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Green and Blue Infrastructure (GBI) in an agricultural setting: can the Common Agricultural Policy (CAP) greening support a GBI in the agricultural landscape?

Abstract

There is significant interest in the use of Green and Blue Infrastructures (GBI) (nature-based management measures) to replace hard engineering forms of intervention in land management (grey infrastructure). Such approaches are encouraged through the EU Green Infrastructure Strategy. The Strategy relies on other policies to reach its desired aims, in agricultural land, particularly on the environmental elements of the Common Agricultural Policy (CAP). This paper describes a two-stage analysis examining the likelihood of the CAP delivering GBI targets. First EU level policies are examined in order to define the types of GBI features recognised and encouraged by EU policies. Secondly, the implementation choices in three example member states are examined.

Keywords: common agricultural policy (CAP), greening, green infrastructure, blue infrastructure, European policy

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Introduction

There is an increasing interest in the use of nature based solutions, often referred to in policy as Green Infrastructure or, where aquatic ecosystems are included, Green and *Blue* Infrastructures (GBI) to replace hard engineering forms of intervention in nature management. A significant advantage of these types of natural solution, is that they can often deliver multiple benefits for example a restored floodplain can slow water flow reducing flooding, absorb carbon dioxide and benefit wildlife.

While GBI as a concept is widely accepted, implementing it in practice is proving to be more difficult. In particular, linking GBI on a regional scale across rural landscapes is challenging. Agricultural practice has significant impacts on the European landscape. Almost 50% of the EU land area belongs to agricultural holdings and 40% is included in the utilised agricultural area (EUROSTAT 2015). Building up GBI structures in rural areas therefore requires a large number of individual farmers to carry out coordinated actions to manage habitats and landscape features. One of the most obvious policy means of incentivising them to do this is through so-called broad and shallow environmental measures encouraged through the Common Agricultural Policy (CAP).

Agri-Environment-Climate (AEC) measures currently included in Pillar 2 of the CAP have been shown to support GBI (Trinomics, 2016) and biodiversity on the field to farm scale (Concepción et al, 2012). The effects however vary depending on the type of farming and biogeographical conditions (Diaz and Concepción, 2016). This paper examines the extent to which environmental conditionality in pillar 1 is likely to contribute to GBI, in particular, the extent to which the so-called “greening” of the CAP in the 2014 reform could contribute to an enhanced provision of GBI across European agricultural landscapes. Additionally, it looks at how the flexibility given to member states has influenced their implementation choices and how this could potentially impact on GBI development. The findings are used to discuss how implementation of the future CAP could benefit GBI.

Approach

To do this, a two-stage analysis was carried out, first focusing on EU level, in order to understand the policy framework in which the CAP may influence GBI developments across Europe. Secondly, the implementation choices in three example member states (Bulgaria, Germany and Spain) were examined.

First, the analysis focused on the EU level regulations and legislative texts of all GBI relevant policies (as listed in the EU GI Strategy). The documentation review was used to define a list of “GBI features” i.e. recognisable landscape features included in the policy documents, which could be said to make up GBI in the agricultural landscape. This initial list was refined through a literature review, focusing particularly on EU-wide meta-reviews of the ecosystem services provided by landscape features. The review also examined the aims of the policy documents related to the establishment of GBI, allowing the definition of a list of GBI-relevant aims described in EU land use policies. The information collected was used to draw some first inferences about how CAP greening may impact upon GBI across the EU and to identify areas to be examined in greater detail when looking at the national implementation of the selected policies.

Second, information on the translation of selected EU policies into national legislation, as well as additional national legislation related to GBI, was collected using a standardised template for each of the case study member states. The analysis of the national policy templates highlighted some of the similarities and differences between the ways member states have chosen to implement Pillar 1 of the CAP and allowed examination of the areas which could potentially have an impact on GBI in the agricultural landscape.

