CNADS

National Council for the Environment and Sustainable Development

CONCLUSIONS OF THE WORKING GROUP ON THE NEXUS BETWEEN AGRICULTURE AND SOIL.WATER.BIODIVERSITY

15 December 2023

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Index

PREAMBLE - Motivations and methodology 1

PART 1

1. SUMMARY AND RECOMMENDATIONS: FOR THE RESILIENCE AND SUSTAINABILITY OF PORTUGUESE AGRICULTURE.....3

1.1 Summary 3

i) The NEXUS approach 3
ii) Soil, water and biodiversity 3
iii) Agricultural activity and farmers 4
iv) Portuguese agriculture.....5
v) The CAPSP for Portugal 2023-2027.....6

1.2 Recommendations 6

PART 2

2. THE NEXUS BETWEEN AGRICULTURE AND SOIL.WATER.BIODIVERSITY..... 11

2.1 The NEXUS approach 11

2.2. Soil, water and biodiversity: interactions with agriculture, drivers and their protection 13

3. THE EVIDENCE: FACTS, TRENDS AND DRIVERS OF CHANGE IN PORTUGUESE AGRICULTURE 18
3.1 A brief characterisation of Portuguese agriculture 20

3.2 The evolution of Portuguese agriculture: how an activity geared towards local and national markets under an extensive utilisation regime is transformed into an activity geared towards global markets under an intensive utilisation regime 25

3.3 The evolution of agricultural policy: from a sectoral policy to a territorial and sustainability-based policy 27

3.4 The drivers of change 34

4. THE SCENARIOS..... 37

Bibliographical references 40

PREAMBLE - Motivations and methodology

At its 1st Ordinary Meeting of 2022, held on 2 February, the National Council for the Environment and Sustainable Development (CNADS) addressed the issues of agriculture, water and biodiversity, which were also discussed in the framework of the Ecosystem Services Working Group of the European Network of Environment and Sustainable Development Councils (EEAC[1]) in the context of the revision of the Common Agricultural Policy (CAP), with the aim of promoting mutually beneficial responses/conclusions. The President, Filipe Duarte Santos, proposed the creation of a Working Group (WG) to address the NEXUS of Portuguese agriculture with water and biodiversity in the image of a tool adapted by the Food and Agriculture Organization (FAO).

The WG was composed of the following Counsellors: Teresa Andresen (coordinator), Gonçalo Santos Andrade, Jaime Melo Baptista, João Joanaz de Melo, Laura Tarrafa, Miguel Bastos Araújo and Miguel Serrão. In preparing these Conclusions the WG benefited from the participation of Filipe Duarte Santos, President of CNADS, and the collaboration of CNADS technical advisors: Sofia Castel-Branco (Executive Secretary), Carla Martins and Liliana Leitão.

The WG defined the working methodology at its first meeting (11 February, 2022), recognising the need to hold hearings with experts in the field in question, as well as with the public administration agency responsible for the design, drafting and implementation of the CAP. As the European Commission is in the process of approving the Common Agricultural Policy Strategic Plan (CAPSP) for Portugal for the period 2023-2027, a hearing was held on 25 May 2022 with Professors José Manuel Lima Santos and Francisco Cordovil, and on 26 May CNADS received the Director of the Planning, Policies and General Administration Office of the Ministry of Agriculture and Food, Eng.º Eduardo Diniz, who gave a general presentation of the CAPSP proposal for Portugal. This was approved by the European Commission on 31 August 2022 and the CAP 2023-2027 entered into force on 1 January 2023.

At the plenary meeting of 14 February, 2023, it was approved to hold a Workshop with limited participation and by invitation, bringing together experts and farmers. The meeting took place on 19 May, 2023 with experts in agriculture, water, biodiversity and soil, as well as farmers and representatives of farmers organisations from different regions of the country and representatives of different agricultural production systems on the continent. Prior to the meeting, all the participants received a set of questions agreed upon by the WG in order to listen to the main concerns and constraints for the development of Portuguese agriculture (see Annex 1 - Workshop Program).

The Conclusions integrate the content of the testimonies offered by the experts in an attempt to converge on "what unites us and what divides us" in a common desire for resilient and sustainable agriculture, and also reflects opinions previously produced by CNADS on various issues such as climate, water and biodiversity. It is divided into two parts, the first of which presents a summary of the Conclusions followed by a set of appeals and recommendations, and the second part presents the full Conclusions.

CNADS would like to publicly thank everyone for their availability and valuable contributions to the preparation of this document.

[1] *European Environment and Sustainable Development Advisory Councils Network* (EEAC Network).

Alongside the above-mentioned initiatives, WG meetings were held to discuss, reflect on and draft the final document to be submitted to the Council. The Conclusions Proposal was presented at the 6th Ordinary Meeting of CNADS, held on 9 November, 2023, and incorporated the changes resulting from the debate and the contributions received by email.

The Conclusions were unanimously approved at the 1st Extraordinary Meeting of CNADS, held on 15 December, 2023.

PART 1

1. SUMMARY AND RECOMMENDATIONS: FOR THE RESILIENCE AND SUSTAINABILITY OF PORTUGUESE AGRICULTURE

The complexity and unpredictability of Portuguese agriculture and the need for an approach that prioritises and operationalises problems and objectives require an informed, results-oriented dialogue. The aim is for everyone to be talking about the same problem(s), sharing common concepts, processes and data and focusing on solutions and impacts.

In the context of Portuguese agriculture, meeting the need to consume food in quantity and quality is at the heart of the discussion. This involves producing food for the domestic and foreign markets, as well as the need for imports. For its part, the current debate on the future of European agriculture is taking place against a backdrop of greater autonomy for European Union (EU) Member States in the design of agricultural policies, profound transformations in agricultural production systems, food supply and consumption, technological maturity (from genetic modification to precision agriculture), digital transition and the climate emergency and environmental crisis. This debate oscillates between two positions:

> i) the primacy of the protection of the environment, the conservation of natural resources and the mitigation of climate change, emphasising the adaptation of aid to the implementation of environmental policy goals;
>
> ii) the primacy of defending the economic strengthening of the agricultural sector, focusing on the food sovereignty and security of the EU and the Member States.

Faced with this dichotomy, how can interests be brought together to produce tradable goods and services and manage public goods and services in a resilient and sustainable way, assuming the unavoidable condition of scarcity of natural and financial resources?

1.1 Summary

i) The NEXUS approach

The NEXUS approach deals with the complex of interdependencies between natural resources and the set of activities that use or depend on them, in this case the interdependence of soil, water and biodiversity with Portuguese agriculture. It is an approach used by the FAO as part of its global food security mission, with the aim of assessing the impact of a decision, which should not only focus on a sectoral activity, but also take an integrated perspective, suggesting compromise solutions and promoting synergies between stakeholders in terms of uses, users and objectives of economic sectors.

ii) Soil, water and biodiversity

The development of Portuguese agriculture depends on the good state of our soil, water and biodiversity, and it is necessary to adopt sustainable agricultural practices in their use throughout the production chain.

Soil is perhaps the scarcest and most threatened natural resource and a fundamental pillar of the agricultural economy. The soil's organic matter content is crucial to its fertility, agricultural production and the conservation of ecosystems. We advocate its unconditional protection from the effects of erosion, low organic matter levels and anthropogenic pressures.

Water is an essential natural resource that conditions socio-economic development. Although Portugal is in a comfortable position in terms of the total quantity of water resources flowing into its territory, a set of circumstances, in particular the temporal irregularity and spatial asymmetry of water availability, create difficulties in meeting current and future water needs, which are exacerbated by climate change and increasing demand. Water is the main limiting factor for agricultural production in Portugal and its storage and distribution are high on the agenda of stakeholders. The development of Portuguese agriculture depends on the good state of and access to water resources, and it is necessary to adopt sustainable and efficient agricultural practices in the use of water.

Since the middle of the 20th century, the trajectory of biodiversity loss has been consistent, accentuated and strongly related to population growth and consumption, aggravated by the predominance of linear production systems, particularly in agriculture. Biodiversity loss threatens to alter the functioning of ecosystems, reducing their capacity to provide production, protection and regulation services. Halting biodiversity loss requires a much higher level of intersectoral coordination than is currently the case, especially in the areas of interaction between agriculture, forestry, fisheries, land management and nature conservation. The development of Portuguese agriculture depends on the good state of our ecosystems and habitats, and it is important to adopt sustainable agro-ecological practices.

iii) Agricultural activity and the farmers

a) An activity whose purpose is to produce food, in order to guarantee the food security of societies, without jeopardising the continuity of natural resources, species and ecosystems, calling for the adoption of sustainable agricultural practices.

b) An activity marked by unpredictability resulting from different factors of change, from climate change to markets, policies or labor shortages, which implies a growing practice of risk management.

c) An activity that has in recent decades shown a significant capacity for innovation, in particular the latest technological advances (drones, robots, intelligent tractors, genetics, data processing, satellites, AI, machine learning, etc.), as well as the agri-food sector, from food preservation methods to the development of the bioeconomy.

d) An activity that is one of the main vectors of landscape transformation and planning, territorial cohesion and the rural economy.

e) An activity that is inseparable from the responsible management of public goods and services, which justifies the public remuneration of part of the agricultural activity.

f) An activity carried out by farmers, who are not only producers of agricultural goods, but are also managers of soil, water and biodiversity, and the development, sustainability and resilience of agriculture will depend on the good condition of natural resources, ecosystems and habitats.

g) An activity carried out by an ageing population, with enormous difficulties in attracting young people.

iv) Portuguese agriculture

a) An activity that tends to be politically and socially undervalued.

b) An economically, socially, culturally and environmentally strategic activity.

c) An activity marked by the diversity of production systems, co-existing with land structures of different sizes and practices and with diverse ecosystems and habitats.

d) An activity born out of a tradition of extensive agriculture geared towards local and national markets, which has partly been transformed into an activity based on intensive use and geared towards global markets.

e) It is a complex activity that requires responses for the intelligent articulation of multi-level policies and strategies (European, national, regional and local), the definition of the correct scale of diagnosis for appropriate concertation and intervention of the different objectives and problems, and the achievement of environmentally and economically sustainable results.

f) An activity carried out at "three speeds", subject to different factors of change and impact, with the following dynamics having been identified:
i) intensive agriculture;
ii) extensive agriculture;
iii) discontinuation of agricultural activity and abandonment.
Each of these dynamics corresponds to a set of environmental and socio-economic factors of change that interact with each other and are of different natures: climatic, biophysical, technological, landownership or arising from the functioning of markets or policies and investments. Each of these needs to be assessed and systematised in order to clarify the respective productivity and sustainability objectives, so that public policies can be correctly prioritised and channelled.

g) An activity distributed throughout the territory, side by side with forestry, which is still highly representative in the so-called interior (Ordinance no. 208/2017 of 13 July), which represents 3/4 of the continental territory and accounts for only 1/5 of our economic wealth, also referred to as low-density territories, and particularly prone to rural fires.

h) The simplification of the Portuguese agricultural landscape, namely the mosaic and the ecological processes that underlie it, is the source of new problems that are disruptive and costly from an environmental, social and economic point of view, with an impact on the NEXUS of agriculture with soil, water and biodiversity.

i) An institutional context born out of a productivism culture that today suffers from inertia in order to evolve into more agile structures, more permeable to change and adaptation, aware of a culture of conservation of natural resources, closer to the land and the players, open to different forms of governance and mobilising new partners and processes of participatory and deliberative democracy.

j) An activity that lacks: i) reliable access to information, knowledge, funding opportunities and sustainability techniques; ii) research support focused on the objectives and problems of Portuguese agriculture; and iii) a training and technical capacity-building strategy tailored to an integrated and up-to-date understanding of agricultural activity.

v) The CAPSP for Portugal 2023-2027

a) From reform to reform, CAP has become complex and hermetic for most of the population, including farmers, and has been held hostage by lengthy processes that lead to a chronic lack of timely knowledge of the rules of the measures. On the other hand, it needs to be complemented by other investments and policies geared towards the specific reality of Portuguese agriculture.

b) The CAPSP of each EU Member State correspond to a new strategic approach (albeit with obligatory general guidelines from the EU), but which tends to meet their specific needs and represents a transition and an opportunity for a policy that is closer to the problems and more results-oriented.

c) The CAPSP are intended to be adaptive and to be open-ended documents, subject to reprogramming.

d) The CAPSP for Portugal 2023-2027 contains the interventions financed by the CAP with the allocation of EU funds. It is national in scope, including the Autonomous Regions and is structured around six pillars. It covers the environment, climate, natural resources and landscape, which means that, as well as being an agricultural policy instrument, it is also seen as a territorial policy with an impact on the environment, local development and sustainable development.

e) The CAPSP for Portugal 2023-2027 does not respond to the needs of a sustainable and resilient Portuguese agriculture, reflects the lack of a regionalised diagnosis adapted to the diversity of realities and problems in the country and faces administrative difficulties in operationalising it and clarifying the doubts arising from the complexity of the financial instrument itself.

