible mixture used in Flanders that also includes *Sinapis alba* and *Lolium* and *Raphanus*. The scores for biodiversity are similar even if the species composition varies. It is difficult to obtain a significant differentiation for catch crops in terms of biodiversity. Indeed, all species may provide some shelter during the winter to active predatory beetles compared to bare soil. When present as winter cover crops all species have a limited effect on amphibians, birds of prey, insectivorous birds, seed-eating birds, small mammals, reptiles and flowering plants.

For **nitrogen-fixing crops,** the standard species used by EFA calculator was *Vicia faba*. For the simulation, other species were introduced, based on the species most used in Belgium and Poland, respectively *Medicago sativa* and *Ornithopus spp.* (Bird's foot).

This simulation exercise shows (Figure 30) that scores vary for nitrogen-fixing crops, especially for biodiversity (in fact, for pollinators *Vicia faba* gave better scores than the species that are actually cultivated). The differences can be reflected in the impact scores for the whole 'NUTS 3 farm', where nitrogen-fixing crops represent a significant percentage of the EFA types.

Figure 30 Comparing impact scores for nitrogen-fixing crops between crops species used in the NUTS 3 analysis (initial crop selection — *Vicia faba*) and those actually mostly used by the farmers in the specific NUTS 3 (real crop selection) for selected NUTS 3 regions in Poland and Belgium



6.2.2.2. Findings from other studies

As the analysis was done by the EFA calculator, the results might be regarded as too narrow. Therefore, the findings were supplemented by other research studies done for different EFA types.

The literature indicates that among EFA options, **buffer strips, land laying fallow and landscape features** are considered to have **positive impact** on biodiversity. Of the landscape features, hedges, field margins and traditional stone walls were considered the most favourable for biodiversity (Pe'er, 2016[9]) as they provide habitats for beneficial insects and arthropods, birds and plants (EIP AGRI 2016).

The EFA non-productive options in general (land lying fallow, landscape features and field margins) have the potential to be even more valuable for biodiversity under **non-intensive type of management** (e.g. no use of pesticides) (Underwood, E. and Tucker, G.,20 16[10]).

By contrast, **nitrogen-fixing crops and catch crops** are **unlikely to produce a positive effect** on biodiversity (Pe'er 2016). Nitrogen-fixing crops rarely produce a positive effect since they are mostly grown intensively, are frequently cut and grazed and pesticides and fertilisers are used. Catch crops can only bring about a positive impact if they are comprised of plant mixes designed to benefit pollinators and birds and those plants are allowed to flower and set seed (Underwood, E. and Tucker, G., 2016). The positive impact of nitrogen-fixing crops and catch crops then depends mostly on **the type of management** introduced on the field.

Land laying fallow is regarded as a 'win-win option' in terms of farmers' uptake and their view on different EFA elements. This is because it is both attractive to farmers and also provides services to farmland biodiversity. In contrast, buffer strips and landscape features, even though they are pro-biodiversity, are not **perceived by farmers** as an attractive option. This can be explained in part by the assumption that farmers tend to choose EFA options which are less costly, are easy to implement and which offer production potential (Pe'er, 2016) (see also Chapter 6.1.2).

As regards the management of EFAs, in the public consultation on greening, farmers voiced the opinion that out of the different management types of EFAs indicated, they regarded rotation and sowing mixtures of species as the production methods most beneficial for the environment.

[9] http://onlinelibrary.wiley.com/doi/10.1111/conl.12333/abstract.
[10] http://www.ieep.eu/work-areas/agriculture-and-land-management/policy-evaluation/2016/12/ecological-focus-areas-what-impacts-on-biodiversity.

6.2.3. Other potential effects: Potential effects on ecosystem services

6.2.3.1. EFA calculator results

A similar analysis as the one for biodiversity was performed for **ecosystem services**, using the classification of ecosystem services as presented by the Common International Classification of Ecosystem Services (CICES[11]):

Provisioning services — provision of water as a material and water for nutrition;

Regulation services — global climate regulation, pollination and seed dispersal, pest control, chemical condition of freshwater, flood protection, mass stabilisation and control of soil erosion, filtration/sequestration by flora and fauna, mediation of smell/noise/visual impacts;

Cultural services — aesthetic services, heritage and cultural services.

The analysis then focused on the **ecosystem services to which EFA measures are more relevant:**

- pollination and seed dispersal;
- pest and disease control;
- chemical condition of fresh water (considering nitrate leaching to surface and groundwater);
- mass stabilisation and control of erosion rates