Evolution of the CAP

The CAP was established to improve food security and increase agricultural productivity but has evolved over time. It over-achieved its initial aims of increasing food production to the extent that in the 1980s quotas were introduced to reduce production. The environmental impacts of the CAP were already part of the discourse around reform at this point. The Agricultural Structures Regulation of 1985 (EU Regulation 797/85), introduced support for income lost implementing environmental measures in sensitive areas and this was integrated into the CAP as a voluntary measure in 1987 (Batáry et al, 2015). However the first compulsory (for member states) measures on the EU-level were added in 1992 with the MacSharry reform which introduced voluntary (for farmers) agri-environment schemes aimed specifically at reducing the environmental impact of agriculture. This approach was reconfirmed and developed at the end of the decade, when the Agenda 2000 reform, established the CAP on its currently recognisable basis of the two pillars: pillar 1 as direct support to producers and pillar 2 rural development aid. The agri-environment payments under pillar 2 were for a long time, the most important contribution to environmental aims.

Initially there was a clear division between the aims of agri-environment support and measures to support the agricultural production and competitiveness. This led to the criticism that instead of reinforcing one another, they had conflicting aims, with the much larger price support payments incentivising production while agri-environment attempted to repair the damage to the environment. In addition, the voluntary nature of agri-environment schemes, meant that in most Member States, uptake by farmers was limited, so that their contribution of environmental benefits to the wider countryside could not outweigh the impacts of intensive production on biodiversity (e.g. Díaz, Concepción 2016). In integrating measures to support investment and increase competitiveness into the Rural Development support, and cross compliance into pillar 1, supplemented by greening ten years later, the aims of the two parts of the CAP have gradually converged. In the latest iteration, “sustainable management of natural resources and climate action” is one of the three aims of both pillars.

The effectiveness of greening has been questioned by many (Ecorys et al. 2016; Alliance Environnement and the Thünen Institute 2017; Underwood, Tucker 2016) and as mentioned above, it will not survive the next CAP reform (2021) in its current form. Nonetheless, environmental conditionality remains an important part of the justification of direct support through the CAP. An important change precipitated by the introduction of environmental conditionality, is that while direct support is only paid to “agricultural land”, the definition of agricultural land has broadened to cover not only the cropped or grazed areas but also the landscape features associated with agriculture and forage systems broader than grassland (i.e. agroforestry or heath). This means that the CAP, theoretically at least, has greater potential to influence the conservation or reestablishment of GBI in the farmed landscape. A second important change, which looks likely to continue in the next round of CAP reform, is the increased flexibility afforded to member states in choosing how to implement environmental conditionality. This is deemed necessary to reach environmental objectives since the biogeographic conditions as well as the farming systems vary significantly across the EU.

Development of EU Green Infrastructure policy

The term Green Infrastructure (GI) was adopted into the EU policy framework in 2011 as a part of the EU Biodiversity Strategy for 2020. Target 2 of the Biodiversity Strategy is: “*By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15 % of degraded ecosystems*.” This is supported by Action 6a: “*The Commission will develop a Green Infrastructure Strategy by 2012 to promote the deployment of green infrastructure in the EU in urban and rural areas, including through incentives to encourage up-front investments in green infrastructure projects and the maintenance of ecosystem services, for example through better targeted use of EU funding streams and Public Private Partnerships*.”

The GI Strategy has since been developed (European Commission 2013). In it, GI is defined as *“a strategically planned **network of natural and semi-natural areas** with other environmental features designed and managed to deliver a **wide range of ES**. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and*

other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings". This definition includes the two key elements of GBI, its nature as a connected network of physical **features** and and its multifunctionality i.e. its importance as a means of delivering ecosystem services to reach particular policy **aims** (Baró et al. 2016). The strategy describes how GI should be supported through an existing array of EU land use and environmental policies.

Green Infrastructure, as well as the synergies and links with existing policy, is explained further by a range of background papers commissioned by the European Commission and the European Environmental Agency (e.g. EEA, 2014, European Commission, 2013, Trinomics, 2016). These examine, for example, the different scales of GBI from small-scale features such as green bridges to large-scale mountain ranges as well as the difference between reintroduced features within a town to the preservation of existing landscape elements in rural areas (European Commission, 2013). The aims of GBI to support a range of ecosystem services as well as to provide habitat corridors for particular species are also examined (EEA, 2014). Perhaps partly due to this profusion of aims and definitions, as well as the guiding nature of the Strategy, which is not backed up by specific legislation, member states have had some difficulties in translating the GI strategy into their own legislation and have approached the task in very different manners. For this reason, the Commission, together with their "GI Working Group" composed of member states and stakeholders, are reviewing the implementation of the strategy and working on GI guidance for MS as part of the Action Plan for Nature, People and the Economy. Drafts of the guidance focus mainly on building up a GI network through specific projects financed e.g. through the LIFE fund and on urban GBI. There has so far been less focus on smaller scale GBI elements in the wider countryside. The assumption seeming to be that the environmental parts of the CAP will contribute sufficiently towards meeting this aim.