1.2 Recommendations

CNADS advocates the promotion of a CULTURE OF DIALOGUE between stakeholders in Portuguese agriculture with a view to developing a strategy for transformation, adaptation and territorial cohesion that respects and enhances the NEXUS of agriculture with soil, water and biodiversity **and calls for**:

i) To policymakers, public and private institutions linked to agriculture and education and research, farmers and citizens, in order to promote Portuguese agriculture as an activity that produces tradable goods and services of a public nature, manages natural and cultural resources and builds landscapes.

ii) To policymakers, public and private institutions linked to agriculture to:

- **create policies and investment conditions so that Portuguese agriculture effectively incorporates sustainable soil, water and biodiversity management and internalizes the full economic, social and environmental costs of producing goods and services;**
- **promote a simplification of the CAPSP in order to make it easier for recipients to understand and to promote comprehensive implementation in the context of existing regional, socio-cultural and ecological diversity;**
- **address the issue of land ownership and use by defining safeguard measures.**

iii) Public and private institutions linked to agriculture to **strengthen mechanisms for empowering Portuguese farmers with knowledge and technology** in order to improve the sustainability and resilience of production processes, reinforcing effective communication mechanisms in terms of sustainability practices, support instruments and new technologies for efficient performance.

iv) Public and private institutions linked to teaching and research in Portuguese agriculture to **strengthen communication networks with farmers in order to identify problems that require additional applied research efforts** and, at the same time, to bring knowledge to farmers for practices that are increasingly supported by evidence.

v) Public and private institutions linked to the management of irrigation systems to define progressive tariff structures, harmonised according to the water availability of the different regions of the country, which **encourage the adoption of low water consumption crops and investment in precision irrigation systems, the reuse of water and the reduction of losses in irrigation systems**.

The WG is aware that a reflection on such a wide-ranging topic, limited in time, cannot be exhaustive and wishes to mention some issues which, although they were not the focus of the work carried out for the preparation of these Conclusions, arise naturally and also calls on public institutions and environmental and consumer organisations to promote actions that encourage: **i) the reduction of food waste**, which is estimated at 30-50% of total agricultural production globally. The causes vary depending on whether you're in developed or developing regions, with waste in the former being associated with oversizing consumption in relation to needs and in the latter with weaknesses in storage; ii) **a paradigm shift from the food business to the nutrition business**; and iii) the promotion of appropriate policies for correct **waste management in agriculture**.

CNADS recommends:

- The creation of a **PLATFORM OF STAKEHOLDERS[2] IN PORTUGUESE AGRICULTURE**, optimizing the flow of information in which stakeholders at different levels assume:

- The **diversity of production systems in Portuguese agriculture in conjunction with the recognition of the coexistence and cohabitation of three dynamics: intensive agriculture, extensive agriculture, and discontinuation of agricultural activity and abandonment**, which are not isolated from each other and which concern everyone.

- Credible access to **information, knowledge, funding opportunities and sustainability techniques**.

- The importance of investing in **research focused on the objectives, proximity and problems of Portuguese agriculture, technological innovation and the dissemination of knowledge in a collaborative way** between research centers dedicated to natural resources, agriculture and the agri-food sector and companies and organizations of farmers, the environment and consumers.

- The importance of effectively **valuing the environmental goods and services** that Portuguese agriculture provides and its contribution to the integrity and sustainability of ecosystems.

- The adoption of **innovative management models** that guarantee the resilience and viability of farms where the environmental function is as important as the production function for the market.

- The importance of an **intelligent multi-level articulation of policies**, viewing Portuguese agriculture as an economically, socially, culturally and environmentally strategic activity based on the diversity of agricultural production systems that coexist with land structures of different sizes and practices and diverse ecosystems and habitats.

- The need for a contemporary, **peer-learning training and capacity-building** strategy for farmers, adapted to an integrated and up-to-date understanding of agricultural activity.

- The enhancement of the **European Union Common Agricultural Policy Network (EU CAP Network), a European network of CAP National Networks** in which organizations, public administration, researchers, entrepreneurs and professionals share knowledge and good practices with the aim of supporting the implementation of the CAPSP.

[2] Stakeholders of the Dialogue Platform for the Resilience and Sustainability of Portuguese Agriculture: Farmers and landowners; Farmers' organizations; Environmental organizations; Local development organizations; Consumers; National and regional political/public policy makers; Authorities responsible for agriculture, soil, water and nature conservation; Operators; Local authorities, CIM and Metropolitan Areas; Industrialists and distributors of agri-food products; Stakeholders in agricultural markets; Credit institutions and insurers; Industry and service agents; Communication, marketing and tourism agents; Researchers in the agricultural and agri-food sectors and in the management and conservation of natural resources; Researchers, educators and trainers in agriculture and natural resources; Citizens

- The creation of a **PORTUGUESE CAP NETWORK**, built from scratch according to the above principles, focused on the objectives, proximity and problems of Portuguese agriculture.

- A REVIEW OF THE PUBLIC AND PRIVATE INSTITUTIONAL CONTEXT in which Portuguese agriculture develops:

- An institutional context equipped with **more agile structures** at central, regional and local government level, as well as agricultural cooperatives and farmers associations that are **more permeable to change and adaptation** (technological, socio-economic and climatic), **aware of a culture of soil, water and biodiversity conservation**, **closer to the land and the players**, and open to **forms of governance that mobilise new partners and processes of participatory and deliberative democracy**.

- An institutional context that is **adaptive** to the three dynamics identified, attentive to the respective factors of change and associated with the promotion of multi-level public policies that:

  INTENSIVE AGRICULTURE
  Contribute to ensuring environmental sustainability, product certification, innovation based on research applied to technology and management, an intelligent water storage and distribution model, etc.

  EXTENSIVE AGRICULTURE
  Contribute to the economic sustainability of production systems (such as cork oak forests or pastures), the organisation of markets (e.g. short agri-food circuits, public procurement), the provision of extension services from the network of agricultural cooperatives, support for small and medium-sized enterprises, and innovation based on research applied to technology and management.

  DISCONTINUATION OF AGRICULTURAL ACTIVITY AND ABANDONMENT
  Give priority to regional, territory-based policies that guarantee the ecological, social and economic viability of agricultural territories in a logic of 'people in places', sensitive to the fragility of active economic structures, etc.

- **CAPSP FOR PORTUGAL 2023-2027 SHOULD BE ACCEPTED AS AN OPPORTUNITY FOR A MORE PROBLEM-FOCUSED AND RESULTS-ORIENTED POLICY**, meeting the ambition of what we want to be and the harbinger of a new culture of shared responsibility, based on the art of good communication and adequate technological and ecological literacy, with the post-2027 period in mind.

A CAPSP for Portugal 2023-2027 understood as a transition strategy for agricultural policy that:

- effectively serves both the **sustainability of agricultural production systems and the recovery of ecological systems** - understood as a single system - interconnected by the NEXUS of agriculture with soil, water and biodiversity;

- integrates the **diversity of landscapes and communities, serves spatial planning and landscape management and is adapted to the regional and local levels**, in other words, a multi-level policy that knows how to find the right scale to respond

to problems and that deepens the integration of environmental, public health and animal health and welfare constraints in agricultural activity;

- strengthen, from an accounting point of view, **the remuneration for ecosystem services**, since the possibility provided for in EU legislation requires prior work to define suitable and reliable indicators and to assess the most appropriate methodology for remunerating farmers for these services in a fair and secure manner.

- brings together a **set of support instruments and access rules, understandable to the end user** (the farmer), which are attractive, promote their application and at the same time allow the above objectives to be achieved, while being monitored and reported on publicly and in a timely manner.

PART 2

2. THE NEXUS BETWEEN AGRICULTURE AND SOIL.WATER.BIODIVERSITY

> *Member States shall ensure that all agricultural areas, including land which is no longer used for production purposes, are maintained in good agricultural and environmental condition.*
>
> REGULATION (EU) 2021/2115), Article 13
> Obligations of Member States relating to good agricultural and environmental condition

2.1 The NEXUS approach

The interactions of the NEXUS of agriculture with water and biodiversity were the starting point of the WG, but as a result of the hearings held, the soil component was also included due to the evidence of its importance as a supporting element, together with water and biodiversity for agriculture, thus meeting the strategic assets adopted and considered "essential for the objectives of territorial cohesion, at national and regional level" in the Diagnosis of the 1st revision of the National Spatial Planning Policy Programme (NSPPP) (Law no. 99/2019, of 5 September)[3].

NEXUS is the complex of interactions between natural resources and the set of activities that use or depend on them, in this case the interaction of soil, water and biodiversity with Portuguese agriculture, based on the knowledge of the scarcity of natural resources and the objectives of sustainable and resilient agriculture.

This is an approach used by the FAO in the context of its mission on world food security, which aims to assess the impact of a decision not only on a sectoral activity, but also to take an integrated perspective, to identify trade-offs and to promote synergies between stakeholders in terms of the uses, users and objectives of the economic sectors involved. FAO has developed the NEXUS of food security with water, energy and food production: “The Water-Energy-Food Nexus. A new approach in support of food security and sustainable agriculture” (FAO, 2014)[4].

The NEXUS approach values interactions for the use and management of resources, as well as the establishment of compromises and synergies created taking into account the interdependencies between them, and its main objective is to create opportunities for a process of intersectoral and plural dialogue. Interactions take place in the context of global change factors such as demographic change, urbanization, agricultural modernization, markets and prices, technological advances or climate change, as well as drivers of change that are more specific to the context under study, such as governance structures and processes or cultural and social behaviour.

The Conclusions focus exclusively on agriculture, with particular reference to Portuguese agriculture on the mainland. There are many economic activities that have an impact on soil, water and biodiversity, but agriculture is certainly one of those that have the greatest impact on

[3] CNADS. Opinion on the proposal to amend the PNPOT, July 2018.
[4] https://www.fao.org/3/bl496e/bl496e.pdf

them and on which they depend, along with forestry, mining and construction. Indeed, the territorial extension and the diversity of agricultural production systems are responsible for this primacy.

The NEXUS approach does not disregard the reality of other natural resources - such as air or energy (renewable and non-renewable; living and fossil) or the climate - which are essential to agricultural activity because they support it or because it affects them (Figure 1). The challenge of carbon neutrality dictates this, as does the context of adaptation to climate change. Portugal approved the National Energy and Climate Plan 2020-30 (NECP2030) (Council of Ministers Resolution (CMR) no. 53/2020, of 10 July), which integrates the Roadmap for Carbon Neutrality 2050 (RNC 2050) (CMR no. 107/2019, of 1 July). In between, the European Green Deal (COM (2019) 640 final) was presented in December 2019, with a new growth strategy for Europe, in line with the EU's long-term decarbonisation goals and based on a green and digital transition that is fair and inclusive. Subsequently, the Climate Law (Regulation (EU) 2021/1119 of 30 June 2021) integrated the objectives set out in the Green Deal and guided the Basic Climate Law (Law no. 98/2021 of 31 December), which supports national public policies for climate action at different levels of governance. Alongside these initiatives, the National Roadmap for Adaptation 2100 (NRA 2100)[5] is being developed, which aims to define scenarios for the evolution of vulnerabilities and impacts of climate change, as well as to assess the investment needs for adaptation and the socio-economic costs of inaction for the national territory.

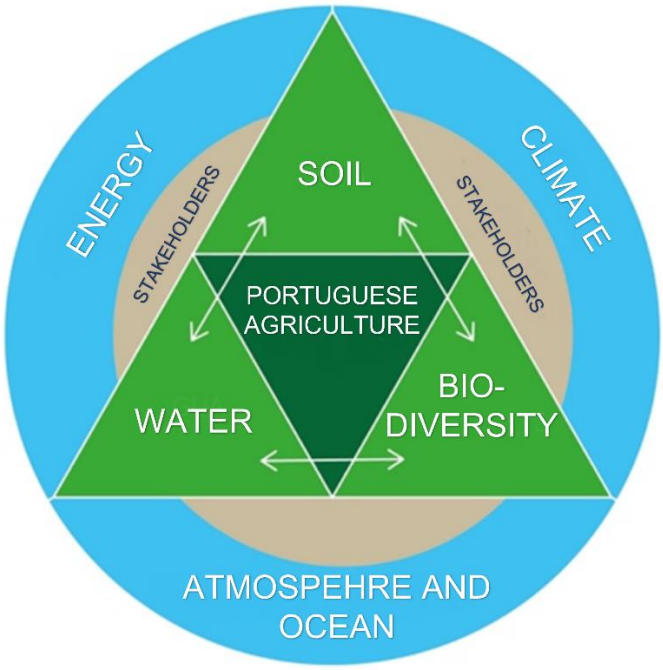

Figure 1 - The broad context of the NEXUS of Portuguese agriculture with soil, water and biodiversity.

[5] https://rna2100.apambiente.pt/pagina/programa-ambiente-alteracoes-climaticas-e-economia-de-baixo-carbono

For the evaluation of NEXUS interactions, FAO has identified three areas of work:

a) Evidence;
b) Scenario development;
c) Response options.

These areas of work are not interpreted as a sequence of steps, but as areas of work that are interlinked through dialogue between stakeholders (Figure 2). For the purposes of the Conclusions, the first two areas - Evidence and Scenario Development - are adopted, while the third area consists of Recommendations supported by a set of recitals arising from this exercise.

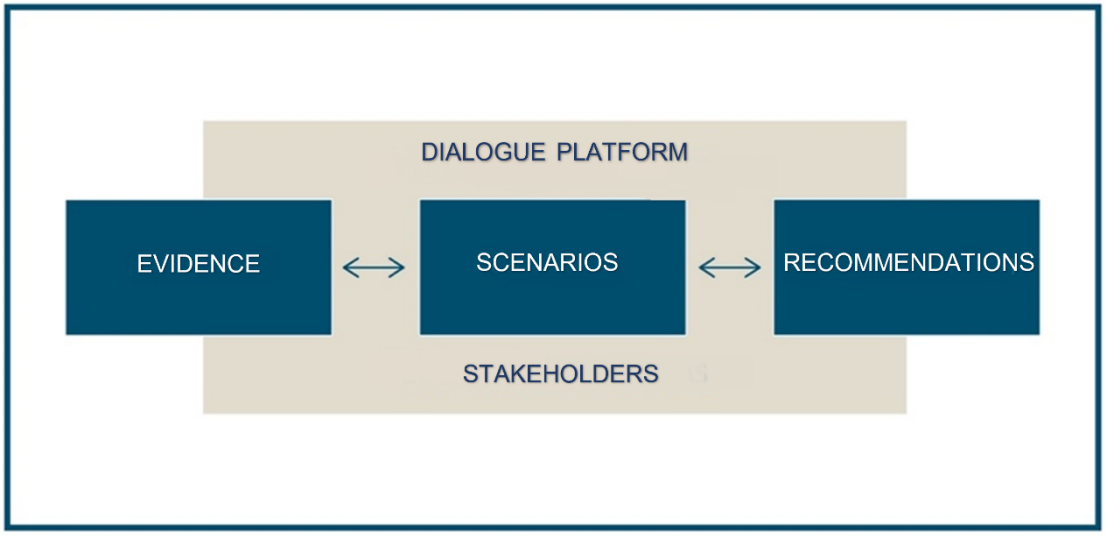

Figure 2 - Working areas of the NEXUS approach.