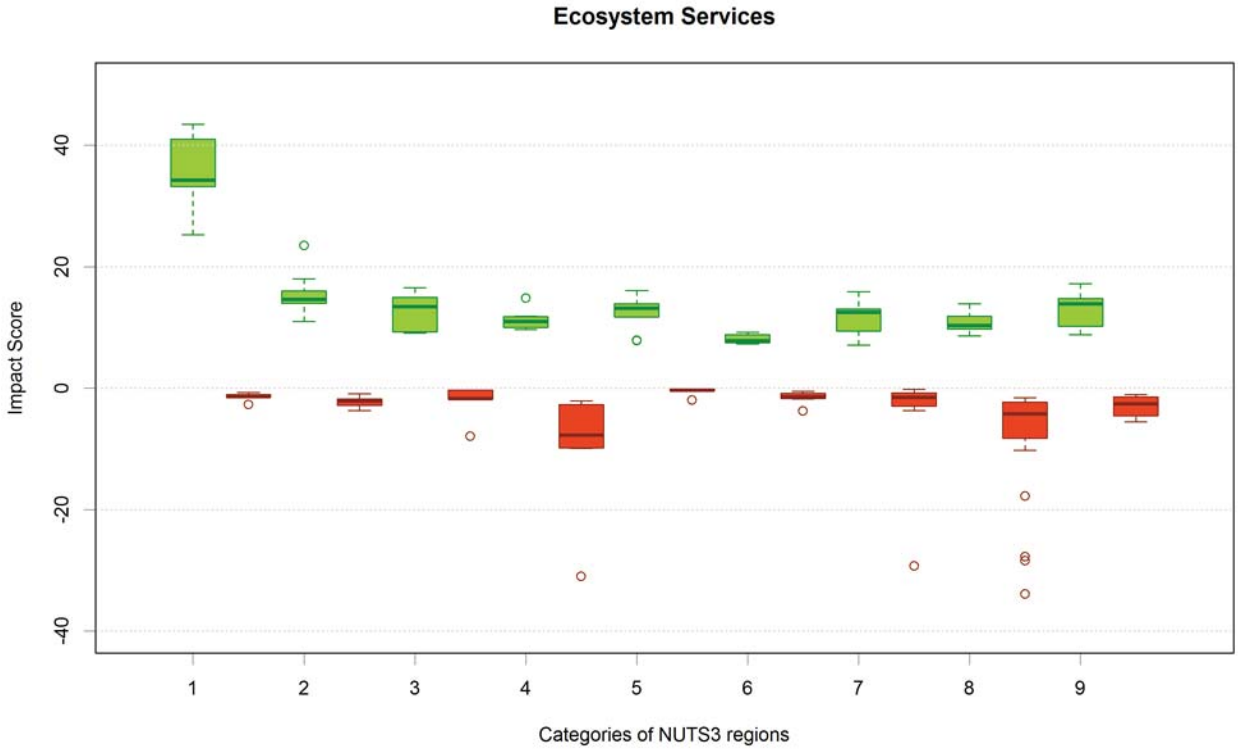
Total impact is the result of aggregating scores for all ecosystem services analysed. Positive and negative impact scores are averaged and aggregated separately. For ecosystem services, each impact score (both positive and negative) has been also presented separately.

[11] http://cices.eu/.

6.2.3.1.1. Overall impact of EFA on ecosystem services

Based on the analysis done, it appears that the **category where landscape features account for more than 50 % of declared EFA** has the **most positive effect** on ecosystem services in general. It can therefore be assumed that landscape features are most beneficial for ecosystem services. On the other hand, since the negative impacts in all the categories are fairly low, it can be assumed that no EFA type has a completely negative effect on the ecosystem services analysed.

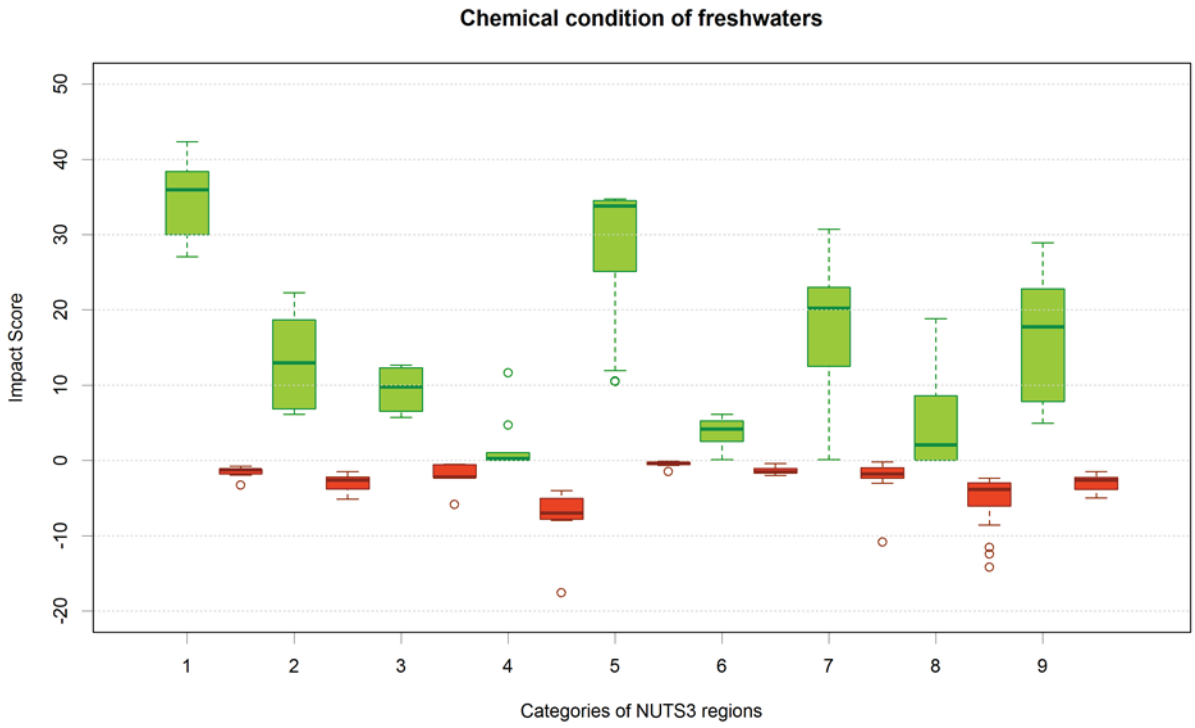
Figure 31 Potential impact on ecosystem services by categories of NUTS 3 regions. Scores for positive impacts are in green, scores for negative impacts in red



