December 2021

Report

CAP Strategic Plans shadow assessment of environmental needs

Spain

The Institute for European Environmental Policy (IEEP) is a sustainability think tank. Working with stakeholders across EU institutions, international bodies, academia, civil society and industry, our team of economists, scientists and lawyers produce evidence-based research and policy insight.

Our work spans nine research areas and covers both short-term policy issues and long-term strategic studies. As a not-for-profit organisation with over 40 years of experience, we are committed to advancing impact-driven sustainability policy across the EU and the world.

For more information about IEEP, visit www.ieep.eu or follow us on Twitter @IEEP_eu and LinkedIn.

DISCLAIMER

The arguments expressed in this report are solely those of the authors, and do not reflect the opinion of any other party.

THE REPORT SHOULD BE CITED AS FOLLOWS

IEEP (2021) 'CAP Strategic Plans shadow assessment of environmental needs: Spain', Institute for European Environmental Policy.

THE WORK WAS AUTHORED BY

Gauthier Schefer, Juliette Pagnon, Giulia Costa Domingo

CORRESPONDING AUTHORS

Juliette Pagnon (jpagnon@ieep.eu)

ACKNOWLEDGEMENTS

We gratefully acknowledge helpful reviews and comments from Harriet Bradley, Kaley Hart and Faustine Bas-Defossez.

IEEP main office
Rue Joseph II 36-38,
1000 Brussels, Belgium
Tel: +32 (0) 2738 7482
Fax: +32 (0) 2732 4004

London office
IEEP
25EP, 25 Eccleston Place
Belgravia SW1W 9NF
Tel: + 44 (0)204 524 9900

Table des matières

1. INTRODUCTION

Science is unequivocal on the need to move fast to sustainable farming; the future CAP legislative texts as agreed between the co-legislators in June 2021 recognise that greater environmental and climate ambition is required and have made this an explicit requirement on Member States.

A major feature of the future CAP involves a fundamental change in the delivery approach towards one in which all CAP support (both Pillar 1 and Pillar 2) is focused on performance, delivering results against a set of EU objectives in light of national and regionally identified needs. The *so-called* CAP strategic plans (NSP) will be at the heart of this new model, and could, if used at their best, most likely help support a transition towards sustainable farming across the EU. However, given the way Member States used the flexibilities under the current CAP for Pillar 1 greening payments to maintain the status quo instead of increasing environmental performance, some doubts remain as regards the level of environmental that will eventually be agreed for the future CAP NSP.

A noticeable difference between what was agreed back in 2013 and what has just been agreed for the future CAP however is that, unlike under the current greening regime, Member States will have to justify their intervention logic and implementation choices on the basis of needs and pre-established objectives. This has the potential to raise the environmental ambition, as the lack of justification provided by the Member states regarding their greening implementation choices was indeed identified as one of the main reasons leading to very limited environmental and climate impacts (Alliance Environnement, 2017).

Another major difference between the current CAP and the future one is the Green Deal which is the most ambitious environmental policy initiative to date and sets out a strategy for the EU with climate and the environment at its centre. As a first step towards achieving this, a suite of new policies, including notably the Farm to Fork Strategy and the Biodiversity Strategy, is envisaged. Agri-food systems are key sectors for the delivery of the objectives on the table and the CAP is the most important EU policy mechanism with the capacity to have significant European-wide impact on the agricultural dimension of these systems in particular. Even if in the legislative texts as agreed between the co legislators the link made between the Green Deal objectives and the CAP strategic plans remain timid and not legally binding, these plans still have the potential to be an effective mechanism to meet them.

Exactly how these evaluations of needs will guide Member States' intervention logic remain however unclear as Member States are still going through the drafting of their

plans[1], the same goes with how the European Commission will evaluate these national assessments and use them for its own approvals in 2022.

Focus of the report

This report aims at: 1) providing Spanish and EU stakeholders and decision makers with evidence-based material to inform the Spanish CAP Strategic Plan's intervention logic, and 2) providing a reference point for the evaluation of the Spanish government's own needs assessment in their CAP Strategic Plan. Similar reports have been drafted for France, Germany and Hungary.

This report begins with an evidence-based evaluation of the state of the environment and climate in Spain. This evaluation looks at past trends, future outlook, and relevant policy objectives/targets in five key areas: climate, biodiversity, water, soil, and air quality. Second, the report introduces a list of needs in the farming sector based on that evaluation. The report then moves to priority actions, followed by suggestions for intervention measures and insights into harmful measures.

Finally, the report outlines the Green Deal objectives that relate to the needs and actions identified in the report.

[1] See annex 1.

2. STATE OF THE ENVIRONMENT

2.1 Climate

2.1.1 Mitigation

Past trends and outlook:

Spain's agricultural sector is the third largest agricultural greenhouse gas (GHG) emitter in the EU (after France and Germany), accounting for 10% of total EU agricultural emissions (EC, 2020). Emissions of GHGs[2] from the agricultural sector represent 11.3% of total national emissions. Of these, around 66% of total net agricultural GHG emissions in Spain are directly related to livestock farming (in particular enteric fermentation from cattle production) and 31.1 % to agricultural soils from crop farming (EC, 2020).

Those emissions fell by 7% from 1990 to 2013 but increased by 9,3% to the current levels (EC, 2020). In terms of CAP support in the current programming period, Spain reached its target for agricultural land under contracts to reduce GHG and/or ammonia emissions, but was not on track to meet its target for reducing GHG and/or ammonia emissions from livestock units (EC, 2020).

As a result, projections by the Spanish authorities for non-ETS sector emissions (including agriculture) under a business-as-usual (BAU) scenario show a relatively stable linear reduction of emissions resulting in a decrease of 17% by 2030 (with around 6% of that from agriculture). With additional measures (including agricultural), a decrease of 37% is projected (Miteco, 2021 a). Meanwhile, grasslands and wetlands have switched to become slight emitters in more recent years. The current measures[3] proposed in the NECP plans regarding the LULUCF sector "*would generate additional removals of 0.96 MtCO2-eq in 2030 compared to the baseline scenario (0.78 MtCO2-eq in forest sinks and 0.18 MtCO2-eq in agricultural sinks)'* (Miteco, 2019).

Relevant policy objectives/targets

The Spanish National Energy and Climate Plan states that the agriculture and livestock farming sector will have to reduce its GHG emissions by 18% by 2030 compared to 2005 levels (EC, 2020). The continuation of current emissions trends would prevent the achievement of the target by 2030. Spain is however considering regulatory options

[2] Including LULUCF.

[3] Regeneration of silvo-pastoral systems and forest, prevention of forest fires or promotion of agroforestry, promoting poplars as replacements for agricultural crops in flood-prone areas, hydrological-forest restoration in areas at high risk of erosion.

to cut emissions from the sector, and the potential integration of NECP measures into its CAP NSP plan (through the way it plans to implement conditionality, eco-schemes, and other relevant interventions). An over two-fold increase in power generation by 2030 from biomass is also planned; from 677MW in 2015 to 1,408MW in 2030 (Miteco, 2019).

2.1.2 Adaptation

Past trends and outlook

Spain, as other EU Mediterranean countries such as Italy, is projected to be particularly affected by the impacts of climate change (Gonzalez Sanchez E et al, 2018). Heat waves, water stress and extreme weather events will impact crop and livestock productivity and will lead to value losses at farm levels, as a 1 °C rise in global temperature could generates value losses up to 9 % (EEA, 2019).

The rise of temperature (+1.7°C since pre-industrial times) and changes in the precipitation patterns have been identified as the most important challenges for Spain. Regions will be impacted differently, with the hardest consequences felt by the South and South-East regions where water demands are projected to rise further due to heat and hydraulic stress and extreme weather events. Those events will impact the main categories of land use: wooded areas on farm (27.6 million ha), arable land (11.5 million ha) livestock and crops. For example, changes in seasonality have led to the progress of a semi-arid climate (increase of 6% of the national territory coverage over the last 40 years). Diseases and pests may also increase or spread to higher latitudes, which will lead to negative productivity trends (EC, 2020). According to the Spanish National Climate Change and Adaptation Plan 2021-2030 (PNACC), their natural control by frost and low winter temperatures, in areas such as plateaus, may diminish. As consequences, the quality of products such as wine, and in particular "premium wine", could be affected by climate change consequences (EEA, 2019). Land abandonment tendencies also runs the risk of increasing the likeliness of forest fires (CAN EU, 2021). Increased risk of flooding related to sea-level rise will affect the whole Atlantic coast, with specific vulnerabilities from climate change for the Canary and Balearic Islands as well the Cantabrian coast. This could cause intrusion of seawater inland, affecting irrigation and causing soil salinisation. In the Canary Islands and Cantabria, increases in torrential rain may lead to crop damage and affect harvests. The islands will experience greater decreases in rainfall than the rest of Spain (EC, 2020).

