44. Agroforestry systems in the Spanish CAP Strategic Plan: analysis and reflection

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Working Paper: leave comments in the draft Spanish or English versions

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Summary

We present an analysis of the inclusion of agroforestry systems (agroforestry) in the Spanish CAP Strategic Plan 2023-27 (CSP), and other related national and regional plans and regulations. The CSP establishes a **maximum of 100 trees/ha for agroforestry to remain classified as "arable land" or "permanent crops"**, although autonomous regions have the option to reduce this threshold. In "permanent pasture" agroforestry is defined in a more flexible way, based on remotely-sensed information, including LIDAR, and the calculation of a "coefficient of eligibility" for basic payments.

Pillar I of the CAP (Direct Payments) describes nine **Good Agricultural and Environmental Conditions (GAEC/GAEC)** which should be maintained by farmers and administrations. Three of these are particularly relevant to agroforestry: GAEC-8 (maintaining landscape features), GAEC-1 (preserving ratios of permanent pasture) and GAEC-9 (ban on converting permanent pasture in Natura 2000 sites). Also in Pillar I is the new concept of eco-schemes. From the nine eco-schemes implemented by Spain, there are six that may be relevant to agroforestry - in particular those related to extensive grazing and the maintenance of vegetative cover in permanent crops.

Pillar II of the CAP includes various measures favourable to agroforestry. There are 28 investment-measures or agri-environment-climate measures in Spain, and at least 13 could be used for the establishment and maintenance of agroforestry - however only two of these explicitly include agroforestry explicitly in their titles. The agroforestry-related measures have been activated in 10 - 11 autonomous regions. All regions have activated at least 4 of the 13 measures, with an average activation per region greater than 7.

In the **CAP Performance Monitoring and Evaluation Framework,** three indicators are particularly important: R.17, which indicates the are of forestry and agroforestry established by Member States; O.16 which indicates the amount of forestry and agroforestry receiving annual support from Member States and I.21, which indicates the area of landscape-feature supported by member states.

The **Spanish Land Parcel Identification System (SIGPAC)** is almost unique in Europe, since it comprehensively includes both agricultural and forest parcels, and has two specific land use categories for silvopasture (pastures-with-trees and pastures-with-shrubs), although there is no specific "agroforestry" or "silvoarable" category.

Tree-cover-density on Spanish grassland/cropland was calculated using Copernicus and Coring datasets for 2018 The **Zero-Tree-Index (canopy cover <0.05%) was around 70%** (11.39 Mha), which is around the average for EU Member States, although there were large regional differences.

A SWOT analysis on agroforestry in Spain is presented, resulting from workshops in which more than 25 actors participated, including farmers and ranchers, civil society representatives, academics and researchers. The overall conclusion was that the Spanish CAP Strategic Plan is a favourable framework for the maintenance and promotion of agroforestry systems, with financing options in both Pillars I and II. It contains the most favourable set of policies towards agroforestry since the establishment of the CAP, although there are great regional differences and uncertainties in the implementation of these.

1 Introduction and regulatory articulation of agroforestry systems

1.1. Definition of agroforestry system

AgroForestry Systems (agroforestry), also known as **agroforestry**, are the integration of woody vegetation, crops and/or livestock on the same surface. The main types of agroforestry are **silvoarable** (woody vegetation combined with agricultural use), **silvopastoral** (woody vegetation combined with pastoral or livestock use) and agrosilvopastoral (integrating the three uses simultaneously).

***Photo 1**: Dehesa Extremadura in summer, showing the grass still green under the holm oaks (Quercus ilex) (Photo: Gerardo Moreno)*

1.2. Mentions of Agroforestry Systems in the CAP Strategic Plan

The **Spanish CAP Strategic Plan** (CSP) defines agroforestry as: "*Land use systems that combine tree maintenance with agriculture on the same land*". The CSP establishes a maximum density of 100 trees per hectare for "*farmland and permanent crops with scattered trees (other than fruit trees)*", but also indicates that the Regional Managing Authorities (CCAA) may adapt this percentage "*taking into account the local pedoclimatic and environmental conditions, the forest species, the specific traditional cultivation practices in the region, as well as the need to guarantee sustainable agricultural use of the land in a similar way to that of the plots of the same area that they don't have trees*". Furthermore, this limit does not apply to the number of small trees in new plantations.

On the other hand, and unusually in the EU, agricultural lands that fall within the national definition of "forest" **may receive support** provided that it can be proven that agricultural activity is carried out in that area, and there is no double financing with aid for the rural development programme for forests.

The silvopastoral and agrosilvopastoral systems have further recognition with the Royal Decree 1048/2022 (implementation of CSP), since permanent grassland is defined as *"land used for the production of natural (spontaneous) or cultivated (sown) herbs and other herbaceous forages, including grasslands permanent, and that has not been included in the crop rotation of the holding for five years or more, nor has it been tilled, ploughed or reseeded with a different type of grass or herbaceous forage for five years or more.* ***It includes other species of shrubs and trees that can serve as grasses and other species such as shrubs and trees that produce animal feed, even if grasses or other herbaceous forages are not predominant or present on such lands.***

The CSP emphasises that the presence of woody plants or shrubs does not prohibit classifying an area as permanent pasture, as long as they do not constitute an obstacle to agricultural activities. This applies to permanent grasslands in which grasses and other herbaceous forages predominate over trees and/or shrubs, **and** to permanent grasslands in which grasses and other herbaceous forages are scarce or absent. Spain, along with Ireland and Greece, are the only European countries that apply the criterion in all their regions that permanent grassland does not have to contain herbaceous species (Bertomeu and Lawson, 2023).

Photo 2. *Extensive livestock farming generates important economic, social and environmental benefits. Grazing in an agroforestry mosaic composed of olive groves, pine forests and other woody crops in the Sierra de Gata, Cáceres (Photo: Manuel Bertomeu)*

Furthermore, in the present CAP, the eligibility of permanent pasture areas for basic payments (BISS) it is not based on the number of trees, but on the presence of non-eligible unproductive items[1], such as areas without vegetation, steep slopes or areas of impenetrable vegetation that prevent its full use. The "pasture subsidy coefficient" (CSP) now incorporates a "*species factor"* (determined by each Autonomous Community), which indicates which woody species can be grazed and should be considered eligible for subsidies (MAPA, 2023c).

There are 19 mentions of *dehesa* in the CSP (MAPA, 2023b), and it indicates that traditional agrosilvopastoral systems of high ecological, economic and social value, like the *dehesa*, should be favoured in the calculation of CSP, although the procedure is not detailed. *Dehesa* is mentioned as the most characteristic agroforestry system in Spain, with 2.5 million hectares. When the words "agroforestry systems" are used in the CSP they almost always refer to *dehesa* systems.