The Evidence addresses soil, water, biodiversity and Portuguese agriculture and is based on the contributions of the participants in the hearings and the Workshop, the members of the WG and the literature review exercise. As far as Scenario Development is concerned, since it is a complex task due to the multiplicity of change factors involved, the Conclusions are limited to identifying possible scenarios to be developed later. The Recommendations have been drafted with the aim of contributing to the definition of policies that, through dialogue between the interested parties, can form a strategy for the transformation, adaptation and cohesion of the territory and contribute to the sustainability and resilience of Portuguese agriculture.

2.2. Soil, water and biodiversity: interactions with agriculture, drivers and their protection

In order to provide a common basis for dialogue and understanding between the wide range of stakeholders in Portuguese agriculture, a number of assumptions about the interactions between agriculture and soil, water and biodiversity, and the pressures on the three resources and their respective levels of protection, are set out below.

The increase in agricultural productivity, innovation in the agri-food sector, the emergence of global agri-food chains combined with the efficient transport of products and the openness and competitiveness of markets have enabled agriculture to become a competitive economic sector. It has transitioned from a local/regional to a global activity, and has also become one of the most impactful in terms of environmental and sustainability challenges, as well as having repercussions on people's health and social and political stability. Despite this, and in a global context, there is an increase in hunger, as confirmed by the United Nations (UN)[6] which points to an average of 735 million people going hungry, 122 million more than in 2019, and almost half of the world's population being unable to afford healthy food. The focus on food security, as defined at the World Food Conference in Rome in 1996, arose from the need to ensure that "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". The concept of food security thus implies the valences of availability, through domestic food production, imports and reserves, of access, which stems from the economic and physical ability of consumers to obtain food, utilisation, covering nutrition and the body's ability to absorb and use the nutrients made available, and stability, which refers to the ability to maintain access to food over time, without fluctuations or shocks that could compromise the other dimensions of food security.

Agriculture is a complex economic activity that has evolved in line with human needs throughout history, producing goods (food, fibre and wood) that are distributed throughout the markets and processed by the agri-food sector and various industrial sectors. It manages territories that are essential for supplying ecosystem services to regulate the water and carbon cycles and support services related to the nutrient cycle and the soil fertility fund.

The concepts of farmer and agricultural activity are thus inseparable from the role of responsible management of goods and services for public use. These goods and services related to water, soil and biodiversity, as well as those resulting from their interaction with cultural elements and dynamics - such as landscapes and recreational and leisure activities - fall into the category of goods and services of public use, justifying public remuneration for agricultural activities that fulfil this function.

i) Soil

Soil has three components: solid (organic and inorganic), liquid and gaseous. The organic matter in the soil is crucial for agricultural production, along with its ability to infiltrate, retain and drain water and in the carbon cycle. Soil acts as a support and nutrient medium for plants and thus underpins agricultural production and the food chains that sustain humanity. In turn, it is home to significant biodiversity and contains large reserves of water. Fertile soils, in particular, are an important tool in our responses to the challenges of climate change, desertification and food security.

[6] FAO, IFAD, UNICEF, WFP and WHO. 2023. The State of Food Security and Nutrition in the World 2023. Urbanization, agrifood systems transformation and healthy diets across the rural–urban continuum. Rome, FAO. https://www.fao.org/documents/card/en/c/cc3017en

Fertile soil is a scarce resource that should be seen as both a natural capital, renewable if well managed, and a cultural asset, whose value tends to be underestimated by the property market and in property transfers.

Soil is perhaps the scarcest and most threatened natural resource, but awareness of this is limited. As a result of the country's orographic and climatic characteristics, soils are exposed to a high risk of erosion. In addition to the natural pressures to which they are subject, anthropogenic pressures have contributed to the degradation of their condition and functioning, including those resulting from agricultural and forestry activity when conducted inappropriately. On the other hand, soil conditions are crucial for plant development.

Most Portuguese agricultural soils have a low organic matter content as a result of a combination of environmental conditions and, in some cases, inappropriate farming practices. However, the intelligent management of organic matter in the soil and, in addition, of carbon reserves is crucial for sustainable agricultural production, for combating erosion and desertification and for adapting to climate change.

So, just as we talk about human generations, we can talk about the generations of soil that accompany them. As a natural process, soil formation also depends on the socio-cultural dynamics of communities and their individuals, who manage it and pass it on from generation to generation. Soil formation is the basis of the economy, particularly the agrarian economy. Portugal's cultural landscapes, although many are disappearing or being transformed, bear particularly intelligent witness to the management and conservation of soil fertility.

Farmers are not just producers of agricultural goods, they are also managers of the soil, particularly fertile soil. The development of Portuguese agriculture will depend on the good state of our soils, and it is important to adopt sustainable agricultural practices, from preparing the land to harvesting the goods produced, as well as strengthening the legal framework and comprehensive policies with a view to managing this resource more efficiently.

Apart from a few pieces of EU legislation relevant to soil protection and the actions undertaken in the context of the 2006 Thematic Strategy for Soil, the EU has not yet succeeded in providing itself with an adequate legal framework to ensure the same level of protection for soil as for water, the marine environment and air. However, the need has become more pressing and knowledge about soil and recognition of its value has increased significantly in recent years. Pressures, expectations and demands on soils have increased, while the climate and biodiversity crises are exacerbating the situation.

We need healthy soils now more than ever.

EU Soil Protection Strategy for 2030 (2021)

Reaping the benefits of healthy soils for people, food, nature and the climate

COM(2021) 699 final

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699

ii) Water

Water is an essential natural resource, whether as a biochemical component of living beings, a means of life for plant and animal species, a factor in the production of various final and

intermediate consumer goods, a factor in the development of ecosystems and even as a representative element of social and cultural values.

Portugal is not a poor country in terms of water resources, however, several factors lead to a marked spatial and temporal asymmetry in the availability of this resource in our country. The prevalence of air fronts originating in the Atlantic and the orography of the continent mean that the average annual rainfall in the north (2,500 mm) is around five times higher than in the interior of the Douro or Alentejo (500 mm), with the River Tejo dividing the territory between the humid north and the drier south. The mainland territory's Mediterranean climate also imposes a marked inter-annual and seasonal variability in rainfall. Between 1930 and 2015, the average of the driest years, defined by the 20th percentile of annual rainfall, is around 50% to 70% of the global average and, as a rule, almost 85% of rainfall each year occurred between October and April. Geological conditions are another factor in the asymmetry of water availability. The most productive hydrogeological units are located in the Tejo-Sado basin and on the western and southern edges. With regard to water availability, it should also be borne in mind that 65 % of continental territory is located in one of the five river basins shared with Spain and that precipitation in national territory is always higher than in Spain.

It should be borne in mind that the occurrence of droughts is a phenomenon characteristic of the Mediterranean climate of southern Europe, particularly in Portugal, which results in high economic costs. Historical records and climate projections for the coming decades suggest an increase in the frequency and severity of these situations. But a more critical problem is that of growing water scarcity, a permanent situation, partly induced by anthropogenic activity, in which the demand for water is approaching its availability in nature. This water scarcity stems from the growth in demand for water as a result of the increase in the population and their standard of living, as well as the increase or transformation of economic activity. In the European countries of the western Mediterranean, with demographically stabilised populations, growing water scarcity is essentially the result of increased variability in the hydrological regime as a result of climate change and increased water consumption due to the transformation of rainfed agriculture into irrigated land.

The APA/Nemus/Bluefocus/Hidromod study (2021)[7] estimates that 5945 hm3 /year are currently abstracted to satisfy consumptive uses, with irrigation accounting for 70 % of this volume. Urban and industrial uses are also important, accounting for 13% and 6% respectively. In addition to consumptive uses, there are non-consumptive uses such as the production of hydroelectricity, aquaculture and navigation, as well as the need for water to balance ecosystems, namely aquatic and riparian ecosystems.

To summarise, although Portugal is in a comfortable position in terms of the total quantity of water resources flowing into its territory, a set of circumstances, especially the irregularity of the weather and the spatial asymmetry of water availability, creates difficulties in meeting current and future water needs, especially in the south of the country, which will be exacerbated by climate change and increased demand for water.

[7] APA/Nemus/Bluefocus/Hidromod, 2021. Avaliação das disponibilidades hídricas por massa de água e aplicação do índice de escassez WEI+, visando complementar a avaliação do estado das massas de água, Agência Portuguesa do Ambiente – in the press.

The debate on water management is the debate on the economic model we want for Portugal. It's a debate about the most appropriate public policies for our country, because water conditions socio-economic development, not the other way around.

Alongside availability, water quality is also a determining factor in its use, and is conditioned by both natural and anthropogenic phenomena that lead to its contamination, such as urban, industrial or even agricultural activities, when carried out inappropriately.

The importance of water is widely recognised and there is a vast legislative framework that supports its use at international and national level. The Water Law, Law no. 58/2005, of 29 December, transposes the Water Framework Directive (Directive 2000/60/EC, of 23 October 2000) into national law and is complemented by the Water Resources Use Regime, established in Decree-Law no. 226-A/2007, of 31 May.

Farmers are not only producers of agricultural goods, they are also the biggest users of water and are among the main stakeholders in its good management. The development of Portuguese agriculture will depend on the good state of water resources, and it is important to adopt sustainable agricultural practices that are more efficient in their use of water, as well as comprehensive policies aimed at managing this resource more efficiently.

iii) Biodiversity

Solar energy is the primary source of planetary energy which, in the particular case of terrestrial systems, requires water and nutrients to become usable by producers (plants) which, in turn, are the basis of the energy made available to consumers (animals). This process of transforming solar energy into chemical energy creates the conditions for the diversification of life forms, generating biodiversity. Biodiversity, in turn, has been defined as the variability of living organisms and the relationships they establish with each other and their surroundings. Without biodiversity, the chemical composition of the atmosphere would be unsuitable for human life. We wouldn't have fertile soil, or enough purified fresh water or food resources to sustain humanity. Without biodiversity, we wouldn't have the ecosystem services of pollination, water cycle regulation and flood protection, or carbon sequestration. The climate would be unfavourable for life. In short, without biodiversity there would be no conditions for the survival of humanity as we know it today.

Since the middle of the 20th century, the trajectory of biodiversity loss has been consistent, accentuated and strongly related to population growth and consumption, aggravated by the predominance of linear production systems, particularly agricultural ones, which require a constant input of raw materials, many of which come from biodiversity or are produced at its expense. This linear economic process generates negative externalities, such as the destruction of habitats, soil and water pollution, the over-exploitation of natural resources, jeopardising their regeneration, and the spread of invasive species. The simplification of trophic chains that results from the loss of biodiversity, particularly at the level of consumers (e.g. animals), tends to reduce the efficiency with which they retain carbon metabolised by producers (plants) in ecosystems, thus increasing the carbon emission/sequestration ratio, with the resulting worsening of the climate change phenomenon. Biodiversity loss thus threatens to alter the functioning of ecosystems, reducing their ability to provide production, protection and regulation services that are essential for maintaining not only our basic social and economic

activities, but also, in extreme situations, human life itself. Halting the loss of biodiversity requires a much higher level of intersectoral coordination than at present, especially in the areas of interaction between agriculture, forestry, fisheries, land management and nature conservation[8].

One of the main reasons for the loss of biodiversity on the planet is the way we feed ourselves. All living beings need to eat. We also know that around a third of greenhouse gas emissions come from food systems. Of these, around two thirds come from the agricultural sector and the rest from the transport, refrigeration, etc. of food. In Portugal, the agricultural sector was responsible for around 12 % of greenhouse gas emissions in 2020[9].

Farmers are not just producers of agricultural goods, they are also managers of biodiversity. The sustainability and resilience of Portuguese agriculture will also depend on the good state of our ecosystems and habitats, and it is important to adopt sustainable agricultural practices adjusted to the current context of climate change, as well as comprehensive policies aimed at understanding the importance of the resource and its efficient management.

> *The State of Nature Report drawn up by the Commission in 2020 (COM (2020) 635 final) noted that the Union has not yet managed to halt the decline in protected habitat types and species whose conservation raises concerns for the Union. This decline is mainly due to the abandonment of extensive agriculture, intensification management practices, the modification of hydrological regimes, urbanisation and pollution, as well as forestry activities and the exploitation of unsustainable species. In addition, invasive alien species and climate change represent major and growing threats to the Union's native flora and fauna.*
>
> *Regulation of the European Parliament and of the Council on nature restoration COM (2022) 304 final*

3. THE EVIDENCE: FACTS, TRENDS AND DRIVERS OF CHANGE IN PORTUGUESE AGRICULTURE

> *Plant productivity is affected by both the increase in temperature and the increase in carbon dioxide, which have antagonistic consequences (Brandão, 2006). The increase in temperature shortens the crop cycle and consequently its productivity. High temperatures also increase the metabolic activity of plants, reducing their net photosynthetic rate. On the other hand, an increase in CO2 increases the photosynthetic rate of the leaves and, of course, productivity.*
>
> DGADR (Coord. Cláudia Brandão). Conhecer para Prever o Futuro. Relatório Final da candidatura PDR 2020-2023 (2019-2021) p. 13

Agriculture is an economic activity that produces goods and services of a multifunctional nature and is based on the management of natural resources, typified in economic theory as goods and services of public use related to soil, water and biodiversity. The purpose of this activity is to produce and commercialise food in order to guarantee the various values associated with

[8] Biodiversidade 2030: Nova agenda para a conservação em contexto de alterações climáticas (Coord. Miguel Bastos Araújo). Universidade de Évora & Fundo Ambiental, Ministério do Ambiente e da Ação Climática, Lisboa, 2022.
[9] https://rea.apambiente.pt/content/emiss%C3%B5es-de-gases-com-efeito-de-estufa

societies food security without jeopardising the sustainability of the natural resources, species and ecosystems on which they depend[10]. In addition to food production, agriculture also provides tradable goods of a non-food nature, such as fibres for various types of application, plant biomass for the production of bioenergy or biofuels (e.g. alcohol), among other more or less recent crops, but with a high potential for occupying arable land in competition with the (scarce) supply of land available for food production. As an activity that produces goods, today it is the basis for the creation of competitive markets on a global scale, which makes it an economic activity with a high impact on the planetary challenges of sustainability and the environment.