6.2.3.1.2. Chemical condition of freshwater

As with the overall impact, category 1, **with landscape features** comprising more than 50 % of EFA, was shown to be most beneficial for the chemical condition of freshwater. When **catch crops** are the most prominent EFA (more than 70 %) (i.e. category 5) they also give good positive results. This means that while catch crops might not have a positive impact on biodiversity, they might still prove favourable for some ecosystem services. Category 4 (**land lying fallow more than 70 %)** shows slightly negative results under some management practices, specifically when the land lying fallow is left with bare soil.

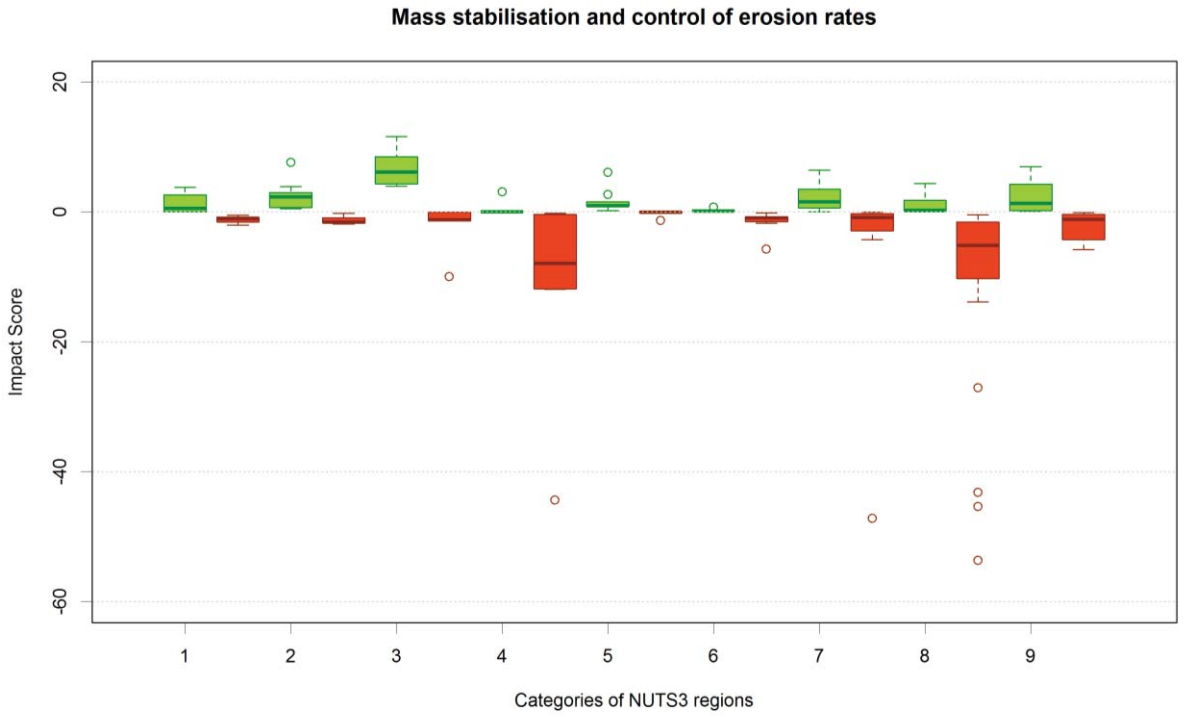
Figure 32 Potential impact on the ecosystem service 'chemical condition of freshwaters' by categories of NUTS 3 regions. Scores for positive impacts are in green, scores for negative impacts in red



6.2.3.1.3. Mass stabilisation and control of erosion rates

The impact of different categories of EFA-type compositions has been proven to be so low that **no general conclusion** can be drawn from these results. The impact probably results more from specific **local conditions** like slope or ground cover. However, these are not taken into account in this analysis.