1.3. Agroforestry Systems in the EU Land Use, Land Use Change and Forestry (LULUCF) Regulation

EU Regulation 2018/841 describes methods to be used by Member States in calculating GHG emissions from the LULUCF sector. It mentions that "*The development of innovative and sustainable technologies and practices, including agroecology and agroforestry, can increase the role of the LULUCF sector in mitigating and adapting to climate change, as well as strengthening the productivity and resilience of the sector.*".

Annex II of the LULUCF Regulation (DG CLIMA, 2023) indicates that, starting in 2028, Spain will change its definition of "Forest Land", at least for the purposes of GHG reporting. The minimum size of the forest plot will remain at 1.0 ha and the minimum tree height at 3 m, but the minimum tree canopy coverage will decrease from 20% of the Spanish regulations to 10%. This change will make it necessary to reclassify upwards the area considered "forest" and recalculate carbon absorption for each year since 1990, but it is not clear if it will be

[1] Described in Section 4.1.3.6 of the CSP.

accompanied by a reclassification of “forest” plots in the Spanish Land Parcel Identification System (SIGPAC - described in section 6)[2].

2. Agroforestry in CSP: Pillar I - Direct Payments

Pillar I of the Common Agricultural Policy (PAC) regulates income support through direct payments. It helps make agriculture more profitable, ensures food security in Europe and helps farmers in the production of agroforestry, healthy and affordable food. This Pillar is funded entirely by the European Union. Two components of Pillar I related to agroforestry are Good Agricultural and Environmental Conditions (3.1) and Eco-Schemes (3.2).

***Photo 3**. Agroforestry creates mosaic landscapes with varied land uses and diverse plant elements of the landscape. Agroforestry mosaic formed by pastures with trees, riparian vegetation, copses, isolated trees and forest in El Cabrerès or Collsacabra, inland Catalonia (photo: Jaime Coello).*

2.1. Good Agricultural and Environmental Conditions for biodiversity and landscape (GAEC)

***Table 1** GAEC 8 Conversions, Weightings, and Protection Status for landscape-features selected by Spain (qv Royal Decree 1049/2022). Protected = cannot be deleted without prior permission*

Type of surface and non-productive element	Conversion factor (m/tree to m2)	Weighting factor	Including	Protected
1 Buffer strips protection	6	1,5	Y	Y
2 Cairns	2	1	Y	T
3 Cultural elements				
- Small buildings of traditional architecture	1	1	Y	Y
4 Trenches				
5 Field margins			Y	Y
6 Woody elements				
6.1 Hedges or tree-lined strip	5	2	Y	Y
6.2 Trees in a row	5	2	Y	Y
6.3 Tree groups	1	2	Y	Y
6.4 Isolated tree	20	1,5	Y	
6.5 Forest boundaries	6	1,5	Y	
7 Fallow lands				
7.1 Fallow land	1	1	Y	Y
7.2 Fallows for biodiversity, including honey plants	1	1,5	Y	Y
8 Others				

[2] It should be noted that the SIGPAC system is one of the few in the EU that has integrated agricultural and forestry cadastres. Most other countries register forest plots in their SIP system (Spanish CAP implementation only takes place if payments have been made on them under Pillar II of the CAP... for example, for afforestation of agricultural land) .

8.1 Islands or enclaves of natural vegetation or rock and mounds	1	1	Y	
9 Ponds, lagoons, ponds and natural watering holes	1	1,5	Y	
10 Small wetlands				
11 Stone walls (m)	1	1	Y	
12 Streams				
13 Terraces (retention terraces, terraces and banks)	2	1	Y	Y

The GAECs establish the land and livestock care requirements that must be met in agricultural management to receive direct aid. EURAF Policy Briefing #21 lists the GAEC-8 landscape features and non-productive areas chosen by all EU Member States in their CAP Strategic Plans. Spain has opted to monitor the implementation of GAEC-8 by offering farmers the choice of all three options: a) at least 4% of the cropland of agricultural holdings dedicated to landscape features and non-productive elements (e.g. including fallow); b) that at least 3% of the cropland at the farm level is dedicated to non-productive areas and elements, when the farmer undertakes to allocate at least 7% of the cropland to landscape features non-productive elements, within the framework of an eco scheme; c) additional inclusion of N-fixing crops on up to 7% of cropland, providing that pesticide is not used. Table 1 shows: a) Landscape Features selected, b) conversion factors to areas; and c) whether farmers are legally obliged to protect the features. Information for Spain in the Strategic Plan is relatively complete although the maximum permitted size of a “landscape-feature” copse is 0.3 ha, while the minimum size of a forest stand is 1 ha. This implies that "large" copses (*bosquetes*) (0.3-1 ha) will not be legally protected (Table 1). The Spanish national administration has also recognized the importance of GAEC-1 and GAEC-9 in supporting the conservation and sustainable management of *dehesas* (MAPS 2022).

2.2. The Eco-schemes

A novelty of the CAP 2023-27 are the Eco-regimes: a series of voluntary environmental practices that allow increasing annual direct aid. Spain has defined nine eco-schemes, which apply to the whole country (Table 2), five are **potentially relevant** to agroforestry systems, although the word "agroforestry" is not used explicitly in their title. These five eco-schemes represent 60% of the allocated funding. Regional Authorities can make small adjustments to their rules, such as the period required to prove that the grassland is indeed being grazed.

Table 2: *Eco-regimes activated in Spain, including those related to agroforestry (in bold).*

Code and name of the Eco-regime	Assigned resources %	% OR[3] that could be accommodated
1PD31001801V1- Carbon agriculture and agroecology: extensive grazing, mowing and biodiversity on humid pastures (801)	9,32	6,79
1PD31001802V1- Carbon agriculture and agroecology: extensive grazing, mowing and biodiversity on Mediterranean pastures (802)	10,41	11,48
1PD31001803V1 – Carbon farming and agroecology: crop rotations and direct seeding on dry-rainfed croplands (803)	21,21	18,36
1PD31001804V1 – Carbon farming and agroecology: rotations and direct seeding on wet-rainfed croplands (804)	3,38	1,70
1PD31001805V1 - Carbon farming and agroecology: rotations and direct seeding on irrigated croplands (805)	15,48	4,48
1PD31001806V1 - Carbon farming: vegetative covers and inert covers in woody crops on flat lands (806)	6,61	4,18
1PD31001807V1 - Carbon farming:Vegetative covers and inert covers in woody crops on medium slope lands (807)	7,17	2,61
1PD31001808V1 - Carbon farming: vegetal covers and inert covers in woody crops on steep terrain (808)	13,99	3,61
1PD31001809 V1 Agroecology: biodiversity spaces on farmland and permanent crops (809)	12,43	9,40

[3] Utilised Agricultural Area

Eco-regimes 801 and 802 are clearly relevant to silvopastoral systems. The description includes "*extensive grazing and the establishment of biodiversity islands or sustainable harvesting*." Grassed Landscape elements (e.g. herbaceous strips) "*may not be mowed or harvested, but may be grazed*." Dehesas are mentioned as typical of the wooded pastures which Eco-scheme 802 focuses on.