As a multifunctional activity, agriculture mobilises multiple actors with their often competing interests in the same territory, embedded in a historical and socio-cultural matrix from which emanates a landscape that accommodates strategic functions for the management of natural risks and the protection of people and goods, such as defence against rural fires, floods, landslides, soil erosion control or climate change mitigation and adaptation.

The evidence presented here emphasises precisely the NEXUS of agriculture with soil, water and biodiversity and, for the most part, is the result of contributions from the Workshop organised by CNADS in May 2023 (ANNEX 1). They underpin the recognition of agriculture as an economic activity with social, environmental and cultural relevance, and are the basis of different European policy instruments that are part of the European Green Deal (2019), such as the Farm to Fork Strategy (2020) or the European Biodiversity Strategy 2030 (EC 2020). The Farm to Fork Strategy advocates a "*fair, healthy and environmentally friendly food system*" that transforms the way food is produced and consumed, which assumes that "*the food sector is one of the main causes of climate change*"[11] and advocates organic production in at least 25% of the agricultural area by 2030 and a halving of the use of pesticides and fertilisers and the sale of antimicrobials. The European Biodiversity Strategy 2030 (EC 2020) proposes to put Europe's biodiversity on the path to restoration by 2030 and sets out a commitment to legally protect a minimum of 30 % of land, including inland waters, and 30 % of seas in the European Union, of which at least one third must be under strict protection, including all remaining primary and secular forests[12]. Restoring ecosystems and improving biodiversity is a cornerstone of the European Green Deal, on the assumption that healthy ecosystems help mitigate climate change and call for nature-based solutions. In turn, these instruments converge with the Commission's agenda for the Sustainable Development Goals / *Towards a Sustainable Europe by 2030* (2019).

The high diversity of agricultural production systems that characterise the Portuguese landscape is the result of factors of an orographic, lithological, pedological and climatic nature, but also of the facies of rural property, in which meteorological variability in terms of temperature and rainfall is decisive, factors related to the spatial asymmetry of water availability and distribution are decisive, and the variability in the size of farms and plots are unavoidable constraints. This

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[10] *... the concept of the Multifunctional Character of Agriculture and Land (MFCAL) encompasses the entire range of environmental, economic and social functions associated with agriculture and related land-use. The concept is based on the assumption that agricultural systems are intrinsically multifunctional, and have always fulfilled more than just their primary aim of producing food, fibre and fuel. Analysis of the multifunctional character contributes to understanding the potential linkages, synergies and trade-offs that can help to achieve sustainability in agriculture and rural development.* 1999, FAO.

[11] Farm to Fork Strategy for a fair, healthy and environmentally friendly food system. Communication from the Commission to the Council Parliament, the European Economic and Social Committee and the Committee of the Regions. COM(2020) 381 final, p. 3.

[12] https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

diversity of systems requires that the correct scale of diagnosis be defined in advance, so that problems can be analysed and tackled in conjunction with the different objectives in order to achieve environmentally and economically sustainable results. This statement about the scale of action also applies to the definition of policies that adjust and accommodate this diversity and contribute to territorial cohesion.

The presentation of the evidence is organised into four sections: i) a brief characterisation of Portuguese agriculture; ii) the evolution of agricultural production systems (1960-2030); iii) the evolution of agricultural policy; and iv) drivers of change.

3.1 A brief characterisation of Portuguese agriculture

In the 2019 Agricultural Census, 290,000 farms were registered, 15,000 fewer than in 2009, corresponding to a reduction of 4.9%. The Utilised Agricultural Area (UAA) increased by 8.1% compared to 2009, reaching 3.9 million hectares (43% of the land area). The average size of holdings increased by 13.7 per cent, from 12.0 hectares in 2009 to 13.7 hectares of UAA per holding.

Compared to 2009, the following stand out:
The cumulative distribution of UAA among agricultural holdings reveals that the majority of UAA is concentrated in a small number of agricultural holdings, with no significant changes compared to 2009;
The intensification of the corporatisation of agriculture, with companies managing 1/3 of the Utilised Agricultural Area and more than half of the livestock units;
An increase in economic size, with each holding generating an average of 23.3 thousand euros in Standard Production Value, 8.1 thousand euros more than in 2009;
Increased specialisation, with specialised farms increasing by 7.0% and the respective Standard Production Value growing by 49.9%;
A significant change in the composition of UAA, with an 11.6 per cent decrease in arable land and increases in the areas of permanent crops (+24.6 per cent) and permanent pasture (+14.9 per cent);
An increase in the area potentially irrigated (+16.6%), benefiting 69.7% of fresh fruit orchards, 11.5% of nut orchards, 31.7% of olive groves and 27.8% of vineyards;
The increase in animal numbers, cattle (+10.6%) and pigs (+15.7%);
The decrease in agricultural labour (-14.4%), reflecting the reduction in family labour. On the other hand, the hiring of salaried workers increased;
A threefold increase in the number of farms certified for organic production.
http://www.ine.pt/

Portugal's Utilised Agricultural Area (UAA) is around 3.9 million ha (43% of the country's land area), distributed as follows: 54% permanent meadows and pastures; 23% permanent crops and 23% temporary crops[13]. In 2009, UAA corresponded to 39.5 % of the country's total area and in 2019 to 43.0 %. The average size of holdings increased by 13.7%, from 12.0 hectares in 2009 to 13.7 hectares of UAA per holding[14]. Rainfed agriculture accounts for 85 % of UAA, of which 15 % (562,000 ha) is irrigated agriculture. Of this, 46% is temporary crops, 45% permanent crops and 9% permanent pasture[15].

[13] INE, 2021. Agricultural Census - Analysis of the main results - 2019. Lisbon. Available at www: <url:https://www.ine.pt/xurl/pub/437178558>.
[14] Idem.
[15] Idem.

The value of total standard production is €6.2 billion (farms with irrigation = €3.8 billion on 562,000 ha; farms without irrigation = €2.4 billion on 3200,000 ha)[16]. Agriculture accounts for 1.2 % of GDP (2022) and, together with the agro-industrial and forestry sectors, the so-called Agroforestry Complex, is equivalent to 5.1 % of GDP and 12 % of the value of exports. The average annual growth rate of exports from 2000 to 2022 for the Agri-Food Complex was 7.4 % (5.6 % for the Economy). Portuguese exports have been growing significantly in recent years and the agri-food sector is one of the main sectors in international trade. However, Portugal remains a net importer of agri-food products. In 2022, the Agri-Food Complex accounted for 11.7% of imports and 7.9% of exports[17]. In this regard, the deficit in volume and value (5.2 billion euros of agri-food deficit in 2022, 1.4 billion euros more than in 2021)[18] is also mentioned and it is emphasised that Portugal's food supply deficits are not only significant but persistent: "The following agri-food products with a degree of self-supply greater than 100 % stand out: tomatoes for industry (1015.9 %), wine (113 %), olive oil (160.5 %), pears (192.4 %) and butter (152.4 %). Sunflower oil (7.5 %), sugar (3.3 %), wheat (4.0 %) and maize (24.2 %)[19] are all less than 100 % self-supply". As for employment in the sector, it comes as no surprise that the agricultural sector still accounts for 5.3 % of employment, while the EU average is 4.4 %. However, it was mentioned that in Portugal in 2010 the figure was 11.5 %.

The main trends in agricultural land use stem from: i) the expansion of intensive permanent crops (essentially olive groves, vineyards and, more recently, almond groves) in the regions of the Raia and the plains of the Alentejo, as well as in Trás-os-Montes (and vineyards in Entre Douro e Minho); ii) the replacement of cereal-poultry by extensive livestock farming; and iii) the decline in agricultural and forest-pastoral use due to the occurrence of major rural fires. The increase in UAA was essentially due to poor pasture until 2010, but the scenario changed between 2010 and 2019 with the growth of permanent crops, which replaced land occupied by annual crops, with both occupations now having a similar weight (25 %). Land use associated with energy production has recently begun to receive some attention.

For the period in question, the overall area of olive groves increased by 20% in 10 years, currently totalling almost 196,000 ha. In the Alentejo, the change in areas occupied by high-density olive groves (>300 pl/ha) is very significant, with growth of around 300%, while the loss of low-density olive groves is not very significant. Regarding almonds, the expansion of areas under almond cultivation was very significant. In a region where the crop was practically non-existent, it now accounts for 25% of the national total of 49,429 thousand ha, which represents an increase of 100%. The expansion of cultivation in Trás-os-Montes is not insignificant, with growth of around 55%.

As a result of the 2003 CAP reform and the irrigation policy in the south of the country, mainly driven by the start-up of the Alqueva Development and Infrastructure Company (EDIA), created in 1995, and alongside the emergence of new technologies and favourable market conditions, the period 2000-2023 saw the replacement of rainfed arable land with cereal-poultry rotations (pseudo-steppe habitats) with permanent pastures used for extensive livestock farming.

[16] Idem.

[17] https://www.gpp.pt/images/GPP/O_que_disponibilizamos/Publicacoes/CULTIVAR_28/Cultivar_28.pdf

[18] https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaques&DESTAQUESdest_boui=594695354&DESTAQUESmodo=2

[19] CMR no. 132/2021, of 13 September - National Strategy for Food and Nutrition Security.

The transformation of rainfed land into permanent pasture was essentially the result of the measures resulting from the 2003 reform to disconnect direct production aid, combined with the increase of 90,000 suckler cows, a transformation that was not the result of intensification, but was the result of specialisation. Extensive cattle production, given that the CAP grants a premium per animal, was associated with the maintenance of areas of cereal for hay harvested before full maturity, with implications for the drastic reduction of some species of birds that nest in these crops. There was also a loss of irrigated arable land to intensive and highly mechanised permanent crops, especially olive groves and almond groves, with olive groves, associated with smaller farms, occupying larger areas.

Water availability is a critical factor for agriculture and varies in space and time in Portugal (and the Iberian Peninsula). As mentioned above, south of the Tejo, and especially in dry years, there is a situation of scarcity in which water needs already exceed availability.

Irrigation is the main use of water in Portugal, as in the rest of the world, and it is estimated that around 4160 hm3 /year are abstracted for this purpose[20]. Surface sources account for 51 % of the total volume abstracted, with the remaining 49 % coming from underground sources. These estimates were obtained by indirect methods, given the limited representativeness and reliability of the water consumption data in the Water Resources Use Permits (TURH). The calculations were based on the irrigated area figures from the 2019 Agricultural Census (INE, 2021) and the allocations published by the DGADR at the time of the calculation. The Directorate-General for Agriculture and Rural Development (DGADR) considers that the Statistics Portugal (INE) data permanently overestimates the irrigated area and has recently revised its irrigation allocation figures downwards, so it considers that the estimates presented in APA/Nemus/Bluefocus/Hidromod (2021) overestimate irrigation needs.

The irrigated area in 2019 was 562,000 ha, which is only 15% of the UAA, meaning that most agricultural crops are grown on rainfed land with yields that are highly dependent on meteorological variability. According to EDIA (2021), private irrigated land accounts for around 68% of the country's irrigated area. It should be emphasised that knowledge of private irrigation in Portugal is far less than that of irrigation practised in public hydro-agricultural schemes.

The irrigated area is mainly concentrated in the Tejo and West Hydrographic Region (RH5) (32%), the Sado and Mira (RH6) (18%) and the Guadiana (RH7) (15%). This prevalence of irrigated area, and consequently of water use, in the drier south of the country emphasises the imbalance between water availability and needs in the south of the country. The strong seasonality of irrigation aggravates this imbalance in spring and summer.

The irrigated area has increased significantly in the last decade (98,000 ha more), especially in the Alentejo, where 89,000 ha more began to be irrigated in the area of influence of the Alqueva Multipurpose Project (EFMA), in the Western Region (4,000 ha more) and in the Algarve (more than 5,000 ha) (INE, 2019). Irrigation has a high economic value, contributes to increased productivity and represents a profound change in land use and biodiversity. This commitment to irrigation is explained by the higher economic return than dryland farming. The average total standard production value of irrigated land in mainland Portugal is €6.8/ha, compared to

[20] APA/Nemus/Bluefocus/Hidromod, 2021. Assessment of water availability by water body and application of the WEI+ scarcity index to complement the assessment of water body status, Agência Portuguesa do Ambiente - in the press.

€0.8/ha for rainfed land[21]. It should be noted, however, that irrigated farming entails increased costs for other production factors that blur this difference, such as energy and water consumption, the more intensive use of fertilisers and plant protection products and the mechanisation of production.