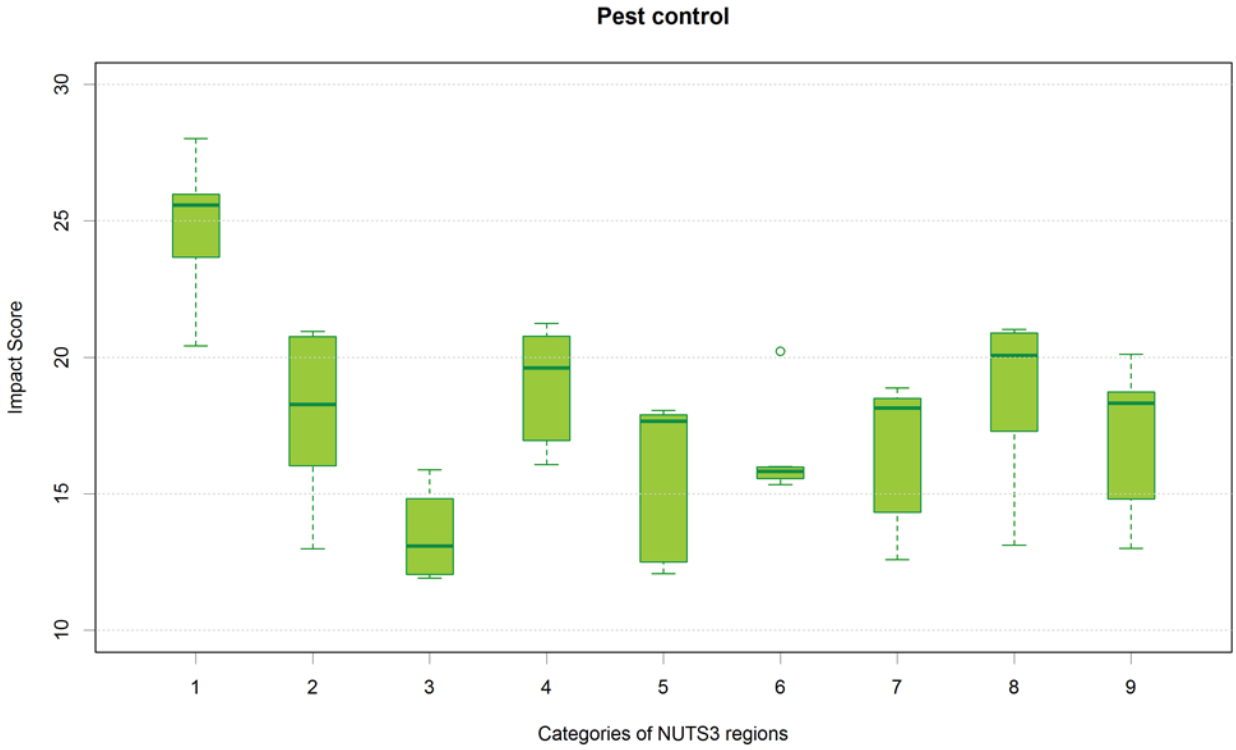
Figure 33 Potential impact on the ecosystem service 'mass stabilisation and control of erosion rates'. Scores for positive impacts are in green, scores for negative impacts in red



6.2.3.1.4. Pest control

As with previous types, the category where **landscape categories** were prevalent proved to be most beneficial for pest control. Other categories showed no significant impact. Natural enemies that control agricultural pests and provide a service by regulating pest populations need to have habitats such as landscape features.

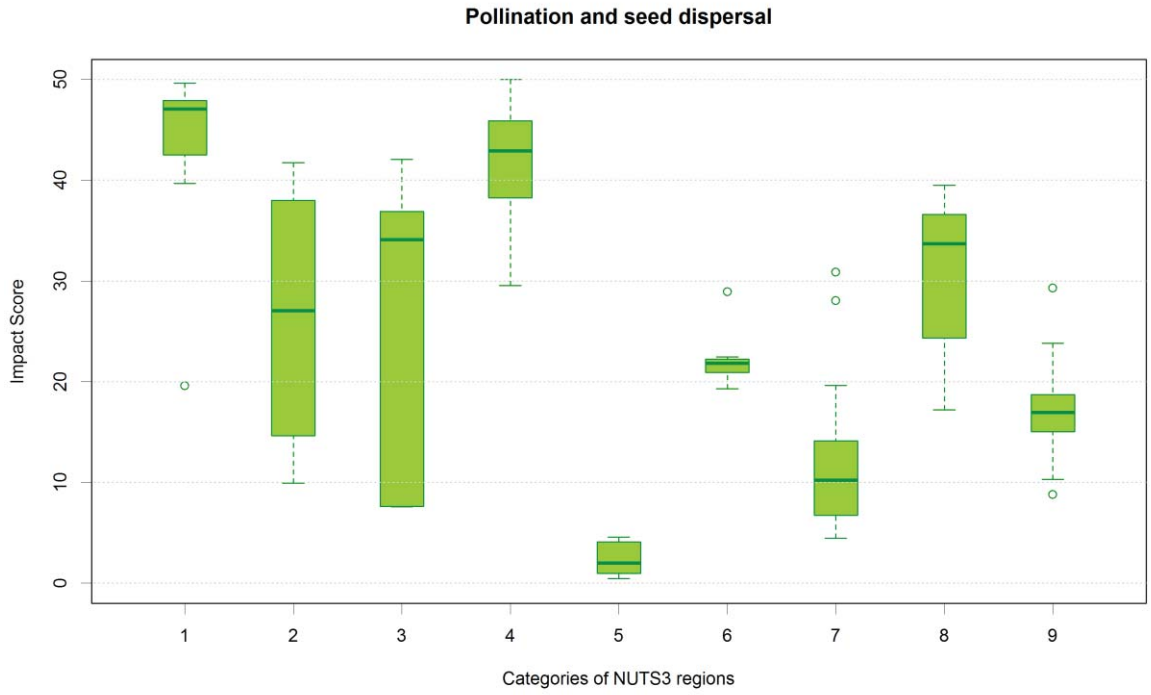
Figure 34 Potential impact on the ecosystem service 'pest control' by categories of NUTS 3 regions



6.2.3.1.5. Pollination and seed dispersal

Pollination and seed dispersal are closely linked to biodiversity. The most positive impact on this ecosystem service can be generated through the **presence of landscape features** and land lying fallow. By contrast, catch crops generate no such result.