Relevant policy objectives/targets

The PNACC does not include targets for the agricultural sector. It does however mention that adaptation actions will be funded through the future Spanish CAP NSP.

Table 1: State of climate overview table

CLIMATE * **	Past trends and outlook		Prospects of meeting policy objectives/targets under the assumption of unchanged policy	
	Past trends (10-15 years)	Outlook to 2030	2025	2030
Mitigation				
Adaptation				

** Evaluation made by the author from the information above*
*** Colour code: red = deteriorating trends/not on track; yellow = trends show a mixed picture/ partially on track; green: improving trends/on track.*

2.2 Biodiversity

2.2.1 Common species: Farmland bird index and pollinators

- **Farmland bird index**

Past trends and outlook

Farmland bird populations, a key indicator of farmland biodiversity, are declining in Spain. The index value shrank by 33% from 2000 to 2017, with declines varying amongst species: the Iberian grey shrike (*Laniu meridionalis*) and the red-legged partridge (*Alectoris rufa*) declining by 63% and 38% respectively since 1998[4] (SACRE 2020). The decline in farmland birds is particularly strong in northern agricultural systems (notably the Cantabrian countryside) and herbaceous[5] crop cultivation, due to their lower landscape complexity compared to other systems like arboreal systems and agricultural mosaics.

General declines in farmland birds have been associated with agricultural intensification with increased use of pesticides and the associated reduction in fallow land which decreased by 1.1 million hectares between 2008 – 2018 (Traba, J., & Morales, M. B., 2019). The dominant agricultural habitat for farmland birds, including threatened steppe species, in Spain is dry cereal farmland, which has undergone intensification in input use and loss of landscape heterogeneity. Although fallow land increased with the introduction of greening measures, increasing by 3.09% from 2019-

[4] Primarily due to the use of agricultural chemicals which kill their prey, along with abandonment.
[5] Herbaceous crops: with fallow land they make up arable land in Spain.

2020, the total area is still considerably below former levels (MAPA 2021). Other threats to Spanish farmland birds include the increase in irrigated woody crops, fertiliser use as well as the decrease in extensive grazing, and land abandonment in dry cereal farmland.

Relevant policy objectives/targets

The decline of farmland bird species in Spain is mainly addressed via the national law transposing the Birds Directive. No reference is yet made to the need to reverse the decline in farmland birds, as part of the EU Nature restoration plan included in the Biodiversity Strategy to 2030. However, the EU will propose legally binding restauration targets that Member State will have to implement (see below)

- **Pollinators**

Past trends and outlook

Spain has a large proportion of the EU's pollinator-dependent crops, which are already facing a deficit in pollination (Breeze, T D, 2014). An estimated 2.6% of Spanish bee species are threatened according to the European Red List of Bees. However, considering that the status of over half of EU bees is unknown, the true number of threatened bee species may well be much higher (Miteco, 2020). Monitoring of grassland butterflies for the European Grassland butterfly indicator also shows declining trends for butterfly species in Spain[6]. For example, in Catalunya (a north-eastern region in Spain), grassland butterflies declined by 71% from 1995-2019 (considerably higher than the decline of 57% recorded in shrubland) (OPNB, 2020). Agricultural intensification represents one of the biggest pressures for pollinators (including butterflies) as it can destroy pollinator habitats, threaten their food supplies and expose them to pesticides. The conversion of grassland to cropland is one of the key threats for Mediterranean butterflies (Numa C et al, 2016). In the north of Spain, where pastures are the dominant landscape, butterflies face additional threats including overgrazing, excessive mowing, and the use of fire for the creation and maintenance of open field areas (Van Swaay, C.A.M. et al, 2016).

Relevant policy objectives/targets

The Spanish National Strategy for Pollinator Conservation was adopted in September 2020, establishing measures to protect wild and domestic pollinators at both the national and regional level. The Strategy has six main objectives including the promotion of favourable habitats for pollinators on agricultural land and reducing risks from phytosanitary products. It is not legally-binding and no quantitative, measurable

[6]Spain has three butterfly monitoring schemes: Catalonia, Basque country, and other parts of Spain.

targets are set under the objectives. However, the implementation of the Strategy as a whole will be evaluated and some measures are expected to be integrated into sectoral programmes. Objective B.1, for example, aims to integrate measures for pollinator habitat conservation into CAP rural development programmes over the next programming period.

2.2.2 Protected species and habitats

Spain is one of the most biodiverse countries in the EU: it is home to 26% of the species protected under the Birds and Habitats directives and 55% of the habitats protected under the Habitats Directive (CBD n.d; Miteco, 2018). Due to its high proportion of endemic species (those occurring only within the country), it is considered to be one of the world's 25 biodiversity hotspots (CBD n.d). A considerable proportion of this impressive biodiversity is found in agricultural land, making Spain the European country with the highest levels of agricultural biodiversity. 40% of the species and 48% of the habitats protected under EU law in Spain are associated with agricultural landscapes (Díaz, M. et al, 2021).

- **Conservation status of agricultural habitats**

Past trends and outlook

In Spain, the latest data show that only 19.41% of species protected under the Habitats Directive are considered to be in good conservation status (the status of 18.71% species is unknown)[7]. The main threats and pressures identified for status of species associated with agricultural areas are the abandonment of traditional farming practices, agricultural intensification, use of pesticides, homogenisation of the landscape, transformation of rain fed cultivation into irrigated cultivation, habitat fragmentation and increase of infrastructure for the tertiary sector.

Despite the share of permanent grassland in the total UAA is slightly increasing (from 27% in 2014 to 29% in 2018), the quality of protected grassland habitats is decreasing (EC, 2020). From 2013 to 2018, only 9.4% of grassland habitats protected under the Habitats Directive were in favourable conservation status. Compared to the reporting period 2007-2012, this represents a decrease from 15%. On the other hand, 62.5% had an unfavourable-inadequate conservation status and 15.6% an unfavourable-bad conservation status, with the trend remaining negative. The more favourable areas are located in the north of Spain, whereas the *dehesas*[8] in the Southwest of Spain are indicated as more unfavourable (EC, 2020).

[7] 2013-2018 reporting under the Habitats directive.

[8] A traditional extensive agroforestry system where pastures and sparse trees co-exist.

In 2018, the share of agricultural area in Natura 2000 protected zones stood at almost 17%, including natural grassland. Spain also has the largest share of total EU Natura 2000 land area at 17.6% (138.311 km^2).

Relevant policy objectives/targets

National conservation strategies and recovery plans for endangered species have been set up. Also, as announced in the new EU Biodiversity Plan, the Commission will be proposing legally binding nature restoration targets in December 2021. Member States will be expected to prepare their own nature restoration targets by 2023, and implement them by 2027.

In addition to the Spanish Prioritised Action Framework (*Marco de Acción Prioritaria* – MAP) 2021-2027, whose targets focus on connectivity, resilience and knowledge gaps, the country has a national law on Natural Heritage and Biodiversity (42/2007) that sets the legal framework for conservation, sustainable use and restoration of biodiversity in Spain. This law requires the creation of a strategic plan on Natural Heritage and Biodiversity, to set objectives, criteria and actions to promote the conservation and sustainable use of natural resources. Only four out of the thirty-nine objectives[9] in the strategic plan for 2011-2017[10] were achieved (IEPNB, 2017). Those non-quantitative objectives aim for example at: improving knowledge, fostering a sustainable use of biodiversity and integrating biodiversity protection into all sectorial policies.

In 2020, two strategies were adopted: a National Strategy for Green Infrastructure and Ecological Connectivity and Restoration (Miteco, 2020), and a National Strategy for the Conservation and Use of Wild Relatives of Crops and Wild Plants for Food Use (MAPA, 2020). Both underline the importance of the preservation of a biodiverse agricultural landscape, and mention the central role of CAP funding, but remain vague on concrete estimates of funding requirements.

[9] Among 8 main objectives listed here

[10] The Spanish government has announced a new plan will be published this year up to 2030 which will build on lessons learned from the previous and will implement the commitments of the EU biodiversity strategy to 2030. However, at the time of writing, it has not been published yet.