Linking GBI with other policies

While the term GBI was introduced to facilitate a comparison between nature-based management and man-made "grey infrastructure", it encompasses a range of concepts already included in earlier EU environmental leglistation. Thus, the 1992 Habitats Directive requires not only the protection of specific habitats and species within and outside protected areas but also of features connecting protected areas. The 2012 Water Blueprint, effectively an action plan for implementing the EU Water Framework Directive and EU Floods Directive, introduced the concept of Natural Water Retention Measures which should be used to meet the objectives of the Directives. It is noticeable that the earlier pieces of legislation refer to habitats, species and ecological quality, whereas later, the focus has moved towards the benefits nature provides to man i.e. nature based solutions and ecosystem services. Table 1 lists the policies considered most relevant to GBI either because they share aims or because they are likely to have a significant influence on the development of GBI in the agricultural landscape.

Table 1. EU policy aims relevant to GBI - findings of the BIOGEA Project (Marsden and Jay, 2017)

Policy	Date	GBI-relevant aim
Biodiversity strategy	2011	Target 2: maintaining and enhancing ecosystem services and restoring degraded ecosystems by incorporating green infrastructure in spatial planning.
Nature : Birds Directive Habitats Directive	 1979 1992	Require the management of habitats outside protected sites and make specific reference to connecting sites and connective features. The 2017 Action Plan for Nature, People and the Economy requires the development of guidance on GI projects.
Climate and Energy Framework 2030	2016 (draft)	The LULUCF draft regulation makes reference to a range of GBI features such as forestry, grassland, cropland, wetland
Climate Change Adaptation Strategy	2013	Aim to ensure the full mobilisation of ecosystem-based approaches to adaptation building on the Green Infrastructure Strategy.
Water Framework Directive Floods Directive	2000 2007	Objective to protect of aquatic ecosystems and wetlands. The 2012 Water Blueprint includes the concept of Natural Water Retention Measures, i.e. protection of GBI to meet the objectives of the Directives.
Nitrates Directive	1991	Annex 2 includes semi-natural features to include in the code of good practice for farmers to meet the aim of the Directive in protecting ground and surface waters from agricultural nitrate pollution.
CAP Pillar 1	2013	The EFAs included in greening include a list of specific landscape features which can contribute to a GBI network.

CAP Pillar 2	2013	General aim of restoring, preserving and enhancing ecosystems related to agriculture and forestry.

A comparison of the policies stated goals and objectives lead to the conclusion that on paper at least, there is little conflict between policy aims. Conflict or incoherence is more apparent in the different governance structures of the polices, which are divided between different Directorate Generals within the European Commissions, examined by different parliamentary groups and discussed by different stakeholders and member state representatives in different working groups. Lack of coordination of the policy timetables was also evident, for example the next evaluation of the Biodiversity Strategy in 2020 and the Water Framework Directive in 2021 will be too late to feed into the CAP reform discussions, already underway (Marsden and Jay, 2017).

Defining GBI in the agricultural landscape – GBI features

As described above, GBI is a fairly diffuse concept with different meanings being assigned by different researchers, administrators and interest groups (European Environment Agency 2011). The Staff Working Document accompanying the GI strategy (European Commission 2013c), acknowledges this issue:

> *"The types of physical features that contribute to GI are diverse, specific to each location or place and very scale-dependent. On the local scale, biodiversity-rich parks, gardens, green roofs, ponds, streams, woods, hedgerows, meadows, restored brownfield sites and coastal sand-dunes can all contribute to GI if they deliver multiple ecosystem services. Connecting elements are green bridges and fish ladders. On the regional or national scale, large protected natural areas, large lakes, river basins, high-nature value forests, extensive pasture, low intensity agricultural areas, extensive dune systems and coastal lagoons are just a few of many examples. On the EU scale, trans-boundary features such as international river basins, forests and mountain ranges are examples of the EU's supranational GI."*