Three eco-regimes relate to "*carbon farming: inert and herbaceous covers in permanent-crops*" (806, 807, 808). These schemes aim to protect the soil between rows of permanent crops (fruit trees, nuts, olive trees), covering it with herbaceous covers or with inert material. Grazing of living vegetation cover is permitted, and this could qualify as a type of silvopastoral system. Harvesting of the crops is not permitted.

Ecoscheme 809 is also relevant to agroforestry since the areas listed include landscape features (stone walls, ponds, hedges, contour trees/shrubs and vegetated areas that act as shelter and habitat for insects, birds and pollinators, including edges and borders of cultivated plots. This eco-regime is related to GAEC 4 and 8.

3 Agroforestry systems in CAP Pillar II - Rural Development Policy

Pillar II of the CAP aims to support rural areas of the Union to respond to economic, environmental and social challenges. It is more flexible than Pillar I, allowing a cascade formulation based on a "menu" of measures defined at European level, whose activation is carried out progressively at national, regional and local level. Pillar II is co-financed between the EU and regional or national funds.

The analysis of Pillar in the CSP (CSP) focused on the 13 Agri-Environment-Climate Measures (Article 70 - Table 3) and the 15 Investment Measures (Article 73/74 - Table 4). Of these 28 measures, there are 13 which could support agroforestry, depending on the interpretation used by the Autonomous Communities (Table 5). Other Articles in the CAP Strategic Plan could be relevant to agroforestry, such as Article 77 (Cooperation) and Article 78 (Knowledge Exchange).

3.1 Agri-environmental and Climate Measures - AECM (Article 70)

Agri-environment and climate measures are used to provide annual payments to farmers for periods of up to eight years, if they adopt measures beneficial for the environment, climate and animal welfare. In Spain there is a measure specifically focused on maintaining newly-afforested and agroforested systems (6502.2), and six more which may be applicable to agroforestry (Table 3).

Table 3. *Agro-environmental and Climate Measures of Pillar of the Strategic Plan of the Spanish CAPArticle 70 (2023-28). In bold: measures related to agroforestry*

Code	Measure
6501.1	**Integrated agricultural production**
6501.2	**Sustainable crop management**
6501.3	**Commitments to promote and sustainably manage pastures**
6501.4	Beekeeping for biodiversity
6501.5	Protection of birdlife
6501.6	**Maintenance or improvement of habitats and traditional agricultural activities that preserve biodiversity**
6501.7	Alternatives to pesticides and herbicides
6501.8	**Practices for soil improvement and erosion control**
6502.1	**Forest management commitments**
6502.2	**Commitments to maintain forestry and agroforestry systems**
6503	Agri-environmental management commitments in organic farming
6504	Commitments to animal welfare and health
6505	Commitments to conservation of genetic resources

- **AECM 6501.1 - Integrated Production:** which aims to adopt changes in agricultural practices that contribute positively to the environment and climate, achieved through "integrated production

standards", with actions that include: a) promotion and improvement of biodiversity; b) maintenance of soil vegetation cover; c) analysis of soil, irrigation water and foliage in perennial crops; d) establishing fertilisation programmes for crops; d) removal weeds and crop residues; f) ground preparation; g) irrigation techniques, and h) implementation of rotations.

- **AECM 6501.2 - Sustainable crop management:** which mentions the “preservation of landscape features”, such as the margins, trees, banks and scattered trees.
- **AECM 6501.3** - **Commitments to promote and sustainably manage pastures:** This measure envisages the following actions: a) extensive grazing with animals of certain species; b) practice of transhumance; c) annual grazing plans that include rotation, movement of animals and use of pastures outside the farm; d) traditional pasture management with seasonal movement of livestock with the same number of animals for at least five consecutive years; e) the temporary exclusion of grazing, consisting of leaving at least 20% of the contract area ungrazed each year for 3 months and on a rotational basis; f) extensification of grazing by respecting maximum livestock load limits; g) mowing, no tillage, controlled grazing, limitations in fertilisation, surface regeneration (avoiding invasive species or shrubby vegetation). An example of the this measure is that of Castilla y León, which envisages the planting of trees (at a minimum density of 10 trees/ha) on areas with less than 60 trees/ha, as well as the conversion of wire fences present in green hedges, by implementing woody margins in at least 25 linear m each year. In Catalonia it includes the maintenance of woody perimeters and preserving the shrub and/or tree vegetation.
- **AECM 6501.6** - **Maintenance or improvement of habitats and traditional agricultural activities that preserve biodiversity:** including the maintenance and conservation of elements and functions of traditional landscapes: natural vegetation, in sets**,** stone walls... In Castilla y León it includes minor crops, specifically plantations of holm-oak for truffle production and permanent crops in unique landscapes, where plots have linear features like hedges or stone walls with at least 100m length per hectare. In the Community of Madrid this measure promotes the maintenance of landscape features, such traditional hedges, walls or areas of natural vegetation..
- **AECM 6501.8 - Practices for soil improvement and fight against erosion**: which includes a) maintenance or implementation of vegetation cover, woody margins and islands of vegetation; b) conservation of landscape features that protect the soil from the effects of runoff, such as walls, cairns, terraces. In the Canary Islands, the conservation of isolated trees or bushes and islands of scrub and thorns is mentioned.
- **AECM 6502.1 - Forest management commitments**: aims to promote sustainable forest management by increasing the multifunctionality and resilience of forests, and improving the prevention of forest fires and their subsequent restoration. Forestry operations include interventions favourable to silvopastoralism, such as pruning, grubbing-up or brush-clearing. Some examples include modification to the use of grasses for fire prevention or habitat conservation. In Extremadura and other regions forest grazing is promoted to prevent fires and to conserve habitats and diversify and enhance the coverage of native forest species.
- **AECM 6502.2 - Commitments to maintain tree plantations and agroforestry systems**: These grants support the conservation of plantations, facilitating their development so that they can provide ecosystem services (e.g., carbon capture and storage, hydrological regulation, cultural and recreational services, soil protection, and conservation of biodiversity), including habitats, and landscape maintenance. The actions will be verified through monitoring for periods of five to seven years, and the resulting loss of income and/or increased costs will be compensated by an annual premium per hectare, or a single payment in justified cases. The measure includes specific budgets for agroforestry systems in Cantabria (500 ha), Extremadura and Galicia (areas not indicated).