The increase in irrigated land has been significant and highly transformative. This increase is mainly the result of the shift from annual irrigated crops to permanent crops. The availability of water for irrigation has contributed to this increase in irrigated and highly mechanised permanent crops, especially olive groves and almond trees, as well as subtropical fruits such as avocados and nuts. Over the last ten years, the potentially irrigable area has increased (+16.6%), due to the significant increase in permanent crops (+73.2%). Investment in the modernisation of orchards, vineyards and olive groves was reflected in the increase in irrigation, which now benefits 69.7% of fresh fruit orchards (+9.9 p.p. than in 2009), 11.5% of nut orchards (+8.9 p.p. than in 2009), 31.7% of olive groves (+12.0 p.p. than in 2009) and 27.8% of vineyards (+13.1 p.p. than in 2009)[22].

In terms of biodiversity, significant losses have been reported, particularly in pollinating insects and birds. The intensive production of monocultures and the improper use of pesticides pose serious threats to pollinating insects, reducing their access to food and nesting sites, exposing them to chemicals that weaken their immune systems and cause disease or even death. With regard to birds, particularly steppe birds, there is the paradigmatic case of the bustard which, in 2022 and compared to 2006, had lost 77 % of its numbers at national level (56 % compared to 2016). These losses occurred mainly outside the Special Protection Areas (SPAs) for birds (designated under European Directive 2009/147/EC), which in the Alentejo have been converted from annual rainfed crops (cereals) to permanent irrigated crops (mainly olive groves and almond trees)[23]. Within the SPAs there has also been a sharp decline in the numbers of steppe birds, many of which are protected. Although administrative constraints have limited the conversion of these areas into permanent crops, as they are Protected Areas, the abandonment of cereal support in favour of livestock production, essentially cattle, has contributed to the conversion of rainfed areas into permanent pastures and fodder crops. The latter - fodder crops - present a habitat structure that is potentially favourable for steppe bird nesting, but when they are cut down in the middle of the nesting season, destroying eggs, young and sometimes the adults, they limit the reproductive capacity of these species[24].

According to EDIA (2021), the upward trend in irrigated areas is expected to continue, as a further 75,000 ha of irrigation are approved or underway for the next decade. The prospective scenarios of the River Basin Management Plans (PGRH) predict an increase in water use in all sectors, except for the urban sector, resulting in an aggregate increase in water use of between 3% and 5% by 2027 and between 5% and 14% by 2033. The hydrographic regions (HR) with the biggest increases are in the south, namely HR7 (Guadiana), HR6 (Sado and Mira) and HR8 (Algarve). CNADS has been commenting on this situation, namely in the Conclusions produced

[21] INE, 2021. Agricultural Census - Analysis of the main results - 2019. Lisbon. Available at www: <url:https://www.ine.pt/xurl/pub/437178558>.
[22] Idem.
[23] https://www.icnf.pt/imprensa/conservacaodeavesestepariasnoalentejo
[24] Idem.

in 2020 on the post-COVID 19 phase and the strategic vision for Portugal's Economic Recovery Plan 2020-2030[25].

The aforementioned growth in the irrigated area with the increased weight of permanent crops creates greater pressure for the water needs of these crops to be effectively and regularly met, as a result of investments in irrigation equipment and the cultivation of crops that are not immediately available for production. With this trend, water demand management loses some of the flexibility it used to have, as a result of the possibility of not watering temporary crops in times of drought.

The response to the imbalance between water availability and needs requires an active, effective and integrated strategy that simultaneously ensures the country's social and economic development and the protection and enhancement of natural ecosystems. There is a consensus on some of the goals of this strategy, such as the need to improve the efficiency of water use in the systems supplying agriculture and the population, although more so in the case of the former, due to the large volumes of water involved. Despite the significant work that has been done to reduce losses, both in the supply systems, from the catchment area to the agricultural plot, and in the irrigation application methods, these remain very high in many cases. In addition, the adoption of irrigation management support systems will make it possible to gauge the true needs of the plants with greater rigour. These technologies are already applied to 30 % of the irrigated area, but there is enormous potential for progress here[26].

Another consensual need, but one that is slow to be overcome due to a lack of funding, is to increase monitoring and deepen knowledge of water resources on a scale suitable for their management. There are still gaps in knowledge in various areas, particularly on the evolution of the main hydrological variables in recent years and on the volumes abstracted for various purposes, with particular emphasis on groundwater used in agricultural activity[27].

Diversifying the water supply is also an endeavour that must be pursued. The reuse of treated wastewater and the desalinisation of seawater are two promising solutions, although they are not without their challenges. These potential sources tend to be located on the coast, near larger urban centres and the sea or transition zones, so their use in the interior of the country requires the treated or produced water to be transported over distances that can be significant. In

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[25] CNADS. Conclusions on Sustainable and Inclusive Development in the post-COVID 19 phase and Strategic Vision for Portugal's Economic Recovery Plan 2020-2030, September 2020. "The country really needs infrastructures that allow surface water to be reserved while preserving deep water, especially in areas where average annual rainfall is increasingly low. The Algarve, Alentejo, Ribatejo and Oeste need a short-term strategy, and some regional plans are being prepared. These multi-purpose surface water reserves will contribute to the emergence of new businesses, the settlement of people in the territory and a reduction in the average temperature in the regions concerned. This approach should, however, emphasise the central importance of effective and efficient management of water resources, because it is in the aspects of managing this resource that we have the greatest weaknesses.
In fact, over the last 25 years Portugal has defined a new integrated public policy for water services and water resources, the results of which have had a positive impact on citizens, the economy, public health and the environment, and which are internationally recognised. Portugal is therefore an excellent case study, with a successful experience in changing public water policy, with geographical, orographic, hydrological and social diversity throughout the country, mainland and islands, with a diversity of governance models for water services, with a diversity of technologies adopted and with various successes and certainly some failures."

[26] INE, 2021. Agricultural Census - Analysis of the main results - 2019. Lisbon. Available at www: <url:https://www.ine.pt/xurl/pub/437178558>.

[27] https://expresso.pt/opiniao/2021-03-03-A-perigosa-descida-do-nivel-das-aguas-subterraneas

addition, its use by the agricultural sector requires water storage solutions to make the tendency for uniform supply compatible with the seasonality of water demand.

The increased variability of water availability has led some sectors to advocate the construction of new dams to increase the storage and regularisation capacity of water resources, while transferring water from wetter to drier regions. It is possible that this type of solution will have to be adopted in some specific cases, but this decision must be justified by a comparative analysis that considers the overall construction, operating, maintenance and environmental costs of the different alternatives. The feasibility of new dams and water transfers must also be verified for the most serious climate change scenarios.

Despite the opportunities that exist to increase and diversify the availability of water and improve the efficiency of its use, demand must be controlled, denying the desire to use water that is less productive or less useful to society. To do this, it will be necessary to promote cost benefit analyses that compare investment, operating, maintenance and environmental costs with the direct and indirect benefits provided by each potential water allocation. In addition to all of this, there is a need to establish rational and harmonised criteria for setting prices for irrigation water, which will ensure the necessary economic and financial sustainability of upstream services with stability and predictability, the affordability of irrigation water users, guaranteed fairness in tariff structures, incentives to preserve natural resources through progressive tariffs that induce efficient behaviour and promote the internalisation of the environmental cost of choosing crops that are less adapted to the climatic conditions of our territory.

3.2 The evolution of Portuguese agriculture: how an activity geared towards local and national markets under an extensive utilisation regime is transformed into an activity geared towards global markets under an intensive utilisation regime

From the 1960s onwards, a profound process of transformation began in what was known as "Agricultural Portugal", which was struggling to achieve food self-sufficiency in a context of economic and political isolation, leading to high levels of poverty. The agricultural suitability of the soils was low, with a few exceptions, coupled with poor irrigation capacity. NEXUS interaction of agriculture with soil, water and biodiversity had very different results to today. The most noticeable impact was soil erosion. This policy ensured the almost generalised cultivation of arable land which, together with forestry (sylvo-pastoral systems), contributed to the management of almost the entire landscape, giving the appearance of a 'balance' or the perception of harmony that concealed various social and ecological problems. On the other hand, it was an agricultural activity adjusted to the country's diverse soil and climate, strongly regionally based, based on local markets, supported initially by the transfer of fertility from marginal land to arable land and then by the import of fertilisers, adapted to the disparities in land ownership and the diversity of agricultural production systems (from polyculture to cork oak plantations). The landscape was revealing of the ecological, economic and socio-cultural complexity and bore witness to the scarcity of endogenous resources.

With the establishment of democracy in Portugal in 1974, there was a profound change in Portuguese agriculture which, in the face of significant emigration, especially since the 1960s, had already been moving towards mechanisation. The subsequent accession to the EEC in the 1980s brought about a further change. The primacy of the CAP took hold and led to the sidelining of national agricultural policies designed according to their specific characteristics. Agricultural

production systems evolved, traditional systems declined and the landscape was subject to processes of agricultural intensification at the same time as processes of marginalisation and abandonment.

A study by Viegas et al (2023) identified the territories that receive the least aid from the CAP - almost one fifth of mainland Portugal - and concluded that more than half (54%) of this area is included in 'Vulnerable Territories' (civil parishes) to fires[28]. Mountain agriculture prevails in these territories, essentially based on traditional farming practices, with less scope for mechanisation and intensification, and closely associated with family farming. They are concentrated in the centre and north of Portugal and a significant part coincides with the so-called 'Pinhal Interior', particularly affected by fire in recent years and its economic, ecological and environmental consequences (Figures 3, 4 and 5). The burnt area (2010 - 2019) coincides with municipalities where the number of beneficiaries of public support is lower or even nonexistent and with areas where the average property size is smaller.

Figure 3 - Vulnerable Territories (Ordinance nº. 301/2020 24 of December)

Figure 4 - Burned areas (ICNF, 2010-2019).

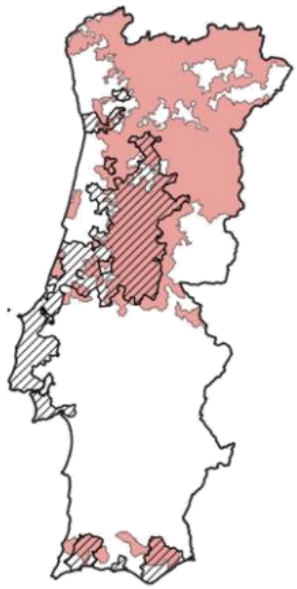

Figure 5 - Overlap of the area receiving the least CAP aid with Vulnerable Territories (Viegas et al, 2023).

Sixty years on, the reality of Portuguese agriculture is profoundly different. As a result of its soil and climate characteristics and the total size of its population, Portugal is not a country that can be self-sufficient in food. In the Conclusions produced by CNADS in September 2020, during the COVID pandemic and given the debate generated at the time around the implications of product supply shortages and strategic food and production sovereignty, we read: "*It is not a question of defending situations of autarky, but of greater autonomy from the point of view of decision-making processes and production and distribution chains, including strengthening the national component in exports (which largely re-export what was previously imported), which implies a*

[28] Ordinance no. 301/2020 of 24 December - Approves the delimitation of vulnerable territories based on the criteria set out in article 2 of Decree-Law no. 28-A/2020 of 26 June.

strong commitment to national (and European) production, strengthening the synergies that can be created between national companies and qualifying and diversifying interdependencies with the outside world. In this context, the objective of strategic food sovereignty takes on a crucial centrality, involving aspects as diverse as maintaining fertile soils and water reserves, combating the processes of abandonment and desertification in rural areas, valuing family farming, protecting rural labour, developing a national agricultural policy or guaranteeing access to quality food for all."[29]. Russia's invasion of Ukraine in February 2022, two strategic countries in the world cereal and fertiliser market, has reinforced the perception of this fragility in terms of strategic food sovereignty in the geopolitical scenario.

Over the last forty years, Portugal has embarked on an agricultural path of specialisation and has started to offer agricultural products that, in a global market economy, present competitive conditions as a result of the Mediterranean characteristics of the climate, namely wine, olive oil, vegetables and fruit (i.e. pears, apples, oranges, cherries, red fruits). Today's agriculture is part of a global and technological industry that brings advantages, but also new sustainability and environmental problems, in addition to global impacts - from climate change to market fluctuations.

Against a backdrop of climate change, the abandonment of agricultural activity in some regions, depopulation and a lack of labour, the pattern of fire has become a recurring and determining factor in the transformation of the landscape, as has the expansion of invasive species, particularly tree and shrub species. This circumstance is not exclusive to our country. It is estimated that around 30 % of agricultural areas in the European Union (EU27) are at least at moderate risk of abandonment and that actual abandonment could reach 5 million hectares by 2030, or 2.9 % of the current UAA (173 million hectares)[30].

Today, the Portuguese landscape is suffering from trends towards simplification of its mosaic and underlying ecological processes, which is contrary to their nature and is at the root of new problems that are disruptive and costly from an environmental, social and economic point of view, with a significant impact on the NEXUS of agriculture with soil, water and biodiversity. However, different agricultural production systems, land structures and ecosystems and habitats still coexist. Agricultural production systems need to be assessed and systematised in order to clarify their modes of sustainability for the correct prioritisation and channelling of public support.

3.3 The evolution of agricultural policy: from a sectoral policy to a territorial and sustainability-based policy

The CAP is the public European policy that has guided changes in the agri-food sector over the last 60 years and has significantly determined the transformation of agricultural production systems and European rural landscapes. Created in 1962, it was a partnership between the agricultural sector and society and between European farmers and Europe, whose main

[29] CNADS. Conclusions on Sustainable and Inclusive Development in the post-COVID 19 phase and Strategic Vision for Portugal's Economic Recovery Plan 2020-2030, September 2020.

[30] Schuh, B. et al. 2020, *Research for AGRI Committee – The challenge of land abandonment after 2020 and options for mitigating measures*, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels. http://www.europarl.europa.eu/RegData/etudes/STUD/2020/652238/IPOL_STU(2020)652238_EN.pdf

objective was to support farmers and improve the productivity of the agricultural sector, guaranteeing a stable supply of food at affordable prices.