Despite this difficulty in identify the specific elements of GBI, the EC has produced an overview of features considered as GBI on the various scales. For example, on the local scale, hedgerows, stonewalls and small woodlands might be considered to contribute to GBI, on the regional scale, agricultural landscapes and on the European scale transboundary features such as mountain ranges or river habitats. The scales used, depend to an extent on the policy aims that are being examined. For example it might make more sense to look at the impacts on a particular invertebrate on the field level, the impacts on water quality on the landscape level and the impacts on greenhouse gas emissions on the supernational level. Whether the listed features can really be considered to be GBI, will also depend on how they are placed in the landscape and consequently the benefits they can deliver. For certain species, for example the physical connectivity of the features is very important. For other ecosystem services, the quantity of the particular feature rather than its connectivity might be more important.

On a practical level, in order to examine the impacts of policy on GBI, it is necessary to have a clear definition of what it is. For the purposes of examining the impact of agricultural policy, landscape features which could form part of a GBI network from the field to farm level were listed. The list of "GBI features" was based on the features identified by the European Commission for the local level. As part of the policy review, the way in which these features were included in a range of EU land use and environment policies was examined. The list and characterisation of the features was adapted during this process to ensure that the features selected are clearly recognisable in the policies. In a second stage, a number of meta-reviews of the evidence of the ecosystem benefits provided by the features was used to refine the list (Dicks et al. (2013), Bues et al (2013), EIP-AGRI (2014), Tzilivakis et al. (2015), EIP-AGRI (2016), Nitsch et al. (2017), Pe'er et al. (2016), Underwood, Tucker (2016)). Finally the practical potential of measuring the features on the ground in the three member states was taken into account. The end result is a list of features recognisable both in the policy documentation and on the ground in the member states examined. Table 2, gives an overview of the GBI features, the types of land use associated with them and how they are included in the EU policies examined.

Table 2. GBI features included in EU policies

Policies influencing GBI						Policies relying on GBI			
Policy instruments	**CAP Pillar 1**					**Pilllar 2**	**Environmental policy**		
	EFA	**permanent grassland**	**Arable diversification**	**cross-compliance**	**agricultural land definition**	**RD**	**WFD / FD**	**Nitrates Directive**	**Nature Directives**
Policy aims	**Enhance the competitiveness and sustainability of agriculture**					**Help rural areas meet challenges sustainably**	**Good water quality / reduced flooding**	**Protect water quality**	**Favourable Conservation Status**
GBI elements (field to farm scale)									
Smallscale landscape elements									
Terraces	x			x	x	x			x
Isolated trees	x			x	x	x			x
Trees in line	x			x	x	x			x
Trees in groups and field copses	x			x	x	x			x
Ponds	x			x	x	x	x		x
In field elements (productive)									
Maintain permanent grasslands and pastures		x			x	x	x		x
Areas with short rotation coppices	x				x	x			
Agroforestry / orchards	x				x	x			x
Land lying fallow	x		x		x	x			
Connectivity features									
Buffer strips	x				x	x	x		x
Hedges and wooded strips	x			x	x	x			x
Field margins	x			x	x	x			x
Ditches	x			x	x	x	x		x
Traditional stone walls	x			x	x	x			x
Strips along forest edges (no production)	x				x	x			x
Maintain / manage bank					x	x	x		x
Maintain / manage natural elements									
Wetland		x			(x)	x	x		x
Floodplane		x			(x)	x	x		x
Bog or moor		x			(x)	x	x		x
Environmentally sensitive pastures		x			x	x	x		x

NB. x shows features which are included (x) features which can be included under particular circumstances, in this case if the features are managed as agricultural land or are kept in good agricultural and environmental condition.

CAP decisions on pillar 1 implementation: potential impact on GBI

The EU policy analysis showed that there are significant overlaps in the aims of the GI strategy with a range of environmental policies but that the CAP was likely to have the greatest influence on the development of GBI in agricultural landscapes. The focus of the national policy review was therefore placed on implementation of the CAP Pillar 1 as having the greatest potential to influence land use, given the administrative structures, size of the budget and number of farmers receiving support.

Under the 2014-20 CAP, direct payments are made up of a basic payment (or single area payment) determined by the area of land farmed plus a number of additional schemes. Out of these schemes, the so called “greening” payment is that of most obvious relevance to GBI. 30% of all direct payments should be dedicated to “greening”; which all farmers receiving support (with a number of exceptions) should apply in their farmed areas. Greening includes requirements to grow up to three crops for arable farms, maintain environmental focus areas (EFAs) on arable land and manage permanent pasture appropriately according to its environmental value. The measures included in the EFAs in particular, have potential to be used to provide a network of GBI features.