Finally, other measures such as AECM 6501.5 (Protection of avifauna) could also promote agroforestry, although it is not specifically mentioned.

3.2 Investment Measures - INVEST (Articles 73-73)

Investment measures are single payments to cover the costs of productive or non-productive investments. One measure is specifically focused on the establishment of forestry and agroforestry systems (6881.1), and at least 5 more that could potentially be used for agroforestry (Table 4).

Table 4. *Investment measures (Articles 73-74) in Pillar II of the Spanish CAP Strategic Plan (2023-28). In bold: measures potentially related to agroforestry.*

Code	Measure
6841.1	Productive Investment in agricultural holdings linked to mitigation of and adaptation to climate change, the efficient use of natural resources and animal welfare.
6841.2	Aid for investments in modernization and/or improvement of agricultural holdings
6842.1	Aid for investments with environmental objectives in the transformation, marketing and/or development of agri-food products.
6842.2	Aid for investments in transformation, marketing and/or product development agri-food
6843.1	Aid for investments in irrigation infrastructure with environmental objectives
6843.2	Aid for investments in agricultural infrastructure to promote competitiveness
6844	**Non-productive investments in agricultural holdings linked to mitigation-adaptation to climate change, efficient use of natural resources and biodiversity**
6864	Investment aid for agricultural diversification
6871	Non-productive investments in basic services in the natural environment
6872	Investments in basic services in rural areas
6881.1	**Non-productive forest investments in reforestation and agroforestry systems**
6881.2	**Non-productive Forestry investments to prevent forest damage**
6881.3	**Non-productive investments in restoring forest damage**
6881.4	**Non-productive forest investments in silvicultural actions with environmental objectives**
6883	**Productive forest investments**

- **INVEST 6844 - Aid for non-productive investments in agricultural holdings linked to mitigation of and adaptation to climate change, efficient use of natural resources and biodiversity.** It supports actions on**:** a) conservation and improvement of biodiversity, especially in the case of protected habitats and species, restoration of agricultural habitats of community interest, creation and maintenance of elements that create environmental heterogeneity; b) Conservation of the natural and/or ethnological landscape and its elements, how are the landscapes linked to agricultural practices. In Estremadura this measure has been implemented focused on the regeneration and improvement of pastures.
- **INVEST 6881.1 - Non-productive forestry investments in afforestation and agroforestry systems.** The objective is to increase the forest area, conserve and restore agroforestry systems, improve the prevention of forest fires and their subsequent restoration, and support silvicultural treatments for the conservation of forests and their adaptation to climate change. Reforestation actions cover agricultural and forest lands with little tree cover. Agroforestry systems can be established by introducing trees into agricultural land or forest land with little tree cover, or by thinning forest vegetation to allow livestock or agricultural use.always in accordance with article 40 of Law 43/2003 on Forests. Funded actions include: a) establishment of forest trees, including replacement of mortality and/or protection of natural regeneration, b) treatment of existing vegetation, c) establishment or improvement of grasslands, d) establishment of woody crops . This measure also includes maintenance payments for agroforestry implemented during the 2014-22 period. However, the annual maintenance for agroforestry implemented by this measure is covered by AECM 6502.2. The agroforestry systems that the Autonomous Regions intend to establish are: Asturias (121 projects), Catalonia (160 projects), Galicia (1,250 ha), Community of Madrid (5 projects), Murcia (361 ha), and Navarre (475 ha).
- **INVEST 6881.2 - Non-productive investments to prevent forest damage:** measure aimed at promoting sustainable forest management, increasing multifunctionality and adaptation to climate change, increasing and restoring the wooded forest area and also conserving and restoring agroforestry systems. These include, among other actions, forestry work and the use of livestock to prevent fires in forest masses, agricultural surfaces and linear infrastructures or the installation and improvement of pastures.

- **INVEST 6881.3 - Non-productive forest investments for forest damage restoration:** With the same objectives as 6881.2, this measure includes forestry treatments (clearing, thinning, resurfacing, treatment of residues), actions for erosion control, reforestation and associated infrastructure, actions for grazing management (boundaries, enclosures, arrangement or construction of livestock infrastructure) or actions for the improvement and conservation of biodiversity: arrangement or creation of water points with faunal interest, installation of refuges, etc.
- **INVEST 6881.4 - Non-productive investments in forestry actions with environmental objectives:** silvicultural actions that increase the stability and resilience of forest areas in the face of biotic and abiotic alterations, including: a) silvicultural management and improvement plans; b) forestry improvement and diversification actions; c) promoting and regulating the sustainable use and public use of forests; d) recovery and maintenance of the livestock trail network.
- **INVEST 6883 - Productive forest investments:** aid for the conservation and maintenance of all the productive potential of the forests, including investments for the transformation, mobilisation and marketing of forest products. The actions include: a) Management and improvement plans with productive purposes; b) Forestry actions to improve the economic value of forests: pruning, thinning and other treatments that improve the volume and quality of wood and other non-wood products (cork, resin, pine nuts); afforestations and plantations with high-value species; c) Investments for the use, transformation, mobilisation and marketing of forest products: machinery and equipment, facilities, etc.

Other measures such as INVEST 6841.1 (Aid for productive investments in agricultural holdings linked to contributing to the mitigation-adaptation to climate change, efficient use of natural resources and animal welfare) and INVEST6864 (Investment aid for agricultural diversification) could also encourage agroforestry, although it is not explicitly mentioned.

3.3 Adoption of Pillar II measures to support agroforestry in each Autonomous Community

Table 5 shows which Autonomous Communities have adopted each of the 13 Pillar II measures identified as favourable to agroforestry. Of the 13 highlighted measures, an average of more than 7 have been activated for each Autonomous Community. The most widely adopted measures are those of Forestry Investments (6881, 6883). The two measures that include the agroforestry in their title (6502.2 and 6881.1) have been activated in 10 and 11 Autonomous Communities, respectively. All the Autonomous Communities have activated at least 4 of these outstanding measures. Castilla y León, Galicia and Navarra stand out, with at least 10 of these 13 measures activated.