Table 2: State of agricultural biodiversity overview table

BIODIVERSITY * **	Past trends and outlook		Prospects of meeting policy objectives/targets under the assumption of unchanged policy	
	Past trends (10-15 years)	Outlook to 2030	2025	2030
Common species : farmland & pollinators				
EU Protected species and habitats				

** Evaluation made by the author from the information above*
*** Colour code: red = deteriorating trends/not on track; yellow = trends show a mixed picture/ partially on track; green: improving trends/on track.*

2.3 Water

2.3.1 Water quality:

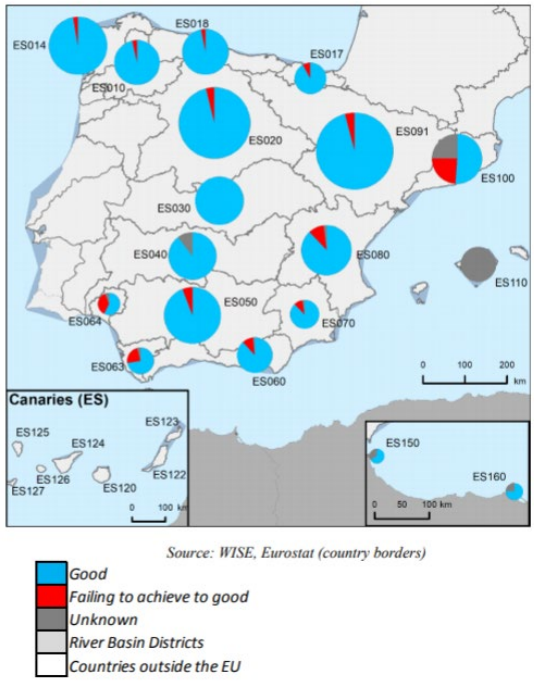
Past trends and outlook

The quality of water ecosystems is assessed by the ecological and chemical status[11] of surface water bodies and the chemical status of groundwater bodies.

[11]Chemical status relates to the presence of regulated chemical pollutants. Ecological status "*looks at the abundance of aquatic flora and fish fauna, the availability of nutrients, and aspects like salinity, temperature and pollution by chemical pollutants"* along with morphological features (EC, 2010).

In Spain in 2015, 87% of the surface waters and 69% of groundwater sites monitored were in good chemical status, but there are a lot of gaps and important variations in the level of surveillance and operational monitoring (EC, 2020). The overall sites monitored have increased since the first River Basin Management Plans (RBMPs), especially regarding chemical status in surface water (those with unknown status reduced from 37 to 6 % since the first RBMPs). However, some expected biological quality elements were still not included in monitoring for all water categories in some river basin districts (RBDs) (EC, 2015).

Chemical status of surface water bodies in Spain based on the most recently assessed status of the surface water bodies Note: Standard colours based on WFD Annex V, Article 1.4.3.



Regarding the assessment of surface waters' ecological status, Spanish monitoring programmes seem to vary a lot depending on the RBD, meaning there is no official aggregated data that assesses the national ecological status of surface waters. Still, in general, ecological monitoring was undertaken at more sites and in more water bodies than for chemical monitoring in all water categories. In its report on the second Spanish RBMPs, the European Commission flagged that the overall ecological status or potential has slightly improved, even though the proportion of water bodies at less than good status is still between 30 and 70 % for natural rivers in most RBD.

Water quality, of both surface and groundwater, is facing increasing agricultural-related pressures in Spain (EC, 2021 a). Several well-known factors are driving this:

- Pollution from nitrate and pesticides: diffuse agricultural pollution is the most significant pressure on groundwaters and second most significant pressure on surface waters. Pollution caused by nitrates is still widespread even though nitrate vulnerable zones (NVZ)[12] represent just 16% of the national territory and 35% of the agricultural area. Spain was recently in formal discussions with the European Commission over its breach of the Nitrates Directive (2018). During the period 2012-2015, 21,5% of groundwaters and 1% of surface waters monitored were affected by nitrate pollution. Moreover, whilst the number of sites affected by nitrate pollution for both water bodies decreased since 2004,

[12] Areas designated as being at risk from agricultural nitrate pollution.

the level of nitrate concentration in those sites increased between 2012 and 2015 in respect to the previous reporting period, in 34% of groundwater stations and 16% in surface waters stations (EC, 2020). This pollution is mainly due to mineral fertilizer widely used in agriculture.

- Water abstraction and flow diversion for farming purposes.

Relevant policy objectives/targets

Spain is implementing its second cycle of RBMPs *(Planes Hidrológicos de Cuenca*, PHC) 2015-2021 to reach the good status for all water bodies in 2027 set in the Water Framework Directive (WFD). The Ministry of Ecological Transition reported in 2019 that only 41% of primary actions planned in 2016-2021 have been accomplished. The Ministry of Ecological Transition reported in 2019 that only 41% of primary actions planned in 2016-2021 have been accomplished.

The third hydrological plan (2021-2027) is being prepared. The current stage of this process is the design of Important Issues Schemes (TSI) of intercommunity River Basin Areas, which highlight the needs identified by each hydrographic boundary. This is facing backlash from civil society for its overemphasis on irrigation and lack of ecological answers to the deteriorating quality of Spanish waterbodies.

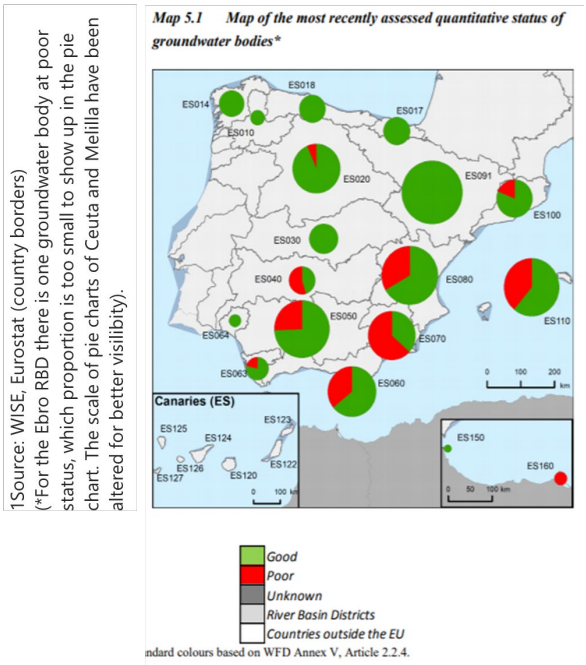
Moreover, a Royal Decree (in preparation) is intended to provide an answer to nitrate pollution beyond the transposition of the Nitrates Directive to take into account the 20% fertiliser reduction target and the 50% reduction in nutrient losses while ensuring no decrease in soil fertility in the Farm to Fork Strategy.

2.3.2 Water quantity:

Past trends and outlook

Agriculture is a great pressure on water resource availability in Spain. Although 81% of groundwater bodies are in "good quantitative status", water scarcity and access are a growing problem, and there is wide regional variation. In the Southern regions, the share of groundwater bodies in "poor quantitative status" can be as high as 60%, for example in Murcia.

Agricultural irrigation uses around 80% of all freshwater drawn from groundwaters in Spain, to cover the needs of irrigated farmland, producing more than half of the country's crop output (EC, 2020).



In the context of climate change and increased droughts, 70% of Spanish river districts monitored are already facing risks of water scarcity, some consuming almost all their renewable freshwater resources like the Balearic Islands (97%) or Segura (77%). Agriculture is one of the main users of water in all these districts.

As an example of detrimental water exploitation practices, a ruling of the European Court of Justice from 24 June 2021 found Spain guilty of infringements of both the Water Framework Directive and the Habitats Directive. The case regarded the Doñana aquifer, overexploited with thousands of illegal wells draining groundwater resources for strawberry cultivation and touristic development. The regional government of Andalucia was pointed out for its inaction.

Table 3: State of water overview table

WATER * **	Past trends and outlook		Prospects of meeting policy objectives/targets under the assumption of unchanged policy	
	Past trends (10-15 years)	Outlook to 2030	2025	2030
Water quantity				
Water quality				

** Evaluation made by the author from the information above*

*** Colour code: red = deteriorating trends/not on track; yellow = trends show a mixed picture/ partially on track; green: improving trends/on track.*

2.4 Soil

2.4.1 Loss of soil biodiversity and soil organic carbon

Past trends and outlook

There are very few data to assess soil biodiversity in Spain, but available studies indicate a general downwards trend for life underground. According to a 2016 study by the European Soil Data Centre, Central, Eastern and Southern Spain's soil biodiversity (soil microorganisms, soil fauna and soil biological function) is highly threatened by a combination of various types of pressures such as erosion, salinization or compaction. Precise quantification is difficult, and more recent or detailed data focused on biodiversity in Spanish soils is lacking (JRC, 2016).