A novelty in the 2014-20 CAP was the amount of subsidiarity granted in implementation of the CAP Pillar 1, i.e. the flexibility member states had in their choices on how to translate the policy into national legislation. This applies to how the greening measures are implemented but also to other elements of direct payments, which can have an impact on the type of farmer, farming and land receiving support. This also has the potential to affect whether farmers chose to maintain GBI features or not in their farmed area and also how much of the total payment received by a farmer is dedicated to greening. The most relevant measures are described in Table 3. Member states could also ask farmers to work together to implement greening through collaborative systems, also likely to benefit GBI by increasing the chance that features are connected, but this was implemented in very few member states and not at all in the three examined below so is not included in the table.

Table 3. Flexibility given to Member States on implementing EU Policies related to GBI

Decisions	Explanation and potential to influence GBI
Payment model for the Basic Payment Scheme (BPS) or Single Area Scheme (SAS)	Member states can choose whether they pay a flat rate per hectare (on a national or regional level) or move towards a flat rate per hectare over the funding period. This can affect the level of payments received by different types of farming system in different regions. The SAS is applied in Bulgaria and is a flat rate per hectare.
Voluntary Coupled support (VCS)	Member states can couple support to particular sectors to the extent necessary to create an incentive to maintain current levels of production. Sectors include livestock, fruit, rice, protein, sugar. This provides an additional support to different sectors which depending on the sector may have a positive or negative impact on GBI. It also affects the relative importance of the Greening payment as a component of the overall support package.
Small farmer scheme (SFS)	Payment replaces all other payments (BPS etc). Exemption from greening and cross compliance. The maximum threshold for payments of 1250€. In some member states, a relatively high proportion of farmers receive this payment, meaning that they do not have to carry out greening measures at all. On the other hand, maintaining small-scale farming structures can benefit GBI.
Greening:	Broad and shallow agri-environment measures which all farmers receiving support (with a number of exceptions) should apply in their farmed areas.
• Crop diversification	• Farmers with between 10-30 ha of arable land must grow two arable crops. Farmers with more than 30ha must grow three arable crops. Little flexibility for member states (only in the period that the crops should be in the ground / will be checked)
• Permanent pasture	• Environmentally sensitive permanent pastures (designated by the Member States) must not be ploughed. Farmers must not convert more than 5% of total permanent pasture (land that has been pasture for over 5 years) to arable.
• Environmental Focus Areas (EFA)	• Farmers with more than 15ha of arable land must dedicate at least 5% to EFAs. The following count as EFAs: field margins, hedges, woodland, fallow land, landscape features, buffer strips, nitrogen fixing crops and ponds. Member states can choose what is added to the national list and farmers, which measures they select. Reviews of the benefits provided by these options suggest that landscape features, hedges and woodland can provide benefits for GBI.
Eligibility requirements	Member states can define the type of land which is counted as agricultural land (e.g. number of trees per hectare, types of forage in addition to grass, etc) as well as the actors who count as carrying out agricultural activities. In some member states, certain types of extensive farming or certain types of landscape feature are not included in the agricultural land definition.
Cross compliance	Set of basic rules which farmers need to follow in order to receive support. Of particular relevance are the good practice (Good Agricultural and Environmental Condition, GAEC) measures GAEC 1 (establishment of buffer strips) and GAEC 7 (retention of landscape features) as well as the Statutory Management Requirements (SMRs) based on the Nitrates, Birds and Habitats Directives.
Measures included in Pillar 2	Member states have significant flexibility about how they implement their Rural Development programmes. The measures most relevant to GBI is generally the agri-environment measure. In addition, it is in some cases possible to add to greening measures through agri-environment so long as farmers are not paid twice for the same activities.

Existence of a national GI strategy	In some member states, a specific GI strategy has been established in response to the EU GI Strategy. In others cases, member states say that they are meeting the requirements of the strategy through combining existing environmental policies.
Measures in biodiversity, water or climate policy specifically related to GBI	In some member states, measures in environmental policies have specific relevance to GBI for example, establishment of biotope networks, green or blue bands or green infrastructure networks.