Figure 35 Potential impact on the ecosystem service 'pollination and seed dispersal' by categories of NUTS 3 regions



6.2.3.1.6. Estimated impact of each EFA type on ecosystem services

As was done for biodiversity, the impact of a single EFA measure on ecosystem services has been considered. The EFA types which were overall most favourable to ecosystem services were **hedges and buffer strips**. Together with land laying fallow, these are also most beneficial for pollination, while control of erosion generated a positive impact only with buffer strips. As highlighted before, catch crops are beneficial for the chemical condition of freshwater.

A very low negative effect has been documented from land laying fallow (but depending on the ground cover) and from nitrogen-fixing crops.

6.2.3.1.7. Additional analysis

As with biodiversity, impact of EFAs should be analysed in a broader perspective, taking account of other factors such as specific local conditions and other qualitative aspects of EFAs.

EFA type and regional context

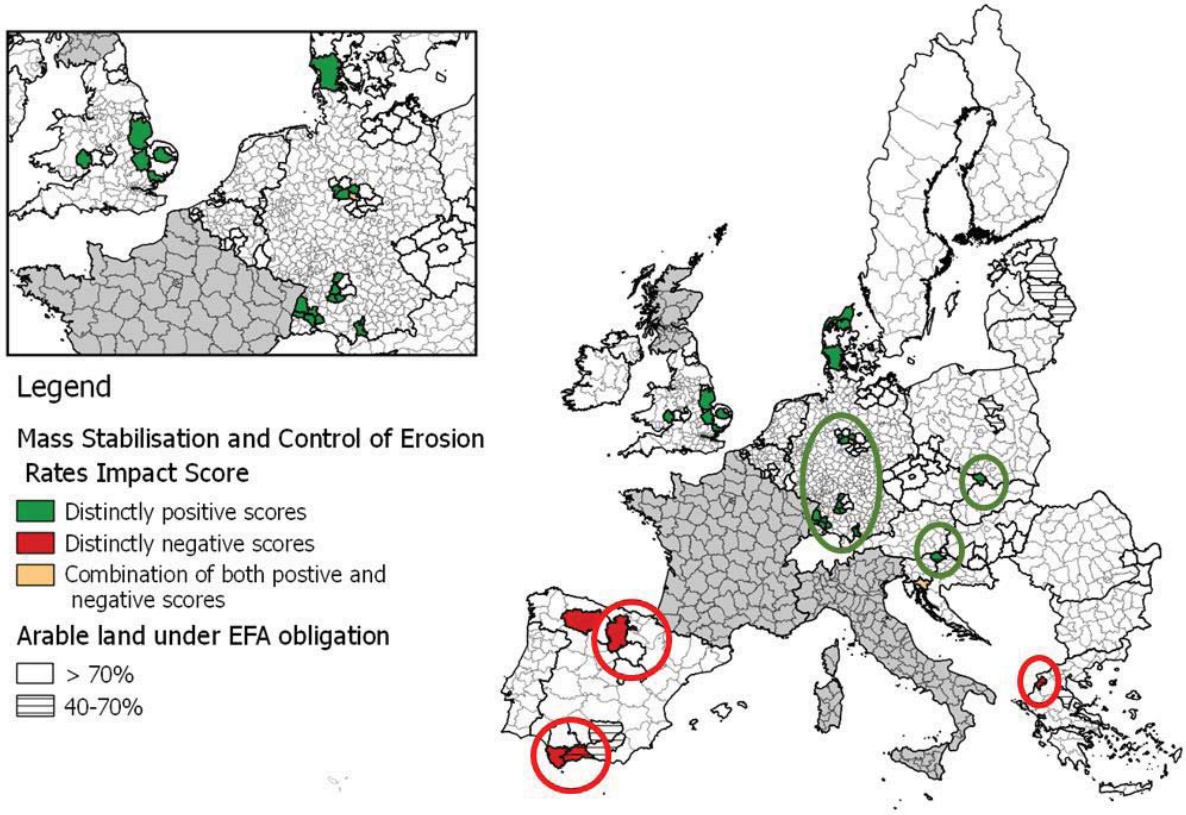
Relevancy of EFA type can depend on certain specific **local conditions**. To understand whether specific environmental issues can be addressed according to the EFA types declared,

a possible approach would be to run a spatial examination of results coming from the analysis of the potential impacts of the different EFA-type composition on ecosystem services. One of these environmental issues is **soil erosion** by water. A map of water erosion of soil in the European Union produced by JRC's Soil Bureau (Panagos et al., 2015) has been used for this purpose.

By overlaying the two kinds of information (NUTS 3 regions with high and moderate risk of water erosion and NUTS 3 regions with good or low scores for the ecosystem service 'mass stabilisation and control of erosion rate'), it is possible to highlight areas with erosion risk where the EFA-type composition declared could have an impact (or not) on mitigating erosion, as shown in Figure 36. The areas highlighted with **green circles** are those where the **actual EFA-type composition** could be **effective** for erosion control (good scores were recorded in areas with moderate soil erosion). In areas highlighted with **a red circle**, it seems that issues related to erosion by water **could not be addressed** by the **composition of the EFA types declared** (low scores were recorded in areas with a moderate or high level of erosion).

In some countries or regions such as Germany, Slovenia and southern Poland, the analysis underlines the potential positive contribution of the EFA types declared in a context of moderate and high risk of erosion. Conversely, for Spain and Greece the analysis points to a negative impact.