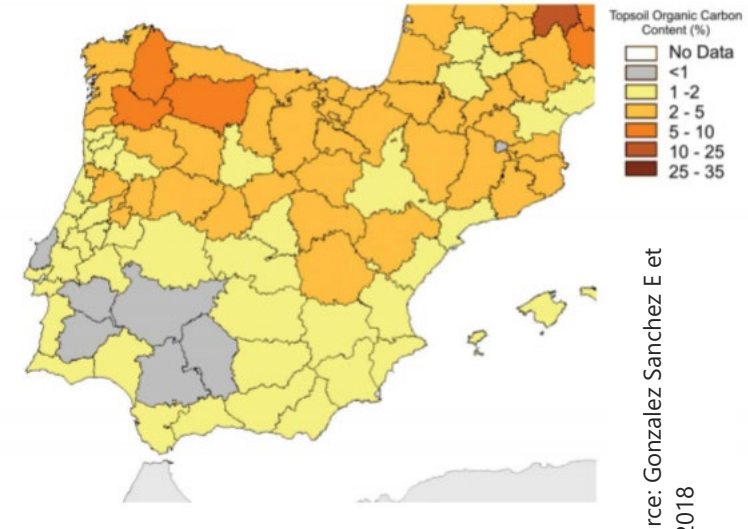


Figura 3. Porcentaje medio de COS por provincias.

Fuente: Soil Atlas of Europe (2005).

Source: Gonzalez Sanchez E et al, 2018

Whilst soil carbon content varies substantially geographically, mean soil organic carbon (SOC) content in arable land in Spain is the lowest across the entire EU at 14.90 gC/kg[13] in 2015, due to faster organic carbon mineralisation (EC, 2020). It is especially low in arid cropland of central and southern Spain (<0.5 – 2%) but much higher in Northern grasslands (21%) (Gimeno B., 2021). The country has limited peat surfaces (high carbon soil stocks), with only 0.1% of peat cover (JRC, 2010). Higher levels of SOC are found in the Northeast of Spain (up to 200 Mg C/ha with an average content of 11%) and the lowest levels in the Ebro basin, and areas with semi-arid climates such as Andalucia, Castilla Leon and Murcia. The highest SOC concentrations are in forests and the lowest in agricultural soils (45.26 and 38.09 Mg/ha respectively). This trend toward less soil biodiversity and SOC can be explained by the intensive use of nutrients, as nitrogen or phosphate fertilizers. According to 2017 OECD data, the gross nutrient balance, i.e. the difference between nutrient input and output on agricultural soil was 8 kg P/ha and 49kg N/ha

[13] Grams of carbon per kilogram.

(OECD, 2018). This illustrates an accumulation of nutrients in Spanish soils resulting from over-fertilisation on agricultural land, potentially leading to water or air pollution.

Relevant policy objectives/targets

Fertilizers and soil improvers are regulated by *Real Decreto* 506/2013, which was updated in 2017. It "*promotes the appropriate use of plant protection agents and sewage sludges for agricultural use and defines the N-supply threshold from organic fertilizers that cannot be exceeded in nitrate-vulnerable zones.*" (Gimeno B., 2021)

A royal decree is in preparation to specifically target the proper nutrient management of agricultural soils. The proposed legal text requires farms to define a fertilisation plan based on nutrient balances in order to calculate appropriate doses and applications. It also requires farmers to keep individual records of irrigation, fertilisation practices and soil conditions on their land. In the CAP, Spain is planning a nutrient management eco-scheme as a preparatory phase before this royal decree enters into force.

Spain's National Action Plan for Phytosanitary products (2018 – 2022), established pursuant to the Sustainable Use of Pesticides Directive, prefers approaches to pesticide risk reduction based on training, advice and research and does not include pesticide reduction targets.

2.4.2 Soil acidification and salinization

Past trends and outlook

Spanish soils are affected by relatively high acidity levels, in particular in Eastern Spain (average pH around 7.6) (JRC n.d). A 2020 European assessment shows significant agricultural areas affected by very severe constraint due to acidity caused by salinization (EIP-AGRI 2020). Salinization is indeed affecting both freshwaters and groundwaters.

Freshwater salinisation was estimated in 2019 to affect more than a quarter of Spanish streams and rivers, particularly in the most arid central and southern regions, as a direct consequence of urbanisation and agricultural activity (Daliakopoulos 2016). More saline, the groundwater and freshwater is passed on to soils via agricultural irrigation, resulting in acidification and fertility loss. Seawater leakage into groundwater bodies as a result of the current high erosion rate by water is another driver.

2.4.3 Desertification and erosion

Past trends and outlooks

With 74% of the country at risk of desertification, Spain is the country most at risk of desertification in the EU. A result of climate change and human-induced pressures such

as over-abstraction of water, salinity, erosion and forest fires, close to a fifth of the country is at "high" or "very high" risk of desertification (EC, 2020). On degraded soils, the practice of conventional tillage, applied to 75% of tillable area in 2016, and the absence of soil cover during the winter months (23% of arable land) has an accelerating impact on the process (EC, 2020).

Spain experiences a much greater rate of soil loss by water on agricultural land (above 3.9 t ha-1 yr-1 in 2016) than the EU average (about 2.5 t ha-1 yr-1) (EC, 2020). Erosion risk particularly affects arable and permanent cropland (91% of the total UAA affected). The risk of severe erosion is present on more than 9.8% of the Spanish utilised agricultural area (UAA), about 2.7 million ha, significantly higher than the EU average of 6.6%. (EC, 2020). Wind erosion is also relatively high in the North-eastern part of the country.

Relevant policy objectives/targets

No European strategy on desertification exists currently. However, Spain is a party to the United Nations Convention to Combat Desertification, under which the country has a National Action Programme (NAP) against Desertification, submitted in 2008. Its main objective is "*to determine the factors that contribute to desertification and the practical measures necessary to combat it and mitigate the effects of drought [translated]" (PAND, 2008).* It aims to remediate fragile areas by the "*the prevention or reduction of land degradation, the rehabilitation of partially degraded lands and the recovery of desertified lands [translated]* » (PAND, 2008). Land use patterns, water resources management, soil conservation, forestry, agricultural activities and grassland and rangeland management are measures promoted in the NAP.

To curb the phenomenon of desertification, this NAP also seeks to assess erosion levels by region. Therefore, Spain has a National Inventory of Soil Erosion as part of the Spanish Inventory of Natural Heritage and Biodiversity. It proposes an interactive map that establishes the state of soil erosion of each Autonomous Community (Region). Rural Development Programmes under the CAP, also address erosion issues, such as the Regional Rural Development Programme for Murcia, the region the most concerned by erosion (Van Leeuwen C et al, 2019).

Table 4: State of soil overview table

SOIL * **	Past trends and outlook		Prospects of meeting policy objectives/targets under the assumption of unchanged policy	
	Past trends (10-15 years)	Outlook to 2030	2025	2030
Soil organic carbon content and soil biodiversity				
Soil acidification and salinisation				
Soil erosion				

** Evaluation made by the author from the information above*
*** Colour code: red = deteriorating trends/not on track; yellow = trends show a mixed picture/ partially on track; green: improving trends/on track; grey = lack of information*

3. SUMMARY OF THE NEEDS PER ISSUE: CLIMATE, BIODIVERSITY, WATER, SOIL

3.1 Climate

Mitigation: Spain's binding GHG reduction target for 2030 for ESR sectors (according to Regulation (EU) 2018/842) has been set at 26% compared to 2005 levels. Half of agricultural emissions originate from livestock production, in particular methane gases. Livestock emissions must diminish, so Spain needs:

- to reduce livestock numbers, develop manure/slurry management (accounting for 21.9% of agricultural emissions) and implement the appropriate use of organic fertilisation instead of synthetic fertilisers. Mineral fertilisation needs also be more tailored and precisely applied to local crop situations to avoid nitrogen surplus;
- to develop forest and agricultural carbon sinks, as proposed in Spain's 2021-2030 National Energy and Climate Plan (NECP) to improve carbon removal;
- to develop, support and fund the use of sustainably sourced biomass as renewable energy to replace fossil fuel (on sustainable limits to biomass use in Europe, see IEEP, 2021).