Comparison across three member states

Bulgaria, Germany and Spain as case studies

In order to examine the potential impacts on GBI identified above in more detail, the translation of EU legislation in three case study member states, Bulgaria, Germany and Spain, was examined. In all three Member States, agriculture is spatially equally important, making up around 50% of the total land area. In other ways, the three countries are very different. Germany and Spain are both large countries by European standards with populations of 82 million and 46 million respectively. In both countries, policy is to a large extent regionalised, with decision-making for environmental policy and many aspects of agricultural policy occurring on the regional state level. Bulgaria has a much lower population (7.1 million) and population density and policy is decided on the national level. It is a new member state, joining the European Union in the 2007 enlargement. Agriculture is still a relatively important part of the economy, making up nearly 4.4% of the GVA (1.6 is the EU average, 0.7 and 2.5 in Germany and Spain). Farm sizes vary considerably between and within the countries. In Bulgaria, while almost 87% of farms are smaller than 5ha, the average farm size is above the EU average due to some very large arable farms. In Spain, farms tend to be small-medium and in Germany medium to large by EU standards. The three countries are thus used to represent the situation in more intensively farmed (and studied) northern Europe (Germany); and in relatively less intensively farmed Southern (Spain) and Southeast Europe (Bulgaria).

National choices around the CAP 2014-2020

The three countries have made different choices in how they have implemented the CAP 2014-20. Germany and Spain implement the BPS, moving away from historically based areal payments towards a national flat rate (Germany) and a regional flat rate (Spain). Bulgaria already has a flat rate payment per hectare having joined a later iteration of the CAP. Bulgaria and Germany chose to make use of the option to pay a higher rate for the first 30 and 46 hectares respectively while Spain did not use this option. Bulgaria and Spain, however have chosen to couple payments to production for particular sectors while Germany has not. These choices make a difference to the relative importance of the Greening payment to farms who receive support through VCS or the redistributive scheme. In addition, the three countries made use of the flexibility in defining the eligibility of types of farmers and agricultural land. Germany and Bulgaria have put in place “negative lists” to exclude certain companies such as airports from receiving support. All three countries have descriptions of the definition of forage areas nationally including up to 100 trees or bushes per hectare.

The three countries have made different choices regarding the greening options chosen (see Table 4). Bulgaria and Germany chose a wide range of options, though Bulgaria reduced the list after 2016. Spain however only chose four different options: fallow land; nitrogen-fixing crops, afforested areas and agroforestry. The potential that greening supports the conservation, or particularly the expansion, of the GBI features in Table 2 is therefore small. The justification for not including any landscape features in Spain is that they were already included in the cross compliance conditionality attached to Pillar 1 support.

In fact, the shorter list of options perhaps makes little difference in the final uptake of measures. In Germany 97% of the area dedicated to EFAs is covered by three options: catch crops; fallow land and nitrogen fixing crops. In Bulgaria three options cover 99% of the land: fallow land, nitrogen-fixing crops, and catch crops. Several previous reviews have highlighted that the measures connected with agricultural production (nitrogen-fixing crops, catch crops and fallow areas) are significantly more popular but the first two in particular, are likely to have minimal benefits for species and habitats (Underwood, Tucker 2016; European Commission 2016). What is noticeable is that the uptake of the measures most relevant to providing GBI in the agricultural landscape is minimal.