Table 5 *Activation by Autonomous Community of Agro-environmental and Climate and Investment Measures identified as favourable to agroforestry systems. Adapted from Dalmau et al., 2024*

Measure	AN	AR	AS	IB	PV	CB	CM	CL	CN	CT	EX	GA	MD	MC	NC	RI	VC	Total
6501.1 Integrated production				X	X				X		X							**4**
6501.2 Sustainable Crop Commitments	X			X	X		X	X	X	X		X			X	X		**10**
6501.3 Commitments to promote and sustainably manage pastures	X				X	X		X	X	X		X			X			**8**
6501.6 Maintenance or improvement of habitats and traditional agricultural activities that preserve biodiversity		X	X			X	X	X		X			X	X	X	X	X	**11**
6501.8 Practices for soil improvement and combating erosion		X						X	X						X			**4**
6502.1 Forest management commitments						X		X			X	X						**4**
6502.2 Forestry and systems maintenance commitments in **agroforestry**	X	X				X	X	X			X	X		X	X	X		**10**
6844 Aid for non-productive investments in agricultural holdings linked to mitigation-adaptation to climate change, efficient use of natural resources and biodiversity			X	X			X	X			X	X	X					**7**
6881.1 Non-productive forest investments in reforestation and agroforestry		X	X			X		X		X	X	X	X	X	X	X		**11**
6881.2 Non-productive forest investments in prevention of forest damage	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	**16**
6881.3 Non-productive forest investments in forest damage restoration	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	**15**
6881.4 Non-productive forestry investments in forestry actions with environmental objectives	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	**12**
6883 Productive forestry investments	X		X		X	X	X	X		X	X	X			X		X	**11**
TOTAL	**7**	**6**	**7**	**4**	**4**	**8**	**8**	**12**	**7**	**8**	**9**	**10**	**6**	**6**	**10**	**6**	**5**	

AN: Andalusia; AR: Aragon; AS: Asturias; IB: The Balearic Islands; PV: Basque Country; CB: Cantabria; CM: Castile-La Mancha; CL: Castile and Leon; CN: Canaries; CT: Catalonia; EX: Extremature; GA: Galicia; MD: Community of Madrid; MC: Region of Murcia; NC: Foral Community of Navarre; RI: The Rioja; VC: Valencian Community

4. CSP Results and Performance Indicators for the Specific Objectives of the CAP

The Results (R), Output (O) and Impact (I) indicators make it possible to measure the achievement of the objectives of the CSP as a whole. The most relevant to agroforestry are:

- **R.12 Adaptation to climate change**: percentage of UAS subject to subsidised commitments to improve adaptation to climate change. Up to 98,331 hectares will be committed to contribute to this result indicator (the organic farming area has not been computed)
- **R.14 Carbon storage in soils and biomass**: percentage of UAS subject to subsidised commitments to reduce emissions, or maintain and improve carbon storage (including permanent grasslands, permanent crops with permanent vegetation cover, and agricultural land in wetlands and peatlands). The general target value for Spain is 7,824,826 ha (i.e 32.1% of the UAA).
- **R.16 Climate-related investments**: percentage of agricultural holdings benefiting from CAP investment aid that contribute to adaptation to climate change and its mitigation, as well as to the production of renewable energy or biomaterials. The target value is 7.19% of farms.
- **R.17 Forested lands**: subsidised area for afforestation, agroforestry and reclamation. The result indicator for Spain is 38,967 ha, but no breakdown is provided between the three categories.
- **R.18 Investment aid for the forestry sector**: total investment to improve the performance of the forestry sector. The objective is €238.03 million.
- **R.19 Soil improvement and protection**: percentage of UAAs subject to beneficial aid commitments for soil management aimed at improving soil quality and biota (such as reduced tillage, soil cover with crops and crop rotation, including legumes). The number of hectares planned under these commitments is 10,536,866 ha (43.2% of the UAA).
- **R.25 Environmental performance in the livestock sector**: percentage of livestock units subject to subsidised commitments to improve environmental sustainability. The number of livestock units subject to these commitments is 307,415, which represents 2.13% of the total.
- **R.26 Investments related to natural resources**: percentage of agricultural holdings benefiting from CAP aid for productive and non-productive investments related to the protection of natural resources. The number of farms receiving relevant aid is 26,143, or 2.77% of the total.
- **R.30 Support for sustainable forest management**: percentage of forest land subject to commitments to support forest protection and management of ecosystem services. The number of hectares under this objective is 151,399 ha (0.62% of the total forest area).
- **R.31 Preservation of habitats and species**: percentage of UAAs subject to aid commitments that promote the conservation or recovery of biodiversity, including high natural value agricultural practices. The overall target value is 3,899,477 ha, or 16.0% of the UAA).
- **R.32 Investments related to biodiversity**: percentage of farms that receive CAP investment aid in favor of biodiversity. The general objective is 2,088 farms (0.22% of the total) that will receive the relevant aid.
- **R.34 Preservation of landscape elements**: percentage of used agricultural area (UAA) subject to subsidised commitments for the management of landscape elements, including hedges and trees. This result can also include the surface of “permanent crops”, so it could cover larger areas than those strictly considered “landscape elements”, according to theCAP Implementing Regulation. The UAA subject to financed commitments to manage landscape elements is 61,238 ha, which represents 0.25% of the total UAA (target value for this indicator).
- **O.14 Number of hectares (excluding forestry) or number of other units subject to environmental or climate commitments that go beyond mandatory requirements.** The total planned area is20.587.953 ha, with a total expenditure allocation of €763,694,047.
- **O.15 Number of hectares (forestry) or number of other units subject to environmental or climate commitments that go beyond mandatory requirements**. Management commitments include 368,019 ha (5,000 units), with a financial allocation (total public expenditure of €7,763,175).
- **O.16 Maintenance payments for forestry and agroforestry**: The total planned area is 87,285 ha with a cost of €27,069,248, but no breakdown is provided between afforestation, restoration and reforestation.

Finally, it is worth highlighting two Impact Indicators: I.21. “percentage of agricultural land covered with landscape elements” and I.22. “crop diversity”. It is not clear when Member States will begin to provide data on Impact Indicators such as these. It may be delayed until the end of the current CAP period.

5. The Commission's Letter of Observations on the initial formulation of the CSP

The Letter of Observations from the European Commission it's a documentor who makes comments about the initial version of the CSP of each member state, requests additional information and proposes revisions, changes and adaptations in its content. In the case of Spainthe letter mentions agroforestry seven times and includes questions about the definition. It also includes the Observation 249 *”The commitments on forest management and maintenance of agroforestry systems have a very low territorial coverage. According to the needs identified, greater acceptance would have been expected, particularly taking into account the importance of agroforestry systems such as dehesas and the lack of tools to preserve them.*

6. SIGPAC and agroforestry systems

The Land Parcel Identification System (LPIS) is part of the EU Integrated Administration and Control System (IACS), and allows authorities to geolocate, visualise and spatially integrate data on agricultural subsidies, as well to accomplish regular updates. In Spain this tool is called SIGPAC and currently identifies 30 land use categories which are used by agricultural managers in their annual statements to verify the use of plots and subplots (MAPA, 2023a). In SIGPAC there are currently no categories for “Agroforestry”, “Silvoarable” or “Silvopastoral” land use. However, there are two categories for silvopastoral systems: “pasture-with-trees" (PA) and "pastures-with-shrube" (PR), which in total add up to more than 8.5 Mha (Table 6). In both categories, a direct payment eligibility coefficient is assigned that varies from 0% to 100%, depending on the vegetation coverage, type of vegetation and other factors like the ground and the slope.