Adaptation: Several climate change-induced processes require the agricultural sector to improve its resilience. This will require, among other things:

- a better water management to cope with increased water stress through efficient irrigation and water storage systems through efficient irrigation system and water storage;
- changes in crop species and breeds to adapt to new climatic conditions and changes in seasonality that lead to increased disease and pests in crops and livestock;
- investments in structures to cope with increased weather events such as flooding and sea level rise.

3.2 Biodiversity:

Common species related to agricultural landscapes: The rapid decline of farmland birds in Spain can be addressed by restoring their habitats and implementing sustainable farming practices. To protect species related to the agricultural landscape, Spain particularly needs to: replace intensive permanent crops field that prevents birds

from finding appropriate nesting and food forage places; preserve traditional fallow plots and non-productive hedges; reduce pesticide use that especially harm pollinators (Traba & Morales 2019).

Protected species and habitats related to agricultural landscape: Bad status and destruction of important habitats in Spain are causing declines in protected species population. Spain must reinforce traditional grazing and protect permanent grassland and steppes that host an important part of Spain's biodiversity. Afforestation and clearing of high nature value land should also be prohibited, and large dry cereal habitats better managed.

3.3 Water

Quality: Spain's groundwater and surface water are affected by diffuse pollution from agriculture. To address nitrate pollution, Spain needs to reduce its use of fertilizers. Because the knowledge and monitoring programmes are still very heterogeneous and sometimes not accurate, Spain also need to improve its surveillance and operational monitoring. No site should be missing, and all quality elements to assess chemical status should be included.

Quantity: Current trends of surface and groundwater bodies, in particular in arid and semi-arid regions, show important signs of depletion. The widespread use of irrigation in agricultural systems is largely responsible so efficient irrigation systems and systems that collect and store rainwater should be put in place.

3.4 Soil

Soil organic carbon: Average soil organic carbon content is very low in Spain. The carbon sequestration capacity of soil could be improved via:

- the management of Natura 2000 farmland and pastures;
- the restoration and maintenance of carbon capture potential of traditional agroforestry systems in the form of *dehesas* or the *montado* silvopastoral system in the Iberian Peninsula (COWI, Ecologic Institute and IEEP, 2021).

Soil biodiversity facing desertification or salinisation threats: Spain needs to start to document and protect soil organisms. Practices such as conservation agriculture with minimum tillage and maintenance of crop residue on fields should be encouraged to bolster life underground. There is also a need to address saline waters in irrigation systems and infiltration in groundwaters (caused *inter alia* by erosion).

Soil erosion: The rate at which Spanish topsoil is eroding needs to be minimised. Eroded soils lose part of their water, nitrogen- or pollutant-absorption capacity,

impacting overall fertility as well as surrounding waters and further increasing desertification risks. It is important to implement practices that protect soil from erosion i.e. soil cover, changing the current tillage practices, at the same time as improving and maintaining the social, ecological and economic functions of terrestrial ecosystems.

Table 6: Summary of the information from Sections 2 and 3 on the past trends and outlook and associated needs for each environmental issue

Theme	Past trends and Outlook	Policy objectives/targets	Needs
CLIMATE			
Mitigation	• Spain is the 4th most significant emitter of agricultural emissions in the EU. • GHG emissions from the agricultural sector represent 11.3% of total national emission and they have increased by 9,3% since 2013.	Reduction of18% by 2030 compared to the 2006 levels.	Reduce emissions from livestock.
Adaptation 9	• Temperature is rising, and important water stress is predicted. • Diseases, pests and negative productivity trends have increased and are predicted to accelerate. • Flooding and sea level rise also affect Spanish islands and lead to soil salinization.	Adaptation measures are likely to be funded in the CAP NSP	• Better water management • Adapt crop species, breeds, sowing dates. • Investments in structures to cope with increased weather events
BIODIVERSITY			
Common species from agricultural landscapes	• The farmland bird population has fallen by 33% from 2000 to 2017 • 2.6% of Spanish bee species are threatened • European Grassland butterfly indicator shows declining trends for butterfly species	The *Spanish national strategy for pollinator conservation provides* several protections measures even though there are no quantitative targets.	Adapt farming practices to preserve species & habitats: protection of grasslands or other appropriate nesting and food forage places; reduce use of phytosanitary products; stop afforestation and clearing of high natural value farmland.

Protected species & habitats	• From 2013 to 2018, 9,4% of grassland habitats were in favorable conservations status. This is a decrease from 15% compared to the previous reporting period. • Around 17% of agricultural area belongs to the Natura 2000 network.	Several strategies exist along with a legal framework focusing on the conservation and restoration of species and habitats in Spain. They aim several non-quantitative objectives as: improving knowledge, fostering a sustainable use of biodiversity and integrating biodiversity protection into all sectoral policies.	
WATER			
Water quantity	• 81% of groundwater bodies are in good quantitative status but results vary depending on the region. Southern regions are more affected than the others. • 70% of Spanish river districts monitored are already facing risks of water scarcity.	Achieve good status for all of water bodies in 2027.	• Conserve a certain level of groundwaters quantity. • Improve irrigation systems, rainwater harvesting.
Water quality	• 87% of the surface waters and 69% of groundwater sites monitored were in good chemical status but results are not very thorough. Some quality elements are not taken into account and not all sites are monitored, even if an improvement has been recorded. • NVZ represent 35% of the agricultural area.		Reduce nitrate pollution and improve monitoring and assessment of water bodies status (include all quality elements of the WFD).

SOIL			
Loss of soil biodiversity and pollution	• Spain's soil biodiversity is highly threatened by a agricultural pressures such as erosion, salinization or compaction. • Mean SOC content in arable land in Spain is the lowest across the entire EU (14.90 gC.kg-in 2015) due to faster organic carbon mineralisation. • The gross nutrient balance on agricultural soil was 8 kg P/ha and 49kg N/ha (OECD, 2018) (i.e. a surplus).	• Fertilizers and soil improvers are regulated by Real Decreto 506/2013, updated in 2017. • A Royal Decree for the sustainable nutrition of agricultural soils in Spain is now in preparation.	To improve soil carbon storage, Spain needs to improve the: • Management of Natura 2000 farmland and pastures. • Restoration and maintenance of carbon capture potential of traditional agroforestry systems in the form of *dehesas* or the *montado* silvopastoral system in the Iberian Peninsula.
Soil desertification and erosion	• A fifth of the country is at "high" or "very high" risk of desertification due to unsustainable practices (tillage, no soil cover during winter). • 91% and 9,8% of Spanish UAA is affected by risk of erosion and the risk of severe erosion, respectively. • Wind erosion is also relatively high in the Northeastern part of the country.	• There is no national regulation for agricultural soils, but Spain has a National Action Programme (NAP) against Desertification to prevent or reduce land degradation, rehabilitate partially degraded lands and promote the recovery of desertified lands. • Spain has also a National Inventory of Soil Erosion as part of the Spanish Inventory of Natural Heritage and Biodiversity to monitor the state of soil erosion of each Autonomous Community.	• Document and protect soil organisms • Develop sustainable practices that protect soil such as minimum tillage; maintenance of crop residue on fields, soil cover.
Soil salinisation and acidification	• Eastern Spain agricultural soil are particularly affected by hight acidity levels : average pH around 7.6 caused by salinization • Freshwater salinisation was estimated in 2019 to affect more than a quarter of Spanish streams and rivers	No policy or targets set	Address saline waters in irrigation systems and infiltration in groundwaters (caused *inter alia* by erosion).

4. LIST OF MOST RELEVANT MANAGEMENT PRACTICES RESPONDING TO THE NEEDS

As underlined in the previous section, Spain is faced with various needs that require it to transform its agricultural system from having a damaging to a neutral or even positive climate and environmental impact. The needs underlined in the last section demonstrate that current practices make the sector an important GHG emitter, a main contributor to the destruction of farmland ecosystems and habitats, as well as degraded water and soil quality.

The present section will offer an overview of specific agricultural practices addressing each of the needs identified above.

4.1 Climate mitigation and adaptation

The most significant way of decreasing Spain's agricultural emissions would be to reduce livestock numbers, which could entail a refocus on protein rich crops, including training (Spain is currently the 2nd largest producer of pulses in the EU) (Eurostat, 2020). A complementary measure should be included in the NSP on improved manure management and storage with a view to further reduce methane and ammonia emissions, which would entail interventions such as slurry acidification and improved manure cover, combined with nutrient management planning. Furthermore, effective measures to reduce Spain's methane emissions include the use of feed additives in combination with modified feed management in livestock farming.