Figure 36 Erosion control rates impact scores in NUTS 3 region with more than 40 % of arable land under EFA obligation



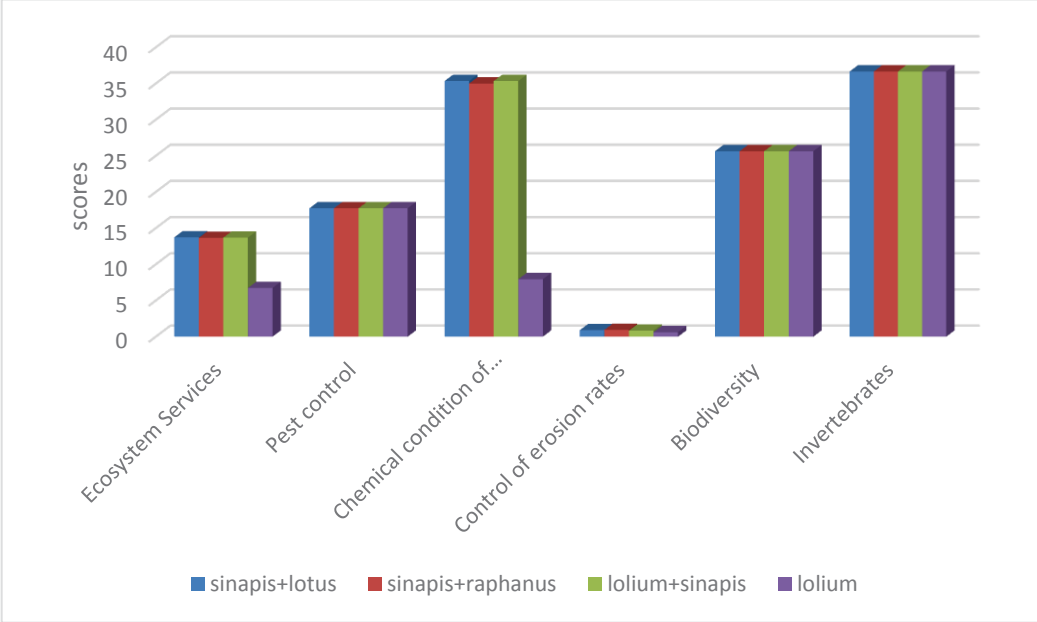
EFA features and species

Using the EFA calculator, the impact of **additional features and the choice of species sown** in different EFA elements has been explored for ecosystem services. This was done by using the same simulation carried out for biodiversity for land laying fallow, catch crops or green cover and nitrogen-fixing crops.

As already identified for biodiversity, for land lying fallow the impact of some **coverage** such as sown wildflower is very significant for the ecosystem service 'pollination' when compared with other coverage. Bare soil performs more poorly in terms of the ecosystem services it supplies.

For catch crops, the scores obtained are similar even if the **species composition** varies. The exception is the ecosystem service 'chemical condition of freshwater', where the same of a single plant family (*Lolium*) used as a mixture produces lower scores.

Figure 37 Impacts of different catch crops mixture on some ecosystem services and biodiversity



The literature confirmed that two species groups with different nutrient requirements and rooting systems are likely to utilise more soil nitrogen in autumn and winter due to differences in plant functional type and nutrient resource exploitation (Finn *et al*., 2013[12]). For this purpose, mixtures including *Poacea* such as *Lolium* (rye grass) and *Brassicacea* can be more effective than having a single composition of *Brassicaceae* or grass species.

[12] http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12041/pdf.

6.2.3.2. Findings from other studies

As for biodiversity, the results from the EFA calculator on ecosystem services are supported by findings from other studies. In terms of benefits for ecosystem services, landscape features, especially **hedgerows and flower strips together with field margins**, are proven to have a positive effect. The ecosystem service functions provided by these landscape features include microclimate regulation, erosion control and nutrient retention, biological pest control and pollination (EIP AGRI 2016[13]). Even though **nitrogen-fixing** crops do not have any significant impact on biodiversity and ecosystem services in general, they are beneficial for biological nitrogen fixation and therefore for the mitigation effect with regard to climate change (RICARDO AEA, 2016[14]).

6.2.4. Other potential effects: Potential effects on climate change adaptation and mitigation

Although the EFA calculator has not been used to analyse the potential impact of EFA measures on climate change adaptation and mitigation, EFAs have some positive potential contributions to global climate regulation.

These potential positive impacts can include:

- increased provision of landscape features, which would be expected to increase the climate resilience of farms (improved climate adaptation, protection against, wind, sun etc.);
- conservation of existing stable elements, which can have an effect on carbon sequestration;
- an increase in the area of nitrogen-fixing crops (vs conventional crops), which is expected to decrease nitrogen use (direct mitigation impact). The displacement of artificial nitrogen with nitrogen fixation is another positive mitigation action leading to reduced greenhouse gas emissions;
- afforestation actions, which help increase carbon sequestration;
- land lying fallow, which generally leads to less overall N fertiliser use and can also have a potential positive impact on climate change mitigation

[13] https://ec.europa.eu/eip/agriculture/node/2094.
[14] https://ec.europa.eu/clima/sites/clima/files/forests/lulucf/docs/cap_mainstreaming_en.pdf.