Recent changes in this criteria have increased the eligibility of pastureland with trees or shrubs slightly (4.7%) compared to the previous CAP period. Furthermore, it is expected an update to the list of eligible forage woody species (to be deployed at the regional level) will increase this area even further.

Table 6.*Area of pasture uses in SigPac (PA: Permanent pasture with trees; PR: Shrub pastures; PS: Grassland) in the previous period of the CAP (2015) and in the current one (2023)(Agrodigital, 2023)*

	Use SigPac	Number of Parcels	Total area (ha)	CAP 2015 Eligible Area (hectares | percentage of total)		CSP 2023 Eligible Area (hectares | percentage of total)	
Active Venues	PA	665.313	3.537.994	2.388.649	67,5%	2.485.879	70,3%
	PR	3.289.847	5.019.676	3.022.172	60,2%	3.179.297	63,3%
	PS	2.882.928	2.231.318	1.969.774	88,3%	2.018.215	90,5%
Total		**6.838.088**	**10.788.988**	**7.380.595**	**68,4%**	**7.683.391**	**71,2%**

The National SigPac Viewer contains additional layers of information. One of these layers (only available in Andalusia, Castilla-La Mancha, Castilla y León, Extremadura and Comunidad de Madrid) is **“Montanera”**. These are plots validated by each Autonomous Community as producing products are eligible to be marketed under the label "acorn fed" - established in Royal Decree 4/2014, of January 10. This is the quality standard for Iberian pigmeat. Another layer is called “**Communal Dehesas**” and delimits the areas of communal property declared under the Royal Decree 1048/2022 on the geographical declaration of permanent pastures.

A recently added SIGPAC category is termed “**Landscape Features**” (EEPP). It has several types relevant to trees, including: trees in groups, trees in rows, isolated trees, hedges, copses and forest edges (MAPAMA, 2023). These are used for the calculation of GAEC-8 (Good Agricultural and Environmental Conditions), described in section 4 of Annex II of the Real Decree 1049/2022. The dimensions and conversion and weighting factors are shown in Table

1, but there is still no information available on the areas declared by Spanish farmers. For example, it is possible to declare isolated trees, trees in lines and trees in groups, but the criteria for declaring such trees in plots with scattered trees instead of using the eligibility coefficient is unclear. EPP can also be used by farmers to register trees within silvoarable plots and on the edges of all types of plots.

***Photo 4**. Silvoarable agroforestry diversifies income and the agroecosystem. The combination of deciduous trees with winter cereal makes it possible to take advantage of resources (light, water, soil nutrients) during all months of the year.*

7.Tree cover density on agricultural land

One of the criteria for prioritising areas in which to install agroforestry systems is tree cover, with partial restoration of this in intensely treeless spaces being especially pressing. This section presents the results of the analysis from the work of den Herder et al. (2020), what studytree cover density in 2018 integrating tree cover data from Copernicus (100 m resolution; (Copernicus, 2020), and Corine land uses (Feranec *et al.*, 2016), in five categories of agricultural land (Table 7). The analysis focuses on areas with the greatest potential for tree planting and therefore excluded the following agricultural categories: 121 (agricultural buildings),242 (agriculture with significant areas of natural vegetation),221 (vineyards), 222 (fruit tree and berry plantations).), 223 (olive grove), 241 (annual crops associated with permanent crops) and242 (complex cropping patterns).

The Spanish **"Zero-Tree-Index"** (i.e. completely treeless area of grassland or cropland) is 70.1%, which is 15th in the EU-27 and is exactly the average value.

***Table 7**. Area in each of the Copernicus tree cover classes and Corine agricultural land categories*

Corine Land Cover Code	0%	<= 1%	<= 2%	<= 5%	<= 10%	<= 100%
211 Rainfed crops	8.239.675	8.538.543	8.717.395	9.033.807	9.319.170	9.813.929
212 Watered permanents	2.171.933	2.254.105	2.306.989	2.403.225	2.495.548	2.726.115
213 Rice	129.752	131.098	131.974	133,518	135.053	138.268
231 Meal	681.132	745.261	785.329	862.350	939.415	1.192.608
244 Agroforestry systems	164.921	238.669	298.171	452.523	705.159	2.367.314
Addition	**11.387.413**	**11.907.676**	**12.239.858**	**12.885.423**	**13.594.345**	**16.238.234**
%	**70,1%**	**73,3%**	**75,4%**	**79,4%**	**83,7%**	**100,0%**

Notes: 211 *It includes cereals, legumes, forage crops, tubers and fallow lands. Includes flowers and fruit trees (nursery crops) and vegetables, whether grown in the open field, under plastic or glass (includes horticulture). Includes aromatic, medicinal and culinary plants. Does not include permanent pastures.* ***212*** *It includes crops irrigated permanently or periodically, using permanent infrastructure (irrigation canals, drainage network). Most of these crops cannot be grown without an artificial water supply. It does not include sporadic irrigated land.213 It includes land prepared for rice cultivation. Flat surfaces with irrigation channels. Periodically flooded surfaces.****231*** *It includes a dense herbaceous cover, with a floral composition, dominated by grasses, not under a rotation system. Mainly for grazing, but forage can be harvested mechanically. Includes areas with hedges (bocage).****244*** *It includes annual crops or grazing lands under the forest cover of forest species. See text for classes that are excluded.*