Nitrogen emissions can be reduced by improving the efficiency of fertiliser use (improved nutrient planning, use of legumes in crop rotations) and reducing livestock density in most intensive livestock regions.

Adaptation interventions in the Spanish NSP must focus on the most at risk areas. Increasing resilience of crop production can be achieved by more efficient irrigation systems (a higher percentage of the water entering the system going to the crop) and rainwater storages. This can be combined with crop rotations favouring more drought-resilient species in summer, adapting cropping periods and sowing dates to seasonal changes, and improving soil quality. Finally, minimum to no tillage and leaving crop residues on fields are among the sustainable soil management practices that can help preserve or improve soil fertility and productivity and protect from soil compaction and erosion.

The conservation of valuable traditional grasslands, orchard and agroforestry systems provides climate adaptative agroecosystems with "self-sustaining" nutrient cycles, limiting soil erosion and increasing carbon sequestration and capture capacity.

The types of measures proposed by Spain in their NECP include measures relevant to the CAP, for example, "the promotion of arable crop rotations on unirrigated land", which links to the future CAP's GAEC 7 on crop rotation in arable land (EC, 2020). Several nutrient management measures targeting nitrogen application and manure management are also planned that may be integrated under the planned eco-scheme on precision agriculture and the establishment of individual phytosanitary plans.

4.2 Biodiversity

Practices typically used under agroecological systems must be more mainstreamed in the country. Indeed, effective measures to protect and promote biodiversity in Spain are mainly related to:

- the use of fallow land in crop rotations and herbaceous crops;
- the maintenance of strips and traditional hedges as biodiverse landscape features, against landscape fragmentation;
- the maintenance of extensive grassland (meadows and pastures) management and orchard grasslands in extensive and high nature value farmland.

As climate change increases the risk, forest fires prevention measures should be streamlined in conservation area planning and adapted to the ecosystem richness of the country. For example, afforestation measures must not lead to the introduction of fast-growing monocultures of timber (for instance eucalyptus), but rather focus on the reintroduction or strengthening of local species.

Biodiverse field practices should be combined in the CAP NSP with a reduction of pesticides use and the promotion of integrated pest management practices. Fertiliser application should also be tackled via the setting of nutrient management plans that make better use of the high manure quantities produced in Spain and limit mineral phosphate fertilisation, in particular on eroding soils. In intensive arable and livestock systems, improved crop rotations with minimum five crops can help break pest and disease cycles, in combination with fallow land, field strips with flowering mixtures and alfalfa fields to enhance biological pest control.

Organic farms have a much higher share of grassland and a lower management intensity than conventional producers and are therefore of importance for the

promotion of biodiversity, although management practices still vary across organic farms and thus remain important.

4.3 Water

Given the multiple pressures on Spanish water quality, key measures are required to reducing deterioration in ecological status: measures to increase resource use efficiency (i.e. reduce the share of the irrigation water lost to the environment) and measures to limit water pollution from agricultural sources. Water quality is closely tied to the measures identified for climate and biodiversity, the most relevant being both reducing and improving organic and inorganic fertilisation (e.g. through nutrient planning, precision farming or avoidance of fertiliser use in risk areas) and improved manure management (e.g. improved storage capacity). In addition, soil conservation measures (e.g. low or no tillage, mulching) reduce the risk of soil erosion and nitrate leaching, and improved grassland management and crop rotation reduce nitrogen (N) demand (e.g. by including N-fixing crops). Promoting integrated pest management, favouring sustainable biological, physical and other non-chemical methods, and wider crop rotations help to improve water quality and minimise risks to human health and the environment.

Increased water scarcity is a major issue in Spain. Water abstraction for agricultural use is an important driver. Hence, irrigation should be limited and methods improved via the promotion of water-efficient equipment, upgraded infrastructure (e.g. lining of canals, repair leaking pipes), appropriate irrigation scheduling and rainwater harvesting.

4.4 Soil

Key farming practices are needed against the multi-faceted pressures facing Spanish soils. In relation to biodiversity, water and adaptation measures identified above, this includes soil conservation measures (e.g. low or no tillage, mulching), wider crop rotations, intercropping, promotion and maintenance of grassland and promotion of landscape features and buffer strips.

In addition, on mineral soils improving the balance of removals to returns of organic matter is important, e.g. through organic fertilization (compost and manure), leaving harvest residues on the field, and expanding crop rotations (e.g. with clover grasses, legumes, deep rooting crops).

Interventions directly targeting the high rate of soil erosion in the country must mainstreamed, such as: cultivating catch crops, prohibiting row crops on slopes above a certain degree and mulch seeding with a minimum soil cover. The reduction of field traffic, especially in unfavourable (wet) conditions that reduces the infiltration capacity of the soils, helps to prevent soil compaction and thus also soil erosion. On sloping land, grassland strips and landscape elements reduce the risk of erosion.

Table 6: Summary table – Example of measures

Measures	Agricultural practices	CLIMATE		WATER		BIODIVERSITY		SOIL			Safeguards/ Other comments	Targeting (geographic/ land type)
		Mitigation	Adaptation	Quantity	Quality	Common species	Protected area species	Loss of soil biodiversity and SOC	Soil salinisation	Soil erosion		
Land management	**Crop rotation**	X	X	X	X	X	X	X	X	X	Genuine crop rotation, not "crop diversification"	Arable land
	Buffer strips and landscape elements	X	X	X	X	X	X	X		X	Not only preservation of existing features but also and more importantly creation of new features	Id.
	Cover crops / Catch crops	X	X	X	X			X	X	X	Mechanical destruction only	Id.
	Mulching and leaving crop residues		X	X	X			X	X	X	Agronomic practice to be adapted to local conditions regarding the quantity of mulch and residues	Id.
	Tillage restriction and conservation tillage	X	X	X	X			X	X	X	Not only preservation of existing features but also and more importantly creation of new features	Id.
	Maintenance of permanent grassland and conversion of arable to grassland	X	X	X	X	X	X	X		X	Should be permanent grassland, not simply including grass into the rotation	Id.

Measures	Agricultural practices	CLIMATE		WATER		BIODIVERSITY		SOIL			Safeguards/ Comments	Targeting
		Mitigation	Adaptation	Quantity	Quality	Common species	Protected area species	Loss of soil biodiversity	Loss of SOM	Soil erosion		
High nature value farming	**Conservation of valuable grassland species**		X			X	X	X		X		Id.
	Conservation of typical orchards (i.e. agroforestry grass/fruit)	X	X			X	X	X		X	Local trees species should be used	Coastal areas, areas with risks of flooding
	Conservation of terraces		X			X	X	X		X		
Water management	**Irrigation limitation (limit transition from rain fed to irrigated, etc.)**		X	X					X	X		
	Improved irrigation techniques		X	X					X		Ensure overall abstraction levels remain sustainable	

Measures	Agricultural practices	CLIMATE		WATER		BIODIVERSITY		SOIL			Safeguards/ Comments	Targeting
		Mitigation	Adaptation	Quantity	Quality	Common species	Protected area species	Loss of soil biodiversity	Loss of SOM	Soil erosion		
High nature value farming	**Conservation of valuable grassland species**		X			X	X	X		X		Id.
	Conservation of typical orchards (i.e. agroforestry grass/fruit)	X	X			X	X	X		X	Local trees species should be used	Coastal areas, areas with risks of flooding
	Conservation of terraces		X			X	X	X		X		
Water management	**Irrigation limitation (limit transition from rain fed to irrigated, etc.)**		X	X					X	X		
	Improved irrigation techniques		X	X					X		Ensure overall abstraction levels remain sustainable	

Measures	Agricultural practices	CLIMATE		WATER		BIODIVERSITY		SOIL			Safeguards/Other comments	Targeting
		Mitigation	Adaptation	Quantity	Quality	Common species	Protected area species	Loss of soil biodiversity	Loss of SOM	Soil erosion		
Biocontrol	**Reduced chemical plant protection in favour of biocontrol**		X		X	X	X	X			Availability of biocontrol products should sharply increase	All crops
Fertilisation	**Limit application of liquid manure**	X			X							
	Nutrient management plan	X	X		X	X	X	X		X		
	Max application levels of phosphorus	X	X		X	X	X	X		X		
Organic farming	**Conversion to and maintenance of organic farming**		X	X	X	X	X	X		X	Regionalised action plans should help calibrating the speed and dimension of the area in transition each year so as to adjust to the demand. Knowledge transfer support necessary.	All regions

Measures	Agricultural practices	CLIMATE		WATER		BIODIVERSITY		SOIL			Safeguards/ Comments	Targeting
		Mitigation	Adaptation	Quantity	Quality	Common species	Protected area species	Loss of soil biodiversity	Loss of SOM	Soil erosion		
Livestock management	**Reducing livestock density**	X			X	X	X	X		X	Maximum livestock densities should be regionalised with a view to reflect the real capacity of each region to feed their animals	Most intensive productions as main targets
Knowledge transfer	**Local development groups and demonstration farms (EIP-Agri)**	X	X	X	X	X	X	X		X	Should make the link between science and practice. Using digital means and dedicated social network would help accelerate the transition.	Build a dense network of demonstration farms over the country
Advisory services	**Targeted advice to farmers to accompany the agro-ecological transition**	X	X	X	X	X	X	X		X	Avoid one-size-fits-all advice. An approach along natural regions should be promoted (by contrast with advice per production).	Young farmers and new installations

No-go measure box

The box below highlights the measures to avoid as they will be counterproductive in achieving the identified needs.