Given its pan-European nature, the CAP has struggled to adapt to different realities. Critical voices have pointed out that it has had a limited impact on the pursuit of territorial cohesion objectives, particularly in reducing asymmetries between less and more favoured farmers and agricultural territories.

European agriculture has become increasingly specialised and competitive – including Portuguese agriculture - but in terms of other objectives, particularly from the point of view of the environment, climate and rural development, the results have been less than desirable, continuing to be associated with the loss of biodiversity and genetic variability of plants and negative impacts on the quality and quantity of water and soil. The development of public agricultural policies, with the resulting mobilisation of investments (European and national structural funds), has given rise to new problems with impacts on ecological dynamics, the landscape, income and social well-being, which have occurred at the same time as the depopulation of the rural world and the need for agricultural labour.

In 2022, the CAP celebrated 60 years of continuous and evolving existence, a path that was initially productivist in nature and which, at a certain point, led to the supply of excess food that could not be disposed of within the EU. In 1984, the solution was to create a quota system for products such as milk as a way of ensuring farmers' incomes. It was in this context that Portugal joined the then European Economic Community (EEC) and, in 1986, adopted the CAP.

A series of guiding documents have supported successive CAP reforms. The 1992 reform – the "MacSherry Reform" - was associated with the replacement of a direct income support scheme with compensatory aid for farmers and the reduction of the CAP's overall budget in the 1993-1999 period. The 2003 reform was the result of a mid-term review of the 2000-2006 period and its guiding document was "Agenda 2000: for a stronger and broader Union" (1999). It was associated with the decoupling of direct aid to producers, the principle of respect for environmental cross-compliance (cross-compliance rules) and a new rural development policy, which included two autonomous funding mechanisms: direct aid and rural development. The latter became known as the "second pillar" of the CAP and the first pillar was associated with direct aid and market measures. The introduction of cross-compliance was a milestone aimed at developing a more competitive and sustainable agriculture through greater awareness/responsibility on the part of farmers with regard to the environment and climate and a policy that pays attention to rural development and social and territorial cohesion.

The European Commission then defined three main priorities for the CAP, centred on sustainability in the second pillar: i) making agriculture more competitive; ii) ensuring the sustainable management of natural resources and climate action; and iii) achieving balanced territorial development of economies and communities[31]. The 2013 reform defined the broad lines of the CAP for the 2014-2020 period. It was based on the conversion of decoupled aid into a multifunctional support system and the consolidation of the two pillars: the first responsible for direct aid and market measures financed through the European Agricultural Guarantee Fund (EAGF) and the second dedicated to rural development, with a co-financing scheme that takes into account the wide range of instruments in this pillar and their simplification through the

[31] https://www.europarl.europa.eu/factsheets/pt/sheet/107/os-instrumentos-da-pac-e-as-suas-reformas.

European Agricultural Fund for Rural Development (EAFRD). New emerging themes have come to the fore: climate change, food security, the sustainable use of natural resources, young farmers and animal welfare. As early as 2016, the first debates on the post-2020 CAP began and the legislative proposals were presented in 2018. Delays in the negotiations led to the creation of a transitional regulation that was applied to the period -20212022, which kept most of the rules in force in the 2014-2020 period and largely coincided with the COVID-19 pandemic.

The challenges, objectives and guidelines for the post-2020 CAP took as their starting point the Commission Communication "The future of food and farming" (2017)[32] to make it more results oriented (alongside 'classic' implementation rates) and market-oriented, modernising and sustainable. The following general objectives were agreed: i) to promote a smart, competitive, resilient and diversified agricultural sector in order to ensure long-term food security; ii) to support and strengthen environmental protection, including biodiversity and climate action, and to contribute to the fulfilment of the EU's environmental and climate objectives, including the EU's commitments under the Paris Agreement on Climate Change (2016)[33] ; and iii) to strengthen the socio-economic fabric of rural areas; and, 10 specific objectives: (i) ensuring a fair income for farmers; (ii) increasing competitiveness; (iii) improving the position of farmers in the value chain; (iv) contributing to climate change mitigation; (v) protecting the environment/efficient management of natural resources; (vi) preserving landscape and biodiversity; (vii) supporting generational renewal; (viii) promoting dynamic rural areas; (ix) protecting quality in food and health; and (x) fostering knowledge and innovation[34].

The "Long-term vision for rural areas up to 2040: stronger, connected, resilient and prosperous" presented in 2021 by the Commission gave rise to the Rural Pact and the EU Action Plan for Rural Areas, thus reinforcing the commitment to rural development by "*capitalising on the opportunities raised by the EU's green and digital transitions and the lessons learnt from the COVID-19 pandemic and identifying ways to improve the quality of life in rural areas, balance territorial development and stimulate economic growth*."[35]. The Rural Pact consists of a framework for co-operation based on three objectives: i) Amplify rural voices and give them prominence on the political agenda; ii) Structure and enable networking, collaboration and mutual learning; and iii) Encourage and accompany voluntary commitments to act towards the vision.

The CAP 2023-2027 has been announced as "a fairer, greener and more results-based CAP" in the name of sustainability and more flexible as it allows member states to adapt the measures to their individual conditions. It maintains the 1st and 2nd pillars and, from an environmental point of view, the creation of eco-schemes in the 1st pillar stands out, in line with a new political vision that is intended to contribute to specific objectives 4, 5 and 6 by demanding new agricultural practices in the logic of "a new green architecture for the CAP". These new measures

[32] https://www.gpp.pt/index.php/noticias/o-futuro-da-alimentacao-e-da-agricultura-por-uma-politica-agricola-comum-flexivel-justa-e-sustentavel.

[33] According to what is available on the APA website: "The Paris Agreement aims to achieve the decarbonisation of the world's economies and establishes as one of its long-term objectives limiting the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C, recognising that this will significantly reduce the risks and impacts of climate change."

[34] https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27/key-policy-objectives-cap-2023-27_en

[35] https://ec.europa.eu/regional_policy/pt/newsroom/news/2021/06/30-06-2021-long-term-vision-for-rural-areas-for-stronger-connected-resilient-prosperous-eu-rural-areas

replace "greening" (the compulsory ecological component of Pillar 1 direct payments introduced in 2015) and the obligations regarding the environment, climate change, good agricultural and environmental condition of land, public health, animal health, plant health and animal welfare that incorporated "greening" are now part of the cross-compliance of aid. New environmental measures were introduced in the 1st pillar, the eco-schemes, which involve agri-environmental policy measures that are compulsory at member state level, but voluntary for farmers, and are associated with a substantial financial envelope (it must represent 25% of the financial envelope of Axis A - Income and Sustainability) although adherence to the eco-schemes is associated with support for conversion and maintenance in Biological Production Mode (BMP) and Integrated Production Mode (IPM)[36].

CAP support measures through direct payments, sectoral measures for fruit and vegetables, vineyards and beekeeping and rural development instruments are defined for each member state in the Common Agricultural Policy Strategic Plan (CAPSP) drawn up in accordance with regulation (EU) 2021/2115 of 2 December 2021, which are assumed to be open documents subject to reprogramming. The CAPSP Portugal for the 2023-2027 period is national in scope, incorporates the Autonomous Regions and is structured around six axes spread over two pillars (Figure 6).

[36] The model of direct payments to farmers, among other aspects, has seen a reduction in the financial envelope and has been profoundly altered, with the expectation that it will have a more significant negative impact on smaller farms. It is anticipated that the shock to farmers from the measures could be as great as that which occurred with the 1992 reform, with filling in the Single Application for Aid, throughout 2023, proving to be very demanding and bureaucratic and is already referred to as 'the PU trauma'. In financial terms, it should be noted that the 2nd pillar is co-financed by the member states through the EAFRD, while the 1st pillar is 100 % financed by the European Union through the EAGF. This situation creates inequalities in terms of implementation, which depends on the financial capacity of each member state. In Portugal, the co-financing rate is around 20 %.

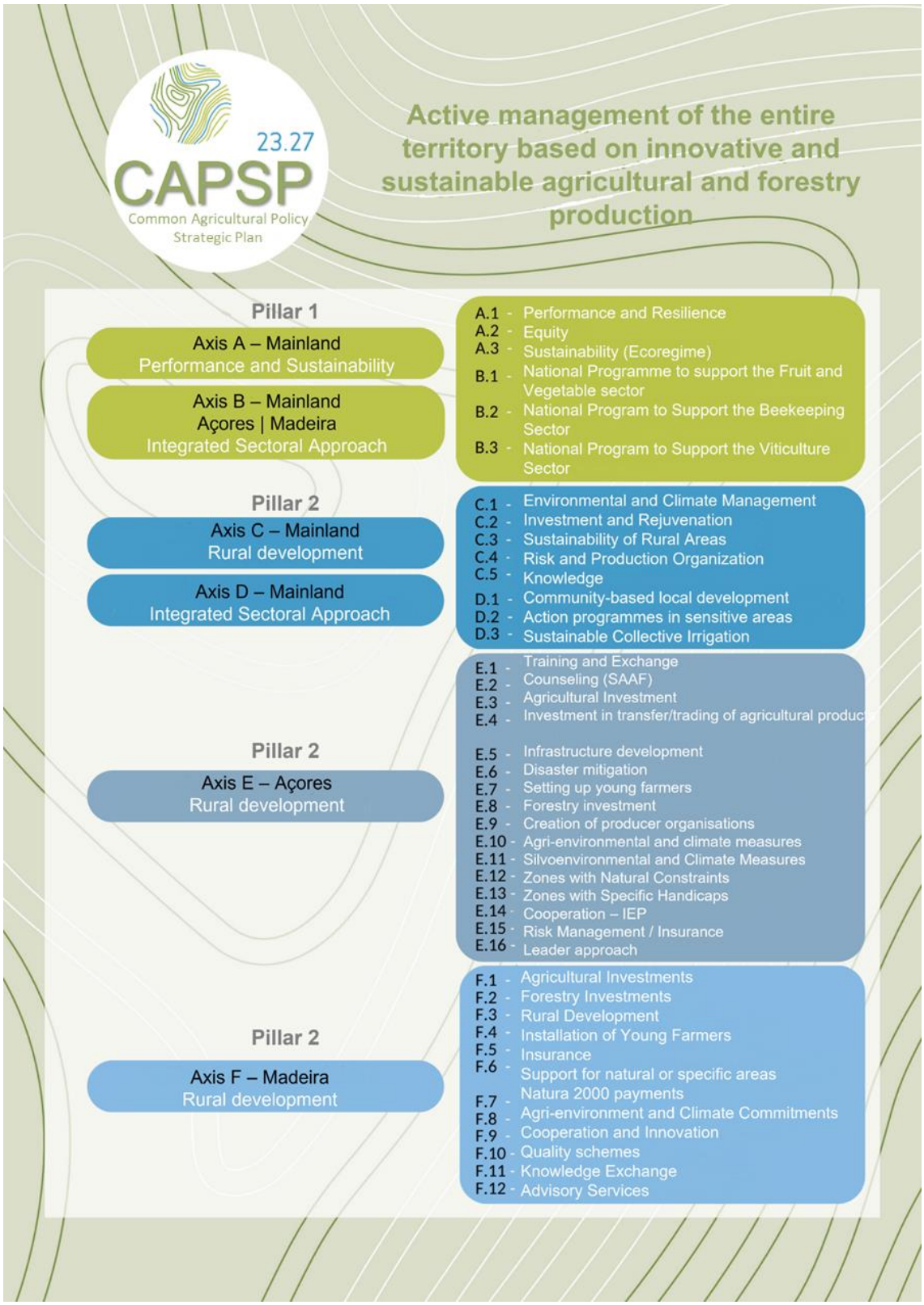

Figure 6 - Structure of Common Agricultural Policy Strategic Plan (CAPSP) Portugal 2023 (source: www.gpp.pt)

Prior to the approval of CAPSP Portugal, on 31 August 2022, the Ex-ante Assessment was carried out (Article 139 of Regulation (EU) 2021/2115), which also incorporated the requirements of the Strategic Environmental Assessment provided for in Directive 2001/42/EC. The "Letter of Comments from the Commission to the Portuguese CAPSP proposal" of 31 March 2022[37], raised several issues (Ref. Ares(2022)2416172), namely noting that it has no national targets for the European Green Deal and, with regard to environmental sustainability, pointing to the need for greater ambition in relation to green architecture and water management (quantity and quality), nutrient use efficiency, ammonia emissions and sustainable forest management. It also notes that the contribution to climate change adaptation is limited with regard to forest fire prevention, water retention, flood risk and drought prevention, and notes 14 comments on supporting and strengthening environmental protection, including biodiversity and climate action, to contribute to the realisation of the EU's environmental and climate objectives, including its commitments under the Paris Agreement.

The context for Portuguese agriculture must be seen as diverse and complex, multifunctional, multi-objective, multi-level and characterised by unpredictability. The complexity inherent in the problems of Portuguese agriculture requires understanding the diversity of objectives and finding the appropriate responses by articulating European, national, regional and local strategies. In turn, the uniqueness of the institutional context was highlighted and characterised as having been born out of a productivist culture that today suffers from inertia in order to evolve into more agile structures, closer to the land and the players, more permeable to change and adaptation, and open to forms of governance that mobilise new partners and processes of participatory and deliberative democracy.