6.2.5. Additional attributes and management types of EFA elements and their impact on biodiversity and ecosystem services

As already explored by the EFA calculator, qualitative aspects are important for EFA impact. Additional attributes and management types of different EFA types may add up to a positive impact on biodiversity and ecosystem services and thus promote the positive effect of the greening measure. The findings of the EFA calculator on this subject are supported by and developed in other studies.

6.2.5.1. Land lying fallow

The impact on biodiversity and on ecosystem services of land laying fallow can be influenced by the **nature of the coverage** (as already highlighted by the EFA calculator) and also by the **land management**, especially the **cultivation intensity**.

The results for positive impacts vary depending on the nature of plant used: **wild seed mixes and bare fallow with winter stubbles** and **naturally regenerated vegetation** perform better than grass or grass-clover ley. By contrast, and as already mentioned, keeping the land lying fallow with bare soil has a detrimental effect.

Mixtures with flowering plants provide:

- favourable habitats and hibernation sites for insects, insectivorous birds and small mammals (a potential food source for birds of prey);
- a source of food for grass eating and insectivorous species such as birds (Tzilivakis, J., et al. 2015[15]).

Young fallow areas with cereal stubble provide a valuable foraging habitat for farmland birds and can be suitable breeding habitats for some species. (Underwood, E. and Tucker, G.,20 16)

The results also depend on the type of management and on the amount of time the land is actually left lying fallow.

Limited cultivation and re-establishment frequency favours predator populations. Mixtures that require more frequent tillage or areas where bare ground persists are not as favourable to predators. (Tzilivakis, J., et al. 2015)

Fallow can be expected to increase soil macro fauna abundance, primarily because of the lack of disturbance from tillage and pesticides as compared to arable soils. The wild native plants tend to reach maximum plant species richness in the second year and long-term fallow land provides an attractive nesting habitat for solitary bees. By contrast, destruction of EFA fallow land after half a year will destroy bee nests and does not therefore offer a nesting habitat for solitary bees (Underwood, E. and Tucker, G., 2016)

Land laying fallow is also beneficial for erosion prevention — sown wild seed mixes are expected to reduce soil erosion and run-off to farmland ecosystems in significant levels compared to bare soil.

[15] https://ec.europa.eu/jrc/sites/default/files/ReqNo_JRC 99673_final_report.pdf.

6.2.5.2. Catch crops

The **choice of seed mixtures and choice of species** greatly affect the purpose of the catch crops and their effect on biodiversity and ecosystem services.

As shown by the EFA calculator, **species that utilise more nitrogen during the autumn** are effective at removing nitrogen from the soil and reducing the risk of leaching during winter, especially on soils with a high percentage of sand content. Examples of such species include winter oilseed or forage rape (*Brassica napus*), or species which rapidly establish extensive roots, such as winter cereals, of which winter rye (*Secale cereale*) is a good example. (Tzilivakis, J., et al. 2015).

In terms of biodiversity, compared with bare soil all species may provide some shelter during winter to soil surface active predatory beetles. However, the impact is likely to be small. (Tzilivakis, J., et al. 2015)

Nevertheless, the benefit will depend on the **sowing date and on the duration** of the catch crops. Catch crops have a benefit for biodiversity when they are sown very early in summer, giving them time to flower. This can provide some prey/host and/or nectar/pollen resources to carry over predators into the next crop or into hibernation, unlike in bare soil. The presence of catch crops in the field can sometimes have also negative effects: for example, the lower weed diversity and abundance in summer catch crops compared to fallow land is considered negative. When winter cover crops replace winter cereal stubbles, seed-eating farmland birds are negatively affected. (Underwood, E. and Tucker, G., 2016)

When catch crops are incorporated into soil they **increase soil organic matter**. However, this benefit is **counteracted by tillage and herbicide application**. Catch crops also help to reduce **soil erosion and nitrate leaching** from the cropping surface into field margins, depending on vegetation structure and duration. A good environmental practice is to immediately follow a nitrogen-fixing crop with a catch crop or a winter arable crop. (Underwood, E. and Tucker, G., 2016)

The positive effect of catch crops on biodiversity and ecosystem services is marginal, but can substantially improve depending on **the farming management**.

6.2.5.3. Nitrogen-fixing crops

The impact of the nitrogen-fixing crops on biodiversity and ecosystem services is also influenced by the **choice of species and the intensity of the management** by farmers.

As shown by the EFA calculator, the **seed mixtures and choice of species** can greatly influence nitrogen-fixing crops.

Vicia faba (Broad bean), *Lotus spp.* (Birds foot-trefoil) and *Trifolium spp.* (Clover species) are of value to pollinating insects, for example bees. They are favoured by solitary bees, short and long tongued bumblebees and honeybees. Species such as *Cicer spp* (Chickpea) and *Glycine spp.* (Soybean) may act as a potential food source for seed-eating birds. Species with a long corolla and light flower colour are potentially favourable to moths, and moths provide a source of food to bats that feed at night. A single species sown crop will be of low floral diversity. (Tzilivakis, J., et al. 2015)

The management of nitrogen-fixing crops also influences its impact. A decrease in **cultivation frequency** reduces the quantity of nitrogen returned to the soil within plant residues via mineralisation, and reduces the risk of soil erosion and phosphate loss in surface

run-off, while a greater frequency of tillage decreases habitat favourability to many soil surface active invertebrates, including predatory beetles.