- Unconditional voluntary coupled support (VCS) for livestock – maximum livestock density should a precondition of VCS;
- Allowing crop diversification instead of crop rotation (as they serve different purposes and are therefore both needed);
- Precision agriculture that only increases efficiency of input-intensive systems and only delivers small reductions in pesticide and fertiliser use, rather than as an accompaniment to practicing integrated pest management (e.g. crop rotation, ecological infrastructures, biological control and use of chemical control as a last resort);
- Ploughed grassland should not classify as 'permanent grassland';
- Production (for example intermediate crops and nitrogen fixing crops[14]) on areas intended for biodiversity like field margins, and mowing of woody margins, which risks further damaging Spain's precious farmland habitats;
- Expansion of irrigation into water-stressed areas, or areas facing water scarcity;
- Investment measures that can promote intensification, like housing for intensive livestock farms, or machinery that increases soil compaction;
- Risk management measures that disincentivise adaptation to climate impacts (e.g. insurance for crop failures even if no preventative measures were taken).

[14] These can be beneficial as soil measures, but are not effective for biodiversity.

5. INTERVENTION MECHANISMS EXAMPLE (NEW GREEN ARCHITECTURE)

The following examples illustrate how certain different CAP instruments (such as eco-schemes, agri-environment and climate measures) could be used to fund the different measures listed in section 4. Just one example is given per category of need, therefore, it is not an exhaustive list. Other potential measures like investment support are also not included. Further, different interventions can fulfil multiple goals, for examples the preservation or restoration of extensive permanent grassland can contribute to climate mitigation, biodiversity and water quality at the same time.

	Practices	Corresponding instruments Pillar 1	Corresponding instruments Pillar 2			
Corresponding needs in the national context		**Conditionality/ Eco-schemes**	**Environmental climate and other management commitments**	**Natural or other area-specific constraints**[15]	**Cooperation (EIP-AGRI OGs)**	**Knowledge and information**
CLIMATE						
Reduce agricultural emissions	Reduce inorganic fertiliser application	SMR Nitrates and Nutrient management plan eco-scheme	AECM on zero fertiliser application (M10 in the current CAP)		Focus group on nutrient recycling	
Adapted crop species against heat events	Maintain and restore traditional agroforestry systems	Agroforestry eco-scheme	Support for creation and maintenance of agroforestry systems (M8 in the current CAP)	Natura 2000 management plan	Exchange of good practices	Investment in biodiversity monitoring (M2 in the current CAP)

[15] In the Rural Development Programmes, it is possible to prescribe ANC conditions for certain measures e.g., for higher support (investments).

BIODIVERSITY						
Restoration/ maintenance of biological corridors	Increase the presence of non-productive margins & landscape elements	GAEC 9 minimum non-productive area, top up via eco-scheme HNV farming eco-scheme	Investment in non-productive field margins (M4.4 in the current CAP)	Flowers strips, landscape features	Exchange of good practices Test fields, demonstrations farms network	Investment in biodiversity monitoring (M2 in the current CAP)
WATER						
Water quality (nitrates)	Reduce use of organic and inorganic fertiliser to achieve nutrient balance	Nutrient management and phytosanitary products eco-scheme	No non-organic fertiliser application	Animal welfare	Converting farms to organic	Eco-intensification
SOIL						
Increase soil organic matter	Crop rotation	GAEC 7 on soil winter cover and GAEC 8 on crop rotation Agroecology eco-scheme involving crop rotation	M10 on rotations with legumes	Rotation on slopes to prevent erosion	Exchange of good practices	Inclusion of crop rotation in output indicators

6. ALIGNMENT BETWEEN RECOMMENDED MEASURES AND THE GREEN DEAL

The management practices described in section III and the examples of intervention mechanisms given in section IV have been chosen because their impact will help achieve the headline targets of the Green Deal (see box 1 below as a reminder).

Box 1: Green Deal headline targets

Climate law

Legally binding target of net zero greenhouse gas emissions by 2050 (2030 reduction target of 55 %, at least, compared to 1990 levels)

Farm to Fork

- *Reduce by 50% the overall use and risk of synthetic chemical pesticides and the use of more hazardous pesticides by 50% by 2030*
- *Reduce nutrient losses by at least 50%, while ensuring that there is no deterioration in soil fertility. This will reduce the use of fertilisers by at least 20% by 2030*
- *Reduce by 50% sales of antimicrobials for farmed animals and in aquaculture by 2030*
- *At least 25% of the EU's agricultural land under organic farming by 2030*
- *The Commission will propose legally binding targets to reduce food waste across the EU by 2023.*

Biodiversity strategy

At least 10% of agricultural area is under high diversity landscape features

Measures have multiple goals and impacts and in their strategic plans, Member States should prioritise measures that have the highest number of co-benefits to reduce the risk of trade-offs. For example, maintaining permanent grassland will help keep carbon in the soil and help fulfil the carbon neutrality target by 2050.

Furthermore, this measure positively impacts biodiversity on the condition that they are extensively managed, both in terms of inputs and other management practices include stocking densities and grazing or mowing regimes, it will therefore help achieve the biodiversity strategy target. As another example, biocontrol reduces pesticide use while also fostering new governance approaches on the farms, in line with the SDGs and the EU Green Deal objectives (Hulot, J.F. and Hiller, N 2021).

BIBLIOGRAPHY

Alliance Environnement (2017) *Literature reviews on the effects of farming practices associated with the CAP greening measures on climate and the environment*. Report carried out for the evaluation study of the payment for agricultural practices beneficial for the climate and the environment ('greening' of direct payments) for DG Agriculture and Rural Development.

Andersen, S. P., B. Allen and G. C. Domingo (2021), *Biomass in the EU Green Deal: Towards consensus on the use of biomass for EU bioenergy*, Policy report, Institute for European Environmental Policy (IEEP) https://ieep.eu/publications/biomass-in-the-eu-green-deal-towards-consensus-on-sustainable-use-of-biomass-for-eu-bioenergy

BISE (n.d) *Spain*. Biodiversity Information System for Europe website. https://biodiversity.europa.eu/countries/spain

Breeze, T D, et al (2014) *Agricultural policies exacerbate honeybee pollination service supply-demand mismatches across Europe*, PLoS One, vol. 9, no. 1, https://doi.org/10.1371/journal.pone.0082996

CBD (n.d) *Spain – Biodiversity Facts*. Convention on Biological Diversity website. https://www.cbd.int/countries/profile/?country=es

Cole, L . (2021) *Nature restoration law 'must succeed where Habitats Directive failed', activists warn*. Ends Europe. Brussles. https://www.endseurope.com/article/1731764/nature-restoration-law-must-succeed-habitats-directive-failed-activists-warn?bulletin=bulletin%2Fendseuropedaily&utm_medium=EMAIL&utm_campaign=eNews%20Bulletin&utm_source=20211028&utm_content=ENDS%20Europe%20Daily%20(156)::www_endseurope_com_article_173&email_hash=

COWI, Ecologic Institute and IEEP (2021) *Technical Guidance Handbook – setting up and implementing result-based carbon farming mechanisms in the EU*. Report to the European Commission, DG Climate Action, under Contract No. CLIMA/C.3/ETU/2018/007, COWI, Kongens Lyngby.