At the Workshop organised by CNADS on 19 May 2023 (Annex 1) with experts in agriculture, water, biodiversity and soil, farmers and representatives of farmers organisations, there was a general feeling of low expectations regarding the 2023-27 CAPSP for Portugal, and it was considered that the diagnosis supporting the CAPSP is limited with regard to regional specificities, biophysical and socio-cultural diversity and agricultural production systems, resulting in an instrument that is distanced from the local scale and has a high bureaucratic burden. It was recognised that the CAPSP regulation needs to be better aligned with the Green Deal, particularly in terms of the link between the environment and the economy. It was anticipated that Portugal will import more food products, fertilisers and pesticides. It was pointed out that many small and medium-sized farmers do not fulfil the minimum requirements to be able to apply for CAP aid, such as the size of their farms, as well as having to deal with the difficulties created by the application processes and the extremely bureaucratic obligations, ending up without access to the available support.

It was recognised that the climate, natural resources and landscape are at the heart of the CAPSP, with repercussions on the environment and sustainable development. However, it was reiterated that, from reform to reform, the CAP has become more complex and hermetic for most of the population, including farmers, and has been held hostage by the lengthy processes that lead to a chronic lack of timely knowledge of the rules of the measures. On the other hand, it was considered that the CAP needs to be complemented by other investments and policies geared towards the specificities of the Portuguese reality.

[37] https://www.gpp.pt/images/PEPAC/Carta_observacoes_PT.pdf

It was questioned whether CAPSP could possibly be associated with an end-of-line process for a policy that fosters its own discredit and risks being interpreted as an electoral instrument, rather than a medium-term strategic change and an effective response to global problems such as climate change or food security.

It was considered that the new strategic approach based on drawing up the CAPSPs to meet the specific needs of the member states was a transition and an opportunity for a policy that was closer to the problems and results-orientated. However, the inadequacy of the CAPSP Portugal to the needs of Portuguese agriculture, the lack of a regionalised diagnosis adapted to the diversity of the country's realities and problems, and the inability of the administration to operationalise and clarify existing doubts were considered to be obstacles to the success of these results.

The new focus on evaluating results, in addition to evaluating implementation rates, was seen as a turning point and an opportunity, along with the opening up to a new strategic approach that takes into account regional specificities that CAPSP allows for at the level of each member state in the 2023-2027 period. However, evaluating by indicator is not enough to know the impact of a farm, requiring a comprehensive set of indicators from production to consumption and prioritising the evaluation of impacts based on a holistic view of the farm.

It was noted as positive that the CAPSPs are open-ended documents, subject to reprogramming. The wish was expressed that the CAPSP for Portugal 2023-2027 should prove to be an instrument that:

> i) effectively serve both the sustainability of agricultural production systems and the recovery of ecological systems - understood as a single system - interconnected by the NEXUS of agriculture with soil, water and biodiversity;
>
> ii) integrates the diversity of landscapes and communities, serves land-use planning and landscape management and is adapted to regional and local levels, i.e. a multi-level policy that knows how to find the right scale to respond to problems and that further integrates environmental, public health and animal health and welfare constraints into agricultural activity;
>
> iii) strengthen, from an accounting point of view, the remuneration for ecosystem services, since the possibility provided for in EU legislation requires prior work to define suitable and reliable indicators and to assess the most appropriate methodology so that farmers are remunerated for these services in a fair and secure manner.

To summarise, this is a long road of learning for the CAP, in which the CAPSP for Portugal 2023-27 can be seen as a transition strategy towards the ambition of what we want to be and the harbinger of a new culture of shared responsibility, based on the art of good communication and adequate technological and ecological literacy, with the post-2027 period in mind.

Development choices in the context of globalisation have highlighted the need to reformulate governance, a multi-level process, and territorial development policies. Among these, place based public policies associated with the EU's Cohesion Policy have begun to gain ground on traditionally sectoral policies, such as agricultural policy.

Cohesion Policy has been reinforcing the importance of the territorial impact of public policies and of an integrated approach, which involves bringing the different levels of governance closer together. The "Europe 2020 Strategy", the territorial dimension of Cohesion Policy, in the 2014-2020 period focused on integrated approaches to territorial development (AIDT), including two instruments: i) Integrated Territorial Investments (ITI)/Development Pacts, and ii) Territorial Cohesion and Community-Based Local Development (CLLD). Over the last few decades, integrated territorial approaches in Portugal have been a process conducted mainly at regional level, although successively discontinued, but also at local level, as in the case of integrated and multi-sectoral approaches orientated towards community-based local development. We're referring to the LEADER programme, which adopted participatory, bottom-up methods promoted through Local Action Groups (LAGs), which emerged to "respond to the specific needs of the various territories through a clear definition of objectives and an articulated set of policies or instruments adjusted to the needs diagnosed."[38]. From 2007, the LEADER 'spirit' was integrated into national and regional rural development programmes under the EAFRD and was subject to an assessment by the European Court of its additional costs and risks compared to other funding models, and the persistent lack of demonstrable benefits which resulted in a recommendation for the Commission to carry out an assessment of the costs and benefits of the programme[39].

Public policy experts have been debating the concepts and terminologies of "*place prosperity versus people prosperity*" and "*place-based versus people-based policy actions*" for years. They are now moving away from the assumptions that there is a clear dichotomy or trade-off between "people versus place" and that "people in places" reflects a more realistic understanding of the relationships between markets, institutions and governance[40]. **The adoption of territorially based regional policies is beginning to gain favour, with the aim of articulating bottom-up and top-down actions, involving actors from the public and private sectors and civil society, in a multi-level governance environment. In turn, the climate emergency has highlighted the greater vulnerability of economically weaker regions and the need to encourage them to take part in the ecological agenda and to compensate and promote "a sense of place and the development of a common sense of purpose", which is essential for bringing about social change for the common good[41].**

3.4 The drivers of change

The transformation of Portuguese agriculture has taken place against a backdrop of public policies and agricultural investments (irrigation) that are disconnected from territorial, climatic and demographic asymmetries and the decline in the diversity of agricultural production systems. A very significant part of the territory is affected by agricultural activity, since, as we've already mentioned, the UAA corresponds to 40% of the total surface area. In general, these changes have occurred on the fringes of land-use planning, which over the last 40 years has favoured urbanisation, infrastructure and building over land-use planning, development and management. These transformations have been determined by a set of socio-economic and

[38] https://www.adcoesao.pt/desenvolvimento-regional/instrumentos-de-base-territorial/
[39] Idem.
[40] McCann, P. (2023), "How Have Place-Based Policies Evolved to Date and What Are They For Now?", Background paper for the OECD-EC High-Level Expert Workshop Series on "Place-Based Policies for the Future", Workshop 1, 14 April 2023, https://www.oecd.org/cfe/regionaldevelopment/place-based- policies-for-the-future.htm.
[41] Idem.

environmental change factors that interact with each other and are of different natures: climatic, biophysical, technological, land-ownership or those resulting from the functioning of markets or policies and investments. Food security or changes in food consumption patterns and dietary trends should also be considered as factors for change in agricultural activity.

Climate change has posed a number of challenges to agricultural production systems, which are faced with increasingly shorter winters, warmer and wetter autumns and drier springs, as well as the increased occurrence of extreme phenomena (rainfall with greater intensity and concentration over time, longer droughts, extreme heat waves both in summer and in periods historically associated with mild or low temperatures, hailstorms in summer, etc.). These affect all Portuguese agricultural activity, regardless of the production system, and put increased pressure on soil, water and biodiversity. The biophysical and structural characteristics of farms are also a major factor in changes in Portuguese agricultural activity, which have always posed different challenges in mountain agriculture, the vineyards of Entre Vouga e Minho, the dairy basin of Entre Douro e Minho, the Oeste, Cova da Beira, the dry pastures of the Alentejo, intensive olive groves or the citrus groves of the Algarve. It's worth highlighting one of the most significant and recent transformations in Portuguese agriculture: the increase in permanent crops, especially in the south (olive groves, almond groves). Permanent crops require a greater amount of water in years of drought and its continued availability over the years, while annual crops can 'risk' years of drought and continue to produce. Although drought always causes damage - to a greater or lesser degree - the losses are lower in these crops than in permanent crops, where one year of drought can simply mean their eradication. This increase has been possible as a result of investment in the retention and distribution of water for irrigation, a decisive factor in bringing about a cultural change and a change in the scale of the activity, which has involved significant public and private investment and, naturally, has introduced new environmental impacts.

In the current context, there are three dynamics in Portugal's agricultural territories:

i) intensive agriculture;
ii) extensive agriculture;
iii) discontinuation and abandonment of agricultural activity.

This systematisation is in line with the "different speeds of Portuguese agriculture" and includes the discontinuation of agricultural activity, which has often led to fields being abandoned. They coexist at the level of the territory and the farm, and each of these speeds corresponds to a set of environmental and socio-economic change factors of different natures that interact with each other.

i) Intensive agriculture

Intensive production systems, namely those for wine, olive oil, almonds, vegetables and fruit (i.e. pears, apples, oranges, cherries, red berries) - some more stabilised than others - correspond to intensive monoculture, highly mechanised and generally technologically specialised crops, associated with the domains of large estates and conducted in a logic of maximising efficiency and economic profit. The environmental impacts of intensive agriculture are on soil, water and biodiversity and are also associated with the intensive use of pesticides and fertilisers which, being negative externalities, are not yet accounted for when calculating efficiency.

The competitiveness of the global market encourages these farmers to adopt technologically demanding crops supported by a high degree of automation and the use of artificial intelligence, regardless of the disparities in the agro-ecological requirements of the crops. It is also necessary to take into account remuneration models or the contribution of agricultural production to supply. For example, the remuneration of products such as wine or olive oil requires "a fair price", which means fair remuneration for the grapes and olives and correct internalisation of the factors of production, particularly the cost of water, or the situation of cereals such as maize, which requires the import of considerable volumes, particularly for animal feed.

Climate change will tend to increase production costs (e.g. irrigation in drought years) and the resulting risk to the activity/business. On the other hand, there is growing pressure to progressively internalise environmental costs that have traditionally not been accounted for. For example, the markets where these crops are consumed have become increasingly demanding in terms of sustainability standards, both in terms of production and distribution (transport), and it is expected that environmental certification of food products will succeed other certifications that already exist with a significant degree of application, as is the case in the forestry sector.

The drivers of change in intensive agriculture will be marked by global markets, technology and a willingness to innovate, public investment and policies, sustainability and the availability and cost of water.

ii) Extensive agriculture

Extensive agriculture prevails in the UAA, where medium to low productivity agricultural production systems dominate, mainly located in the north and centre of the country, and in the Alentejo drylands. It tends to coincide with low-density territories (both in the mountains and in the plains) and has been undergoing a major transformation due to demographic, climatic and technological changes. It occurs in territories with a polycultural agricultural practice and/or in smallholdings, namely the traditional "*campo e bouça*" or "*campo e monte*" systems (including territories with medium and high population density in metropolitan areas) and in permanent pastures associated with the extensive livestock farming that has been occupying Alentejo cereal territories. In the North and Centre, medium and small agricultural entrepreneurs prevail, generally at family business level, supplying mainly local, regional and national markets. Income from farming tends to complement that of the household.

The mosaic of landscapes where the activity is practised tends to be diverse, coexisting with forest areas - some subject to a management model, others without any model and in abandonment - areas of scrubland or areas simply in abandonment or at risk of abandonment. In general, these are territories with a certain vulnerability to rural fires. Innovation has emerged based above all on the sustainability of production methods associated with the sustainable use of resources and the adoption of organic or other production methods, such as agroecology, regenerative agriculture or natural-based solutions.

The factors for change in extensive agriculture will be marked by farmers' predisposition towards innovation and sustainability, the effectiveness of local and regional commercial circuits, the organisation of producers' associations, the possible restructuring of

smallholdings, the availability and subsidisation of water costs following public investment, rural development policies and the risk of fire in the surrounding territorial matrix.

iii) Discontinuation and abandonment of agricultural activity

The causes of the discontinuation and abandonment of agricultural activity (agro-sylvo-pastoral systems) are well understood and are associated with the loss of economic viability of farms and the consequent disappearance of the dynamics of the agricultural (and forestry) sector. It's a complex phenomenon that has a number of interlinked factors for change, from soil and climate, orography, geography or land ownership to demographic loss, from factors related to landbased policies (e.g. lack of public services) to those of a technological nature. The effects of climate change will certainly have a significant impact on these territories, which tend to be low productivity.

In contexts where agricultural activity is discontinued and abandoned, landscape management is often left to ecological succession. In some cases, this succession is cyclical. In other words, the discontinuation of land management leads to an accumulation of fuel which, combined with the characteristics of our climate, which is hot and dry in summer, results in an increase in the frequency and intensity of rural fires. These cycles prevent the ecosystem from progressing to more mature, wooded states, crystallising the landscape into more or less homogenous scrubland with pyrophytic characteristics, which benefits from and facilitates the spread of fire.

The abandonment of traditional agro-sylvo-pastoral field management can, however, give way to new forms of active land management aimed at renaturalising ecosystems and enhancing biodiversity, especially when the abandonment of agricultural activity is accompanied by the restoration of critical plant communities and animal populations, biomass management and other essential ecological processes. Over the last decade, pilot renaturalisation experiments have been tried out in various locations across the country, with particular emphasis on the Côa Valley.

The factors changing the discontinuation and abandonment of agricultural activity will be marked by biogeophysical (climate, soil, relief, water and biodiversity) and demographic factors, structural adaptation of management (cadastral and organisational), rural fires and the availability and cost of water, which, in turn, depend on public policies supported by incentives to pay for services of public use in order to bridge the gap between the costs of management and the return on that management for the farmer/owner and rural development, as well as the creation of new markets geared towards the consumption of leisure-related products in renaturalised territories.

4. THE SCENARIOS

The aim of this section is to identify the next steps in the NEXUS approach, which will enable the above questions to be considered from a prospective point of view based on various options, and which should be regarded as merely indicative and methodological in nature.