Table 4. Implementation choices for CAP Pillar 1 in the three member states

	Bulgaria	**Germany**	**Spain**
Size of CAP total (€) (2014-20)	7.4bn	44.1bn	42.9bn
Pillar 1 total (€)	5.1bn	34.7bn	34.6bn
BPS/SPS € per ha (2016)	102.9	179	93,4
Greening € per ha (2016)	64.5	86.5	48,4
Use of redistributive payment	Additional payment of 77,11 €/ha for the first 30 ha	Additional payment of around 50€/ha for the first 30 ha and 30€/ha to the next 16.	Not used
Voluntary coupled support	Used for dairy cows, suckler, ewes and goats, buffalo, frut, vegetables, protein crops	Not used	Used for beef, fruit and vegetables, grain and legumes, milk, nuts, protein crops, rice, sheep and goatmeat, sugar beet.
Small farmers scheme	Applied to maximum payment of 1250€	Applied to maximum payment of 1250€	Applied to maximum payment of 1250€
Greening decisions:			
Crop rotation (period for checking)	15.5-15.7	1.6-15-7	1.5-31.7
Grassland	Can be converted only with written permission	Permission needed for conversion (not granted if regional threshold has been passed	Conversion not allowed.
Environmentally sensitive grassland	All natura 2000 grassland areas	Grassland areas designated under the Habitats Directive (but not the Birds Directive)	All Natura 2000 areas
Environmental focus areas (ha in 2016)			
Land lying fallow	124,277	209,300	227,046
Terraces	10*	2	
Buffer strips	39*	4,346	
Agroforestry			0
Strips along forest edges			
Strips along forest edges no production	504	737	
Short rotation coppice	160	2,474	
Afforested areas		975	106,363
Catch crops/green cover	18,274	938,074	818,820
Nitrogen-fixing crops	102,471	175,646	
Landscape features (area in ha for total landscape features)	1773	33,200	
• hedges/wooded strips			
• isolated trees	*		
• trees in line			
• trees in group/field copses			
• field margins			
• ponds / wetlands	*		
• ditches	*		
• traditional stone walls			

*Grey squares where option available (details on the individual landscape features were not available for all countries). * removed as option after 2016.*

National approaches to Green Infrastructure

The three member states have also taken different approaches in implementing the Green Infrastructure Strategy[1]. Bulgaria is one of the most biodiverse countries in Europe according to European assessments. The Natura 2000 network covers nearly 35% of the terrestrial area. While there are several LIFE projects specifically addressing the connectivity of habitats, national legislation has not specifically taken up the terminology of green infrastructure and no national strategy exists. In Germany, the 2017 National Green Infrastructure Concept (Bundeskonzept Grüne Infrastruktur) aims to bring together the various national and regional policies relating the green infrastructure. This builds on a range of previous actions including the 2009 agreed establishment of a national ecological network (Biotopverbund) and the Green Belt initiative which stemmed out of the reunification of Germany (the previous border has been developed into a green belt) and the 2017 Blue Belt Initiative, aiming to expand this approach to water bodies. The problem has also been addressed from the angle of reducing fragmentation of habitats with the Federal Defragmentation Programme (Bundesprogramm Wiedervernetzung) in 2012. This reflects the fact that Germany is more densely inhabited than Bulgaria or Spain with significant grey infrastructure development pressures as well as intensive agricultural systems. 15.4% of the terrestrial area is designated as Natura 2000. Spain is relatively biodiverse, 27% of the country is designated as Nature 2000. In Spain, the elaboration of a national Strategy on Green Infrastructure, Connectivity and Ecological Restoration is on-going. Actions to date have focused on the biodiversity value of connecting protected sites. Certain states and cities have developed their own green infrastructure strategies.

Discussion

The GI Strategy on the EU level and the EU level activities on implementing the strategy, place a focus on urban GI and where rural GI is addressed, on individual cross-border initiatives. It is assumed that GBI in the wider countryside will be supported through environmental measures included in the CAP (Trinomics, 2016). This is reflected in national policy. We have therefore examined the relevant choices made by three member states with very different natural, political and social conditions in implementing CAP to raise some points for discussion about how pillar 1 (particularly greening) influences GBI in agricultural landscapes. This may be used to inform discussions on CAP reform on the EU level, for implementation choices by the member states and for discussions for the GI Strategy Working Group.

The EU providing a broad range of options to member states has resulted in member states presenting a broad range of options to farmers. In Germany and Bulgaria, almost all options were initially available to farmers. Bulgaria then chose to reduce this list based on the uptake of the options in the first two years. Spain took a different approach in excluding options already covered by cross compliance. Neither the initial choice of option nor subsequent changes are related to the likely benefits of the measures to the environment. Instead, selection or adaptation by member states is based on whether farmers are likely to use them or not.

Member states providing a broad range of options to farmers does not result in a broad range of different options being implemented by farmers. The examples of Bulgaria and Germany illustrate where choice is available, only a few measures have been selected. There are however differences in focus in the member states, for Bulgaria, fallow land was by far the most popular option, whereas in Germany, catch crops was taken up most widely. This is likely to relate to current practice as well as to the advice received by farmers. In general, farmers have chosen “productive” measures such as catch crops, nitrogen fixing crops and fallow land which are least likely to contribute to GBI. Adjustment of the “weighting” of different EFA options (weighting determines the amount a EFA feature contributes to a farmers’ EFA) could make some of the more environmentally beneficial options more attractive, however the only adjustment made on the EU level is likely to increase the attractiveness of the productive measures which are already well-used (Marsden and Jay, 2018).