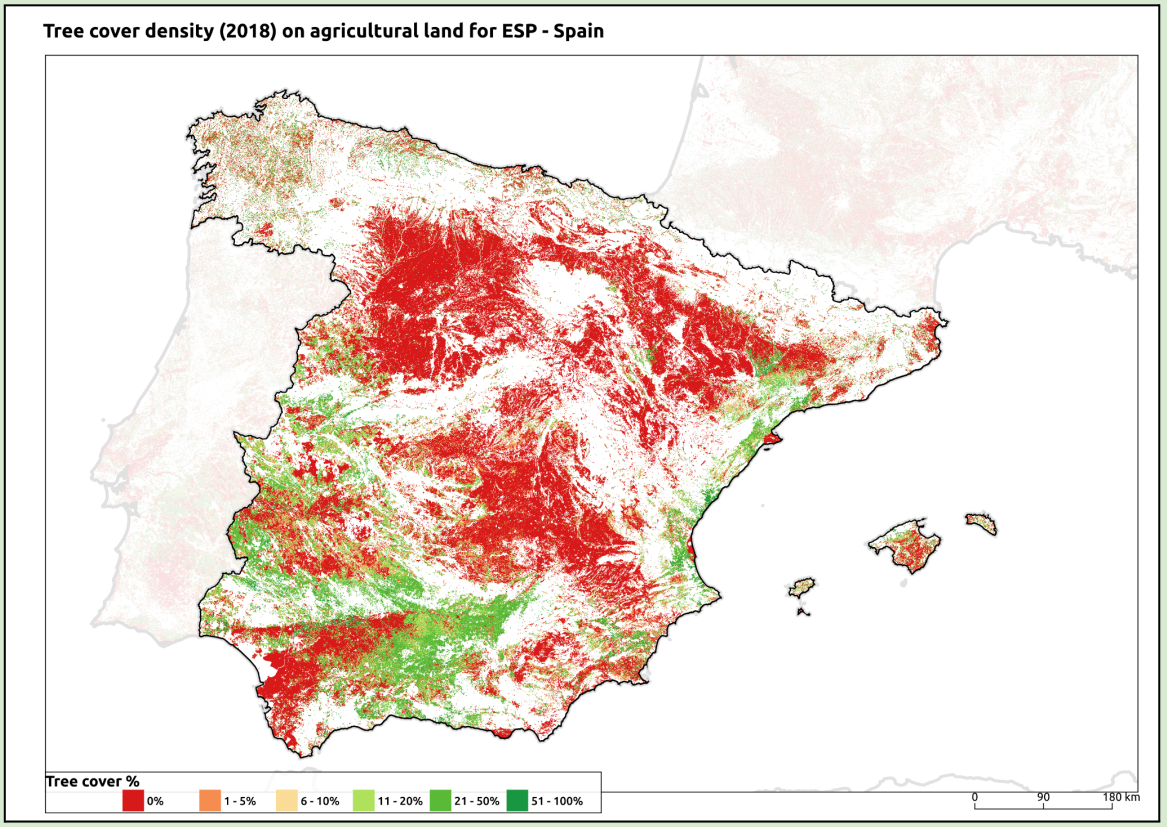

Figure 1: *Tree cover density in Spain on agricultural land, including Natura 2000 spaces, using data from Copernicus and Corine from 2018. Intense red colours indicate canopy coverage below 1% in each 100 m pixel.*

8 SWOT analysis of agroforestry systems in Spain

The CSP recognizes the important role that agroforestry may have for sustainable agriculture in Spain and mentions some of the difficulties that these systems face (mainly referring to the pastures of the southwest of the peninsula) related to diseases and lack of regeneration. This section summarises the strengths**, weaknesses, opportunities and threats** of agroforestry in Spain identified in the CSP and in the entire regulatory and socioeconomic framework. This section is the result of various meetings with actors in the territory.

8.1 Strengths

1. The CSP **explicitly highlights the role of the agroforestry** for mitigation (carbon capture and storage) and adaptation to climate change (reduction of the vulnerability of agricultural, livestock and forestry systems to the impacts of climate change and extreme events including forest fires), soil protection and conservation, hydrological regulation, conservation and connectivity of biodiversity, including the diversity

of habitats and the maintenance of landscape elements (hedges, isolated trees, in lines, and groves) and protected spaces; the provision of cultural and recreational services.

2. SIGPAC is an excellent tool that **integrates agricultural and forestry cadastres**, allowing the identification of extensive agroforestry areas of wooded pastures and scrub pastures.
3. The **area and diversity of agroforestry existing in Spain is the largest in Europe (7.5 mha),** most of which is eligible for area payments.
4. E**xtensive grazing** on forest land and wooded-pasture is an invaluable ecological mechanism to maintain productive and diverse landscapes, with protection against the risk of fire..
5. Silvopastoralism also reduces the intensity of fires. Numerous successful initiatives have taken place engaging stakeholders like farmers, shepherds, technical personnel, public administrations and the local population[4]
6. A **growing number of people, projects and institutions** who work in the generation and transfer of knowledge, advice on agroforestry systems (see final section)

8.2 Weaknesses

1. The area of **agroforestry supported in the new CAP is unknown** (European Commission, 2023). It should have been reported by Spain as Result Indicator 17.3, alongside 17.1 (area of afforestation), 17.2 (area of restoration) and 17.4 (area of trees in lines as landscape features).
2. Quantitative maps of agroforestry areas are not available, although because of SIGPAC, Spain has a better idea than many countries. The threshold density of trees in agroforestry provided by Spain is 100 trees/ha, but the threshold size of trees is not given (e.g. are seedlings to be counted)
3. **There is no budget allocation for many Pillar II measures which could support agroforestry.** Furthermore, other measures that could include agroforestry do not mention it in their descriptions (e.g. beekeeping for biodiversity, agri-environmental management commitments in organic agriculture, animal welfare or agrarian diversification).
4. There is **confusion over the implementation of "landscape-features" in Spain**. The term has been introduced for small groups of trees and tree lines in the SIGPAC system, but criteria for selection are unclear and the maximum size of these areas is 0.3ha, whereas the minimum block size for "forest land" is 1ha. What happens to small blocks of trees between 0.3ha and 1ha), can these not be landscape features?
5. **There is a lack of descriptive studies and practical information on silvoarable systems** that can serve as a reference for interested farmers and extension services**.**
6. The current **low profitability of agricultural, livestock and forestry activities** hinder generational change, the professionalisation of small and medium-sized producers and the possibility of undertaking investments and changes in management models.
7. There is a **problem of access to land** for people potentially interested in dedicating themselves to agroforestry
8. The strict **segregation between agricultural and forestry training in universities and technical colleges** makes it difficult to train farmers and landowners
9. The **lack of a significant premium for agroforestry products** versus those from conventional production limits uptake. This is not the case with acorn-fed hams, but in other areas there is not a premium for extensive versus intensive management of livestock.
10. The **long-term nature of many of the economic and environmental benefits of agroforestry**, limits its attractiveness. During the transition phase profitability can be reduced, and land management is made more complicated, especially in properties under lease and/or owned by investment groups.

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[4]Among them, it is worth mentioning the Plan *of Brush Clearing (PDM)* started in 1986 by the Regional Government of La Rioja (Leaving *et al.*, 2018); Network *of Pasture-Firebreak Areas of Andalusia* (RAPCA) (Varela*et al.*, 2018); the support program for grazing in firebreaks in the Valencian Community between 1996 and 2009 (EFNCP, 2023); the "Flock of Fire" program in Catalonia (Nuss-Girona*et al.*, 2022), or the "Mosaico" program in Extremadura (Pulido *et al.*, 2023).