Daliakopoulos IN, Tsanis IK, Koutroulis A, Kourgialas NN, Varouchakis AE, Karatzas GP, Ritsema CJ (2016). *The threat of soil salinity: A European scale review*. doi: 10.1016/j.scitotenv.2016.08.177.

Díaz, M. et al (2021). *Environmental objectives of spanish agriculture: scientific guidelines for their effective implementation under the common agricultural policy 2023-2030 objetivos ambientales de la agricultura española: recomendaciones científicas para su implementacion efectiva según la nueva política agraria común 2023-2030*.

Ardeola: International Journal of Ornithology. 68. 445-460. 10.13157/arla.68.2.2021.fo1.

Gonzalez Sanchez E., Veroz Gonzalez O., Gil Rubes, J., Ordoñez Fernandez, R. (2018) Iniciative 4 por mil: el carbono organico del suelo como herramienta de mitigacion y adaptacion al cambio climatico en España. Ministerio de agricultura y pesca, alimentazion y medio ambiente. 013-18-014-7. Madrid.

EC (2010) *Water Framework Directive: factsheet*. European Commission Website. https://ec.europa.eu/environment/pubs/pdf/factsheets/water-framework-directive.pdf

EC (2020) *Commission recommendations for Spain's CAP strategic plan*. European Commission (ed). SWD (2020) 374 final, Brussels.

ECA (2018), *Combating desertification in the EU: a growing threat in need of more action*, Special Report n°33/2018. European Court of Auditors website.

EEA (2019) *Climate change adaptation in the agriculture sector in Europe*. European Environment Agency, Copenhagen.

EIP-AGRI (2020) *Soil salinisation: final report*. EIP-Agri Focus Group, Brussels.

Eurostat (2020). *World Pulses Day: production of pulses in the EU*. Eurostat website.

IEPNB (2017) Anexo IV informe de seguimiento del Plan estrategico del patrimonio natural de la biodiversidad

JRC (n.d) *Soil pH in Europe*. Joint research centre- european soil data centre (esdac). https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwi7p-zBto3xAhXPA2MBHRjhChQQFjAAegQIAhAD&url=https%3A%2F%2Fesdac.jrc.ec.europa.eu%2FLibrary%2FData%2FPH%2FDocuments%2FpH_Pub.pdf&usg=AOvVaw2B66h_VA78qvqnTHiAdbu-

JRC (2010) *Relative cover (%) of peat soils (0–30cm), per country*. Joint Research Center of the European Commission. https://esdac.jrc.ec.europa.eu/ESDB_Archive/octop/Resources/Peatland_Per_Country.pdf

JRC (2016) *Potential threats to soil biodiversity in Europe*. Joint research centre- european soil data centre (esdac). https://esdac.jrc.ec.europa.eu/content/potential-threats-soil-biodiversity-europe#tabs-0-description=0

Gimeno B. (2021). *Agricultural soil challenges in Spain: overcoming existing barriers for the implementation of sustainable practices*. European Joint Programme SPOIL website.

https://ejpsoil.eu/about-ejp-soil/news-events/item/artikel/agricultural-soil-challenges-in-spain-overcoming-existing-barriers-for-the-implementation-of-sustai-1/

Goksen, S. et al (2021). *Common Agricultural Policy (CAP) : Will CAP strategic plans help deliver much needed climate action ?* Climate Action Network (CAN) Europe. https://caneurope.org/content/uploads/2021/05/WillCAP-Strategic-Plans-help-deliver-needed-climate-action.pdf

Gonzales, R. (2021) *La naturaleza tiene límites, pero no es limitante.* SEO birdlife website. https://seo.org/2021/03/18/la-naturaleza-tiene-limites-pero-no-es-limitante/

Gonzalez Sanchez E., Veroz Gonzalez O., Gil Rubes, J., Ordoñez Fernandez, R. (2018) Iniciative 4 por mil : el carbono organico del suelo como herramienta de mitigacion y adaptacion al cambio cli atico en España. Ministerio de agricultura y pesca, alimentazion y medio ambiente. 013-18-014-7. Madrid

MAPA (2018) *Iniciativa 4 por mil: el carbono orgánico del suelo como herramienta de mitigación y adaptación al cambio climático en España.* Minesterio de Agricultura y Pesca Alimentation y Medio Ambiante

MAPA (2020) *Estrategia de Intervencion.* Minesterio de Agricultura y Pesca Alimentation website. https://www.mapa.gob.es/es/pac/post-2020/estrategia-de-intervencion.aspx

MAPA (2021) *La superficie de cultivo se mantiene estable, con ligeras subidas en los cultivos leñosos.* Ministerio de agricultura pesca y alimentation. Link

Miteco (2011) *Evaluacion de los ecosistemas del milenio de espana - sintesis de resultados.* Fundacion bidoivesridad. Ministerio de Medio ambiente, y medio rural marino website.

Miteco (2018) *Prioritised Action Framework (PAF) for Natura 2000 in Spain*. Ministerio para la transformacion ecologica y el reto demografico. Madrid

Miteco (2019). *National Integrated Energy and Climate Plan 2021–2030*. Ministerio para la transformacion ecologica y el reto demografico website. link

Miteco (2020) *Estrategia Nacional para la Conservacion de los polinizadores.* . Ministerio para la transformacion ecologica y el reto demografico website. https://www.miteco.gob.es/es/biodiversidad/publicaciones/fauna_flora_estrategias_polinizadores.aspx

Miteco (2021) Proyecciones de emisiones a la atmosfera. Edicion 2021. Resumen resultados. Secretaria de estado de medio ambiente. Ministerio para la transformacion ecologica y el reto demografico website. Link

Miteco (2021 b) *Plan Nacional de Adaptación al Cambio Climático 2021-2030*. Ministerio para la transformacion ecologica y el reto demografico website. https://www.miteco.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/plan-nacional-adaptacion-cambio-climatico/default.aspx

Miteco (n.d) *Esquemas de Temas Importantes del tercer ciclo de planificación (2021-2027)*. Ministerio para la transformacion ecologica y el reto demografico website. *https://www.miteco.gob.es/es/agua/temas/planificacion-hidrologica/planificacion-hidrologica/ETI_tercer_ciclo.aspx*

Minesterio de Medio Ambiente y medio rural y marino (2008). *Programa de acción nacional contra la desertificación*. Convención de las Naciones Unidas de Lucha contra la Desertificación. https://knowledge.unccd.int/sites/default/files/naps/spain-spa2008.pdf

Numa, C., *et al.* (2016). *The status and distribution of Mediterranean butterflies*. IUCN, Malaga, Spain.

OCDE (2018) *Nutrient balance*. OECD iLibrary website. https://www.oecd-ilibrary.org/agriculture-and-food/nutrient-balance/indicator/english_82add6a9-en

OPNB (2020) *Estat de la Natura a Catalunya 2020*. Observatori del patrimoni natural i la biodiversitat (OPNB).

OSE (2011) *Biodiversidad en España: base de la sostenibilidad ante el cambio global*. Observatorio de la Sostenibilidad en España ed. ISBN : 978-84-8476-433-5

SACRE (2020) SACRE 25 anos de seguimiento de aves communes en primavera. https://seo.org/wp-content/uploads/2021/04/Separata_Sacre_2020.pdf

Traba, J., & Morales, M. B. (2019). The decline of farmland birds in Spain is strongly associated to the loss of fallowland. *Scientific reports*, *9*(1), 9473. https://doi.org/10.1038/s41598-019-45854-0

Van Leeuwen, C., Erik L.H. Cammeraat, Joris de Vente, Carolina Boix-Fayos (2019)*The evolution of soil conservation policies targeting land abandonment and soil erosion in Spain: A review*. Land Use Policy, Volume 83, 2019, Pages 174-186, https://doi.org/10.1016/j.landusepol.2019.01.018.

Van Swaay, C.A.M.et al (2016). *The European Butterfly Indicator for Grassland species 1990-2015*. Report VS2016.019, De Vlinderstichting, Wageningen. https://assets.vlinderstichting.nl/docs/93d67587-0a55-40f6-8cb0-050034e811b2.pdf

Annex 1

Ex ante analysis	SWOT analysis	Assessment of needs	Public / stakeholder consultation	Final intervention strategy	1st Draft	Strategic environmental assessment	2nd draft submitted to the EC	Approval the CAP CSP
	Link		Over SEA consultation runs 30/11/2021 to 04/02/2022	Link	Submitted in July 2021		Foreseen for the end of 2021	

www.ieep.eu