Scenarios are a complex task due to the large number of drivers of change that need to be considered and the non-linear interactions between them that are difficult to assess. One way of dealing with this complexity, often used by international bodies such as the

Intergovernmental Panel on Climate Change, is to: i) identify the factors considered to be determinants of a given response variable; and ii) analyse the interactions between the factors, based on narrative descriptions of the "what if" type, discussing the foreseeable consequences on the response variable. Considering this type of narrative makes it possible to explore the consequences of alternative trajectories in the drivers of change without having to quantify the future probabilities of each of the trajectories. This is a probabilistic foresight exercise that would be as difficult as it would be futile, since the future, as far as socio-economic dynamics are concerned, is often determined by low-probability, high-impact phenomena (popularised by Nassim Taleb as "black swans").

In the context of Portuguese agriculture, we have identified three scenarios as a reference for future studies, which are the result of contrasting three alternative trajectories for two determining factors: the international geopolitical architecture, which affects the direction and magnitude of trade flows between countries, and climate change, which affects the abiotic and biotic environment in which agriculture takes place.

The three scenarios are as follows:

> Scenario A (Sustainability) - The IPCC description of the scenario ("shared socio-economic pathway") SSP1-1.9 is materialised. Greenhouse gas emissions reach neutrality from 2050, with a moderate global temperature increase of 1.6ºC in 2041-2060 and 1.4ºC in 2081-2100.

In this scenario, the world evolves gradually and comprehensively along the path of sustainability, emphasising a more inclusive development that respects the planetary environmental limits defined by the United Nations. Economic globalisation is accompanied by political globalisation, which strengthens the capacity to manage the global common good and provides for large investments in education and health that accelerate the demographic transition. At the same time, the emphasis on economic growth is being accompanied by a diversification of goals for social, economic and environmental progress, reflecting in a more complex way the range of changes that affect human well-being. The commitment to achieving the Sustainable Development Goals (United Nations Agenda 2030) is reducing inequality both between and within countries. Consumption is growing moderately and the intensity of resource and energy use is decreasing.

> Scenario B (Regional Rivalry) - The IPCC description of the SSP3-7.0 scenario ("shared socio-economic pathway") is materialised. Greenhouse gas emissions double by 2100, with a sharp rise in global temperature of 2.1°C in 2041-2060 and 3.6°C in 2081-2100.

The world is witnessing a resurgence of nationalism and renewed concerns about competitiveness and security. The emergence of regional conflicts (such as Ukraine and Palestine) is leading countries to focus on internal (e.g. national) or macro-regional issues (e.g. geopolitically related blocs). In the course of the 21st century, policies have become progressively more orientated towards national and macro-regional security issues. Countries are seeking to maximise energy and food security objectives within the macro-regions in which they are integrated, to the detriment of cost reduction driven by a global mercantile logic. As a result, there is a reduction in investment in education and technological development. The pace of economic growth is slowing, consumption is intensive in terms of raw materials, and

inequalities persist or worsen. Population growth remains low in industrialised countries, but is high in developing countries. The strengthening of geopolitical concerns reduces the international priority given to the climate and ecological transition, accelerating environmental degradation in some macro-regions, especially those with lower levels of development.

> Scenario C (Development based on the consumption of fossil fuels) - The IPCC's description of the scenario ("shared socio-economic pathway") SSE5-8.5 is materialised, with greenhouse gas emissions tripling in 2075 and a global temperature increase of 2.4ºC in 2041-2060 and 4.4ºC in 2081-2100.

In this scenario, there is growing confidence in the global integration of markets following principles of efficiency and competitiveness, with a strong commitment to innovation and the development of participatory societies as a condition for driving technological progress and the development of human capital. There are strong investments in health, education and institutions to boost human and social capital. At the same time, the impetus for economic and social development is coupled with the exploitation of abundant fossil fuel resources and the adoption of resource- and energy-intensive lifestyles, despite investments in green technologies. These drivers of change are leading to rapid growth in the global economy, while the world's population is set to peak and then decline in the 21st century. Local environmental problems, such as air pollution, are successfully managed. There is confidence in the ability to effectively manage social and ecological systems, including through geoengineering if necessary.

As mentioned in 2.1, the Conclusions are limited to the identification of possible scenarios to be further developed. Should it be possible to develop the three scenarios further, it is recommended that the following variables be adopted:

- National and global demographic trends (which determine demand);
- GDP per capita (which affects the quantity and quality of consumption);
- Climate trajectory (which affects primary productivity and production costs);
- Technological trajectory (which increases or minimises the effects of the climate trajectory).

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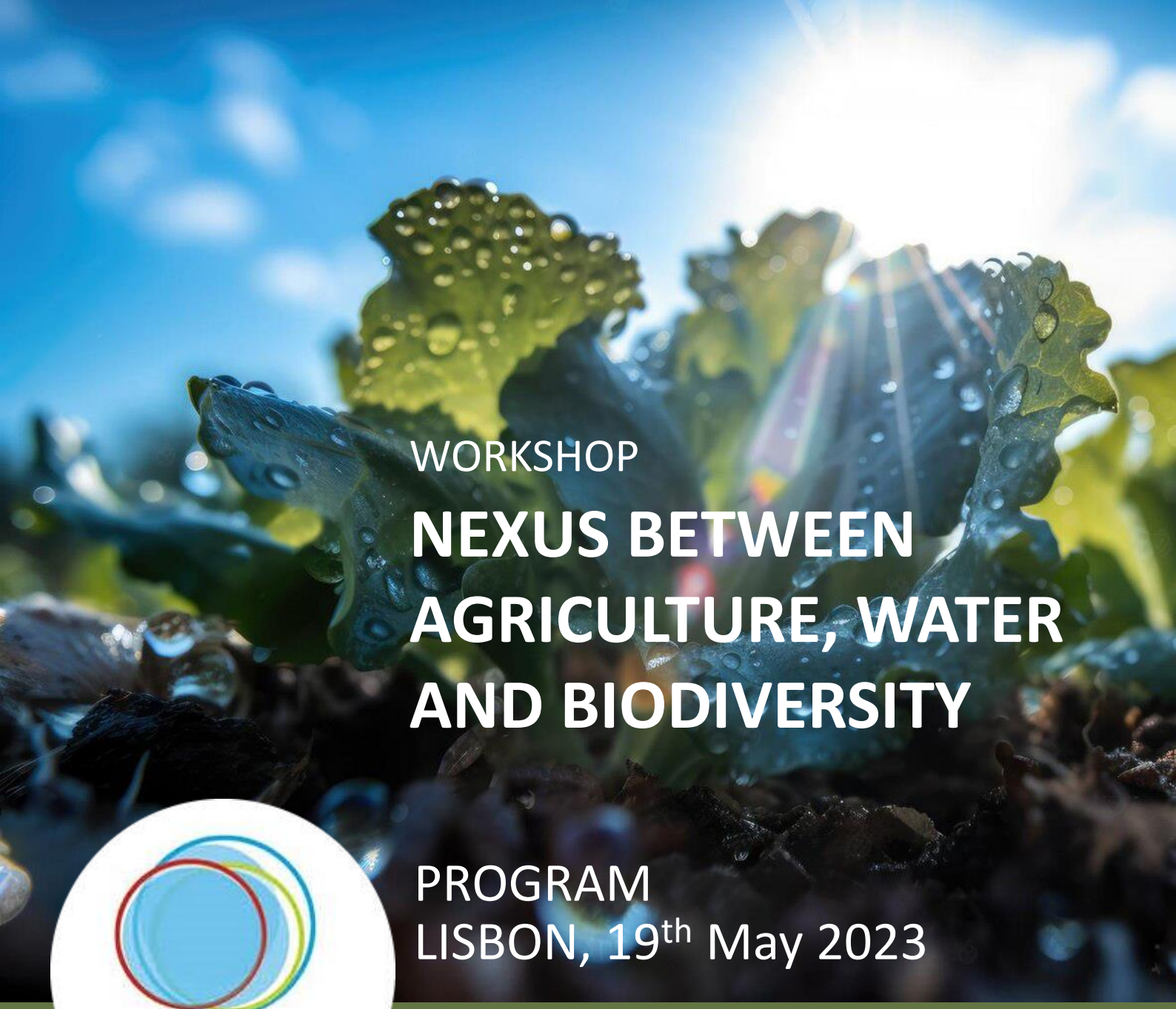
[Unanimously approved at the 1st Extraordinary CNADS Meeting in 2023, held on 15 December]

The President

a) Filipe Duarte Santos



WORKSHOP

NEXUS BETWEEN AGRICULTURE, WATER AND BIODIVERSITY

PROGRAM
LISBON, 19th May 2023

CNADS

The National Council for the Environment and Sustainable Development (CNADS) intends to contribute to the Common Agricultural Policy Strategic Plan for Portugal (CAPSP). Aware of the importance and complexity of the issue, the CNADS has set up a working group to focus on the impact of agriculture on natural resources, in particular water and biodiversity, the close link between the two, and to contribute to the definition of a strategy for the transformation of the territory. As part of this work, a Workshop will be held on the 19th of May.

PROGRAM

FRIDAY, 19th MAY 2023
RUA DE O SÉCULO, 51
1200-433 LISBOA

9h00 **Reception**

9h30 Opening
Filipe Duarte Santos – President of the National Council for the Environment and Sustainable Development (CNADS)

9h40 1st session
THE IMPACT OF AGRICULTURE ON WATER
Moderation
Helena Alegre - Director of the Hydraulics and Environment Department of the Civil Engineering Laboratory (LNEC)
Keynote speaker
Rodrigo Proença de Oliveira – Instituto Superior Técnico – University of Lisbon
Gonçalo Morais Tristão - Vice-President of the Portuguese Federation of Irrigation Associations (FENAREG)
José Manuel Gonçalves - President of the Specialized Commission on Water, Agriculture and Forests - Portuguese Association for Water Resources (APRH)
Polytechnic of Coimbra

10h40 **Debate**

11h20 INTERVAL

11h30 2nd session
THE IMPACT OF AGRICULTURE ON BIODIVERSITY
Moderation
Teresa Pinto Correia – University of Évora
Keynote speaker
José Manuel Lima Santos - School of Agriculture of the University of Lisbon
Nuno Gaspar Oliveira - NBI – Natural Business Intelligence
Mário Carvalho – MED - Mediterranean Institute for Agriculture, Environment and Development - University of Évora

12h30 **Debate**

13h00 **LUNCH**

14h00 3rd session
PROSPECTS FOR THE AGRI-FOOD SECTOR
Moderation
Francisco Cordovil - Emeritus professor of the University Institute of Lisbon (ISCTE)
Carlos Neves - General Secretary of the Portuguese Milk Producers Association (APROLEP)
Dora Simões - President of Viticulture Commission of the Vinho Verde Region (CVRVV)
Albano Álvares - President Boticas Agro Rural Cooperative (CAPOLIB)

15h00 **Debate**

15h30 INTERVAL

15h40 4th session
PROSPECTS FOR THE AGRI-FOOD SECTOR
Moderation
Pedro Santos - General Director of CONSULAI
Jorge Soares - Administrator of CAMPOTEC
João Coimbra - Quinta da Cholda, SA
Alfredo Cunhal Sendim - Herdade do Freixo do Meio

16h40 **Debate**

17h10 **CLOSURE**

CNADS

QUESTIONS FROM THE WORKING GROUP TO THE SPEAKERS

1st SESSION – **THE IMPACT OF AGRICULTURE ON WATER**

- How do you characterize the current water availability in Portugal, in terms of quantity and quality?
- How do you characterize the current and future water demands (globally and for agriculture), and which areas have the greatest scarcity?
- How do you foresee the evolution of this resource regarding climate change and other threats?
- How do you assess the impact of agriculture / CAPSP on water?
- What are the main synergies and opportunities between agriculture, water resources and water services?

2nd SESSION – **THE IMPACT OF AGRICULTURE ON BIODIVERSITY**

- What were the main agricultural dynamics in Portugal in the decade 2010-2020 and what role did agricultural policy had? How have these dynamics affected biodiversity in the decade 2010-2020?
- Has the agricultural policy for 2010-2020 managed to reconcile the objectives of food production and the maintenance of support and/or regulation services provided by biodiversity?
- How will the new CAPSP 2020-2030 change the trends observed in the last decade? In terms of impacts on biodiversity and supporting and regulating ecosystems, will the sustainability of agriculture be enhanced?
- What measures would you suggest to ensure that CAPSP is more effective in terms of environmental sustainability, regarding biodiversity and ecosystem services?

3rd and 4th SESSIONS - **PROSPECTS FOR THE AGRI-FOOD SECTOR**

- Characterize your activity and sector and what is the role of CAP.
- What are your expectations of CAPSP 2023-27 for your activity and sector?
- Regarding your activity and sector, what is your perspective on the challenges concerning water and biodiversity?

EXPERTS
Luís Dias, FCUL, National Roadmap for Adaptation 2100
Raúl Jorge, President of the National College of Agricultural Engineering. Order of Engineers

CNADS WORKING GROUP
NEXUS BETWEEN AGRICULTURE, WATER AND BIODIVERSITY
Filipe Duarte Santos, President of the National Council for the Environment and Sustainable Development (CNADS)

Ana Cristina Tapadinhas, appointed by the Portuguese Consumer Protection Association (DECO)
António Abreu appointed by the Autonomous Region of the Azores (RAA)
Gonçalo Santos Andrade appointed by the Confederation of Portuguese Farmers (CAP)
Jaime Melo Baptista, appointed by the Portuguese Government
João Joanaz de Melo, appointed by the Portuguese Confederation of Environmental Defense Associations (CPADA)
Laura Tarrafa, appointed by the National Confederation of Agriculture (CNA)
Miguel Araújo, appointed by the Portuguese Government
Miguel Serrão, appointed by the Portuguese Confederation of Environmental Defense Associations (CPADA)
Teresa Andresen (COORDINATION), appointed by the Portuguese Government

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