11. **The lack of quality tree seedlings and cuttings adapted to planting at wide-spacing may limit the growth of new plantations**
12. **The lack of crop species and varieties adapted to shade and competition for surface water** may limit uptake

8.3 Opportunities

- The CSP offers the more **favourable regulatory framework** for the introduction and maintenance of agroforestry, with support measures in Pillars I and II, and greater flexibility for farmers.
- The crisis of conventional agriculture in Spain, with great vulnerability to the price of inputs and negative externalities, is generating increasing interest from producers and consumers in sustainable production models.
- The clear **EU commitment to agroforestry in the European Green Deal** is an incentive for Member States to develop it in national and regional strategies
- The **devolved permission to regional managing authorities** to determine the maximum density of trees per hectare for cropland and permanent crops in agroforestry systems, can encourage them to develop regional criteria to monitor and support agroforestry, and to encourage new planting.
- The **new definition of permanent pastures includes trees and shrubs as an integral part of the grazing-system,** and regional authorities have control over the identification of forage shrubs and calculation of basic payments in their areas.
- The possibility of making **agricultural basic payments (BISS) on forest land**, providing that there is no double financing with forest-based payments is unique in Europe and should be advertised, using the power and flexibility of SIGPAC.
- The availability of a **large area of cropland and grassland in Spain with zero-trees** should encourage incentives for tree planting, especially since the environmental benefits provided per tree will be much greater than planting in traditionally forested areas (Figure 1).
- The new minimum areas for afforestation aid (3 ha) and the lower allowed planting identity (600 stems/ha) make it easier to mix afforestation and agroforestation aid.
- The new **grazeable shrubs included by Autonomous Communities in the definition of permanent pasture** allows a significant increase in the basic-payment eligibility coefficient of pastures with trees or shrubs.
- The **growing body of knowledge about agroforestry systems**, in Spain and similar areas, makes it easier to disseminate information on methods and benefits.
- New **agricultural and social strategies at the national and regional level**[5] These also highlight the need for new groups to link projects and promote the uptake of agroforestry such as the Community of Agroforestry Systems and Mixed-crops (CASM).
- **New market tools**, including i) **carbon markets** associated with the EU Carbon Removals Certification Framework, and potential voluntary and statutory instruments ii) **environmental labels**, stressing the diversity of products generated in agroforestry systems and their environmental benefits: both will give an opportunity for more quantitative valuation of environmental benefits and potential "payment by results"
- **New political tools**, related to climate targets which are set at national levels, including:
    - a) **International measures** such as the EU Land Use, Land Use Change and Forestry Regulation DGCLIMA, 2023) which has allocated Spain a target of 43.6 MtCO2e/annum to be met in 2030 (European Commission, 2023) - which will be an extremely difficult challenge, needing a massive increase in both afforestation and agroforestation levels; the EU 4 per 1000 initiative, also seeks to increase the organic carbon content of the soil by 0.4% annually.
    - b) **National measures**, such as: (i) the **Spanish National Integrated Energy and Climate Plan** (PNIEC) 2021-2030 (ref), which proposes tree regeneration in silvopastoral systems, controlled grazing in strategic areas (focused grazing) to prevent forest fires, as well as afforestation. It indicates several mechanisms for the implementation of these actions, including the CAP Strategic

[5]Such as Generational Relief Strategy and the Network of Agrarian Test Spaces at the state level, and regional initiatives to confront the problem of access to land while reversing abandonment, such as the Land Bank of Catalonia.

Plan, the development of land contracts through public-private partnerships that support forest management and grazing in forest landscapes, and a favourable tax regime to support grazing in forest landscapes and forest management); (ii) the **Royal Decree that will regulate the Carbon Fund** for a Sustainable Economy, has a provisional text for public consultation (iii) the **Spanish Forest Strategy (EFE) 2050** (ref), which includes a mitigation objective of 0.54 MtCO2eq in agroforestry systems through the regeneration of pastures (not a very ambitious objective).

    - c) **Regional measures,** for example a) the Climate Credit System of Catalonia, which articulates a system of forest climate credits (which integrate the effect of forestry practices on carbon, water and biodiversity) and agricultural land climate credits, in the articulation phase; In the preamble of this Government Agreement, agroforestry systems are explicitly mentioned, so it is expected that these practices can benefit from this system; (b) the voluntary carbon credit market of Galicia, which is in the formulation phase and is expected to include sustainable forest management measures, silvopastoralism and (agro)forestation.

- **New technological tools** for the management of extensive livestock farming such as GPS collars[6] and virtual fences, although they are still expensive technologies (Pauné 2017; Pauné 2022).
- **New collectives of farmers and ranchers,** who are more educated, with a greater ability to network and open to adopting new practices.

8.4 Threats

The main threats to agroforestry implementation include:

- **Climate change**, which causes direct and indirect impacts. In the context of southern Europe the following stand out: i) the increase in temperatures; ii) drought and growing water deficit; iii) increase in the frequency and intensity of forest fires, the risk of which is aggravated by the abandonment of forestry and silvopastoral management; iv) health problems linked to water and thermal stress. These impacts can especially discourage the planting of trees, since these must be viable for decades.
- **Resistance and inertia in the land-sector to new techniques:** from ownership to Administration, passing through agribusiness conglomerates (agrochemicals, machinery, veterinary, land-owning investment groups): the current model has been shaped by a series of actors who tend to avoid the adoption of profound changes in the production model.
- **Modest use of existing CAP flexibilities.** While Spain has redefined its definition of permanent pasture to include edible shrubs, the impact of this was only a 4% increase in the "Pasture Eligibility Coefficient (CSP)" in eligibility compared to the previous CAP (see Section 1.2). This may be due to: a) reluctance on the part of the Administration to adopt this change with ambitious criteria, b) opposition by current beneficiaries of basic support, since the same funds are now distributed over a larger area; c) the calculation of the CSP tending underestimate the pastoral potential (Platform for Extensive Livestock Farming and Pastoralism, 2015).
- **Little experience in using Pillar II to promote agroforestry:** in the CAP 2014-2022 the sub-measure 8.2 "Creation and maintenance of agroforestry systems" was activated in Andalusia, Asturias, Extremadura, Galicia, the Basque Country and the Valencian Community, with a very low level of implementation (2.2% of the planned €91.5 M budget)[7]. Sub-measure 8.1 (Aid for reforestation/creation of forest areas) was activated in 14 autonomous regions, but still achieved only 16% of the €820 million planned expenditure. This sub-measure has a high minimum required planting density for afforestation schemes, and requires the re-classification of land from agriculture to forest.
- **Unfamiliarity with woody vegetation and trees in some regions of Spain** (Figure 1), with simplified degraded agricultural landscapes which are precisely the areas with highest-priority for agroforestation.
- **CAP bureaucracy in Spain is huge, and constantly changing.** The CAP is already more than 3000 pages long, resulting in most farmers and foresters being ignorant of the support systems and not pressing for the necessary changes., for fear of losing part of the aid which they currently receive.

[6] Not yet legally usable in horses

[7] EU DGAGRI CAP Monitoring statistics for March 2023

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