This means that benefit is provided by species that may only require re-establishment and tillage every few years, for example *Lotus spp.* (Birds foot-trefoil), *Anthyllis* (Kidney vetch) and *Trifolium spp.* (Clover species) (Tzilivakis, J., et al. 2015)). This corresponds to nitrogen fixing used as multiannual forage instead of annual crop used such as dry pulses.

Nitrogen-fixing crops can also benefit from **extensive management** (low input and cutting regime). This is the case of alfalfa, where weed diversity is significantly higher without management inputs between May and August.

Delayed mowing of parts of an alfalfa crop benefits spiders, seed-eating carabid beetles and butterflies. Populations of bumblebee species can benefit from late season red clover and also generally if the nitrogen-fixing crop is allowed to flower for several months in spring and in late summer.

Finally, legumes used as a green manure can increase soil organic matter and fertility and prevent soil erosion and nitrate losses, while the increased soil nitrogen content can also reduce need for nitrogen fertiliser in subsequent crops. Broad bean and field pea specifically do not require nitrogen fertiliser and so can lower fertiliser use and associated energy use in the crop rotation if the farmer follows recommendations. (Underwood, E. and Tucker, G.,2016)

6.2.5.4. Landscape features — hedges

As presented through the EFA calculator, landscape features have great potential for biodiversity and ecosystem services. Additional attributes of hedges and their management, such as the following, can increase this potential positive impact:

- floral diversity;
- hedge height;
- hedge density and porosity;
- presence of deadwood;
- cutting of the hedge. (Tzilivakis, J., et al. 2015)

Hedgerows rich in **floral diversity** can attract a greater diversity of pollinators and promote pollination. Flora richness in the hedgerow, in terms of both total richness and insect-pollinated plant richness, is important for birds, insects and mammals. Also the presence of deadwood affects the diversity of life in hedges as it is beneficial for pollinators and provides nest holes, foraging and perches for many different species, for example invertebrates such as spiders, ground beetles and hoverflies. Deadwood also provides nesting opportunities for bees and can enhance the habitat for mosses and liverworts. (Tzilivakis, J., et al. 2015)

Hedge height also affects potential impacts both for ecosystem services and biodiversity. Tall hedgerows offer the greatest benefit for trapping pests, and are most effective in reducing pesticide drift and protecting non-target areas, including water bodies. They also offer the greatest benefit for mediating smell, noise and visual impacts and attract a large number of birds. (Tzilivakis, J., et al. 2015)

The density and porosity of hedges influence the presence of birds and other species. Also the presence of trees in hedges can play a role since it has a large positive impact on the abundance and diversity of moths. Having a large number of species (including butterflies) visiting the hedge is dependent on the tree layer. The incidence of bats is significantly affected by tree density — the more trees present, the greater the population and diversity of bats visiting. Porosity is also a key factor. Hedgerows with low porosity offer the greatest benefit for trapping pests and mediating smell, noise and visual impacts while moderate porosity is most effective in reducing pesticide drift and protecting non-target areas, including water bodies. (Tzilivakis, J., et al. 2015)

The **management of the hedge** can also be a factor in the positive effect on biodiversity. **Uncut hedges** provide more flowers and berries than cut hedges and can support twice as many species of birds. Hedgerow cutting reduces the number of flowers and the biomass of berries available over winter. Therefore cutting should be done in the winter and avoided during spring and summer. (Tzilivakis, J., et al. 2015)

Other studies confirm the positive impact hedges also have on biodiversity and ecosystem services. Hedges contain greater herbaceous plant species richness than crop areas, as well as the presence of woody species. Soil macro-organisms are likely to be much more abundant in undisturbed (i.e. untilled) soils below hedges. Hedges are also key foraging and dispersal habitats for butterflies, moths, solitary bees and bumblebee queens. In addition, wide hedge bases can provide larval food plants. Hedges also provide important breeding habitats and food resources for many species of farmland birds. Also, as mentioned before, hedges reduce soil erosion and buffer arable field run-off, filtering out nutrients and pesticides. (Underwood, E. and Tucker, G.,2016)

6.2.5.5. Landscape features — buffer strips

The important attributes of buffer strips are the following:

- the dimensions and location of the buffer strip;
- the density and structure of vegetation;
- diversity of vegetation. (Tzilivakis, J., et al. 2015)

Buffer width has an impact on pesticide drift and surface run-off: the impact increases with buffer width due to greater opportunity for infiltration (surface run-off) and filtration by vegetation (pesticide drift). (Tzilivakis, J., et al. 2015)

The **management of the adjacent field** also affects the buffer strip, especially if the field is prone to erosion. Buffer strips may become overwhelmed if there is excessive sediment delivery, so there is a risk that they may become less effective in **locations** where soil erosion is high. (Tzilivakis, J., et al. 2015)

The **density and diversity of vegetation** is also an important factor as dense vegetation provides a greater barrier to overland flow (and the pollutants it carries) than more sparsely populated buffer strips, thus reducing flow velocity and increasing time for infiltration. Structurally diverse habitats such as rough grassland, scrub, hedgerow or woodland in close proximity provide a favourable habitat. This habitat declines in suitability with a decrease in structure, for example frequently cut vegetation maintained at a low uniform height or where large areas of bare or frequently disturbed ground are present. (Tzilivakis, J., et al. 2015)

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