Overlap between the measures included in cross compliance, greening and agri-environment may benefit GBI more. While existing features within agricultural landscapes should be protected through cross compliance, it does not provide any incentive for the expansion or recreation of these features. Nor does it encourage bringing additional non-productive features into the area which qualifies for agricultural support If a feature is also included in greening, the incentive to include this area is greater since it will help to meet the areal requirement. Neither cross compliance nor greening are likely to encourage management going beyond the requirements (e.g. creation of features). There are examples (Germany)

[1] https://biodiversity.europa.eu/countries/gi

in the case studies, of agri-environment measures providing a top-up to greening to increase the environmental management of the areas included.

Options to encourage collective approaches to greening have not been used. None of the member states examined took up the options to either allow collective approaches within an area (this was used by only two member states in total and has been very little used by farmers). In the context of managing GBI features, collaborative approaches have great potential as they may help to ensure that the area or design of a particular feature on a multi-farm to landscape scale delivers more. There is currently significant interest in this area for water and soil policy (see for example, currently ongoing work by the ENRD Thematic Group (TG) on sustainable management of water and soils) and biodiversity (Pe'er et al., 2017).

More ambitious management requirements have not been attached to greening measures. Numerous reviews illustrate that the management of a feature is the most important determinant of the quantity or quality of environmental services it can offer. Member states have the option to attach management requirements to greening measures but in the case studies examined, the requirements largely matched those on the EU level. Illustrative of this was the use of plant protection products on productive EFA measures which continued in most member states until a ban on the EU level was introduced (Marsden and Jay, 2018).

Choices on greening options cannot be regarded in isolation but should be examined together with other pillar 1 choices. For example, the types of land that qualify as agricultural land can mean that certain GBI features are not included in the agricultural area. Small farms often do not have to carry out greening at all and even if they are above the size threshold for the small farm payment, the proportional importance of greening for an individual farmer is potentially less through the increased percentage of the BPS from redistributive payment and voluntary coupled support.

The reasons for choosing particular measures and views on their effectiveness on a local to regional level, will be examined further through the BIOGEA project which will look at the implementation of greening measures in several smaller scale case studies – a more intensively and more extensively farmed example in each of the three member states. Biological fieldwork and stakeholder interviews will be used to examine the environmental impacts of greening measures in these particular locations and how they have been combined with other measures. Additionally the impacts in areas with more or less previously-existing GBI will be examined.

The EU and national policy overview, however, suggests that to date, greening does not significantly incentivise management of GBI features in agricultural landscapes and adjustments need to be made to enhanced environmental conditionality to ensure that the measures providing higher environmental benefits are more attractive to farmers.

The European Commission proposal for a regulation for the CAP after 2021 reform, was published 1 June 2018 (European Commission, 2018) and is currently being widely discussed. It does not include greening in its current form but integrates the individual greening measures back into cross compliance "enhanced environmental conditionality" as well as giving member states more flexibility for defining their environmental priorities through pillar 1 "eco-schemes". Our examination of how member states have used the flexibility afforded to them in the 2014-20 CAP is therefore timely and can contribute to the debate on increased subsidiarity of the CAP and the likely environmental impacts thereof. Giving member states a broad range of greening options to choose from and the flexibility to change these options on an annual basis has not resulted in the selection of measures which will contribute to GBI nor adaptive management of these options based on farmers' choices in the first years. The incentives for member states to ensure the measures available to farmers are targeted to meet environmental needs therefore need to be greater.

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This submission is a product of the project Testing BIOdiversity Gain of European Agriculture with CAP greening (BIOGEA). It researches the impact of land use change on Green and Blue Infrastructure (GBI) in the agricultural landscape. The impacts of policy on GBI and GBI on biodiversity and ES are examined through policy analysis on the EU and national level and biological monitoring and modelling in six case study areas in three Member States (Germany, Spain and Bulgaria) chosen to represent intensive and extensive landscapes in different biogeographic regions. Project outputs will include advisory tools and policy recommendations for the CAP reform.

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